Handbook of Research on

Instructional Systems and Educational Technology

Terry Kidd and Lonnie R. Morris, Jr.

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Handbook of Research on Instructional Systems and Educational Technology

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List of Contributors

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Teacher professional development programs typically do not meet teachers' ongoing, long-term needs that arise. In this chapter, the authors forward a systematic framework called responsive online professional development (ROPD) that can be used by instructional designers to provide continuous, online PD for teachers in the service of curriculum implementation fidelity. The systematic process afforded by the ROPD framework promotes teachers' reflection on their individual classroom practice as they implement new curricula or standards and provides support to teachers as they are implementing new curricula, standards, and pedagogies. Design elements of the proposed ROPD framework are discussed by the authors, and an illustrative example of the implementation and observed outcomes of a previously enacted ROPD Program (GE2PD) are discussed. When compared to conventional PD programs, professional growth from ROPD is emphasized during the implementation process through a systematic approach that intentionally connect teachers with the instructional designers of a curriculum.

This chapter reveals the overview of Massive Open Online Courses (MOOCs) and the implications of MOOCs in the digital age. MOOCs are the Internet-based courses which have large numbers of students involved. MOOCs have a potential for helping college students succeed and for giving a preview of a particular university's teaching style to potential applicants. MOOCs can bring students from all over the world and encourage engagement between staff and students of a given university to interact with the wider public. Offering diverse classes on different topics through MOOCs makes it easy for students to keep up with the latest trends and be on top of their professional field. The chapter argues that encouraging MOOCs has the potential to improve educational performance and gain educational goals in the modern learning environments.

Virtual learning environments provide new teachers with experiences to apply knowledge of learner differences to semi-authentic learning situations involving students with special needs, teachers, and parents. Instructional design provides a systematic process to document instructional designs in an undergraduate special education course, which has students apply universal design for learning principles. A variation of instructional design designed for teacher education, the teacher decision cycle, documents the teaching decisions behind the use of TLE TeachLivE to provide simulated experiences in virtual learning settings, as well as supporting activity structures. Implementation guidelines are provided.

This chapter explores the connections between behaviors in virtual work and virtual learning environments. Benefits and challenges of virtual communities are reviewed. Following a review of organizational and educational literature, the authors identified six core competencies that emerged with shared emphasis as keys to virtual environment success. The authors appeal to educational leaders to assess and develop student, faculty, and administrator skills in developing trust, building relationships, empowerment, coaching and mentoring, inclusion and communication management.

Generally it is difficult for an instructor to prepare and disseminate electronic course contents via Web. Therefore it is necessary to study and develop methodology and tools for supporting instructors, experts and even students to manage and access their online course contents easily, conveniently, flexibly and reliably. In order to do some jobs, module technology was introduced to e-learning to provide modularity in conducting educational development of courses and e-learning. Modules can best perform tasks independently on behalf of what was designed in a modular architecture. In modular design modules can be optimized independently of other modules, so that failure of one module does not cause other modules to stop and in general makes it easier to understand, design and manage web-based course system.

A personal learning environment (PLE) is a construct designed to facilitate the process of learning and knowledge management. As a multidimensional system, a personal learning environment enables users to control the content and process of learning through the selection of resources, applications, and activities that best serve the learning needs. Personal learning environments exist as transformative learning spaces that differentiate to the users' ongoing personal interests and needs. Personal learning environments will continue to transform the educational landscape as technology continues to impact our culture. New modalities of learning will be needed to meet the needs of individuals who wish to pursue education in a manner that best serves their needs. Self-directed learning will require flexible landscapes that can coexist with traditional educational platforms; personal learning environments, if implemented effectively, can meet the emerging challenges in the future of education.

Research on gender difference remains a strong interest today because the gender equality issue has not been fundamentally tackled in many areas due to traditional and cultural gender values. However, on the technology adoption, especially social media tools usage, the gender difference is less prominent. The research study in this chapter was conducted in a higher education institution and data were collected from 1534 students in eight years (2009–2016). The purpose of this study is to find out if there are any gender difference in familiarity of social media concept and use of social media tools, and if the traditional gender values are affecting social media adoption. The results indicate that there is no statistically significant gender difference in media concept knowledge. Both genders were using the same top four social media tools. However, male participants have higher usage of resource-based social media tools, while females have higher usage on relationship building platforms.

This chapter per the authors identifies the problem of rape culture on college campuses, and within the nation, and the idea that social media and technology have not only brought much-needed attention to the issue of sexual assault and violence to the forefront, but it can also serve as a catalyst for college campuses to combat the issue by enlisting the help of its faculty, staff, students, and especially the college's student celebrities. It examines the effect of Social Learning Theory, Differential Association Theory of Deviance, and Feminism as a means to identify faults in our nation's culture, and to use this same method to correct the attitudes of all involved concerning rape culture, bystander intervention, and other aspects of fighting rape culture through the avenue of social media and technology.

Foreword

The instructional systems and technology revolution is for all practical purposes, a major revolution in education, impacting every facet of curriculum, instruction, and student engagement and participation with a speed beyond one's imagination. With the revolution of new learning approaches coupled with the advanced in information and communication technologies, the growth and expansion of instructional systems and technology that began during the early 1950s, but continued, challenging the way in which scholars and practitioners understand and implement such tools for learning. During the last decade, communication technologies including mobile and social media technology, have become a driving force in how people learn and engage, allowing people the ability to communicate, exchange information, create content and share ideas in ways that have advanced new learning spaces. To that end, research and strategies are needed to fully incorporate these tools for the ultimate learning experience

More than ever, the twenty-first century has ushered in a more definitive acknowledgement, appreciation, and ultimate value of instructional systems and technology. Concomitantly, with the advances in technology and the increasing demand by students and practitioners alike, we see an increasing need for research, preparation, and implementation. The need for this text has become very apparent given the economic interdependence this country and the world currently find itself. With the application of current technology, time and space become less and less formidable factors in the advancement of education. The Editors Dr. Terry Kidd and Dr. Lonnie Morris, Jr. have accomplished the objective and mission of this book, by bringing together leading scholars and practitioners to present perspectives as they relate the broad field of instructional systems and technology. Terry's diligence, persistence, and dedication to educational innovation are insightful! Dr. Morris, Jr. has provided industry insights that can be leveraged in an organizational setting to strategic goals using technology. By integrating research and sounds practices, instructional systems and technology paves way to provide students with a quality educational experience. This new book provides "new frontiers for teaching, learning and performance practices.

Whether one is engaged in the development activities of eLearning, or using social media and mobile technology to increase student engagement or academic performance in the classroom, or whether one is a researcher in the field, practitioners and scholars alike will need quality access to knowledge and strategies regarding instructional systems and technology. This text is it.

With the diverse and comprehensive coverage of multiple perspectives presented, this authoritative handbook will contribute to a better understanding all topics, research, and discoveries in this evolving, significant field of study. Furthermore, the contributions included in this handbook will be instrumental in expanding of the body of knowledge in this vast field. The coverage of this handbook provides strength to this reference resource for both instructional systems and technology researchers and also decision makers in obtaining a greater understanding of the concepts, issues, problems, trends, challenges and opportunities. It is my sincere hope that this publication and the amount of information and research presented will assist colleagues, faculty, students, teachers, and organizational decision makers in enhancing their understanding of this discipline and to effectively integrate instructional systems and technology to meet the needs of our diverse learning population. Perhaps this publication will inspire its readers to contribute to the current body of research in this immense field, tapping into possibilities to assist educational institutions in making all educational opportunities open to participants.

As one that teaches online and actively integrate the use of instructional systems and technology tools to advance quality teaching in my courses, I found this text to be a welcomed resource to assist in meeting the challenges of technology mediated instructional practices. I enjoyed reading it and found it very informative. I expect that you will feel the same way.

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Preface

INTRODUCTION

As a field of study and practice, instructional systems and technology utilize learning and instructional theory with various forms of technology as a means of solving complex educational challenges. It is a broad approach that integrates theoretical foundations with systems thinking. This approach, coupled with emerging information technology and computer mediated learning strategies, changes the creative and social nature of learning in education environments and work spaces. These shifts are catalysts for new opportunities in learning, skill development, content development, social interaction and teaching.

BACKGROUND

This book provides theoretical understanding of the essential links between context (traditional academic learning spaces, informal learning spaces, and creative non-formal spaces) technology (ICTs, mobile technology, digital and social media) and the system approaches to teaching and learning. By exploring and analyzing how tools might be used within these contexts, researchers may be able to (a) design strategies that inform, connect, and support optimal technology use in educational settings for teaching and learning; (b) design new learning environments appropriate for the digital age; and (c) inform our understanding of the use of digital media and technology to advance and improve learning spaces.

THE CHALLENGES

The challenges found at the intersection of technology and instruction might be easiest summed up as issues of adoption, pedagogy and assessment. Multiple factors impact technology adoption in education spaces.

Research has shown factors such as access, workload, user-friendliness (Mirriahi, Vaid, & Burns, 2015), collaboration (Oncu, Delialioglu, & Brown, 2008), training (Del Favero & Hinson, 2007), and even mentorship (Kopcha, 2010) can impact how and if users adopt available technologies into their instructional experience. Empirical explorations of educational technology adoption across the globe, including African (Kizito, 2016), Canadian (Mirriahi, Vaid, & Burns, 2015), and British (Lee, 2010) contexts, reveal critical common threads. Without clear strategy, appropriate infrastructure, and perceived usefulness, technology rollouts can fail to reach desired adoption goals.

Although the current generation of education technology is considered pedagogy driven (Adams, 2007), enhanced technological options do not necessarily lead to pedagogical shifts. Educators constantly grapple with balancing the disruptive potential of technology-enabled solutions with pedagogical strategies (Hutchings & Quinney, 2015). Researchers and practitioners recognize there is no single pedagogic or andragogic theory that addresses the needs of all learners. Physiology, cognition, personality, and organizational culture must all be considered (Cercone, 2008). Computer mediated learning strategies require students, instructors and administrators develop enhanced skills in collaboration, cooperation, and relationship building (MacFarlane, 2011). These realities frame how educators consider instructional strategy.

Technology adoption and pedagogical integration are futile without clear indications for how these strategies affect learning outcomes. Although models for the integration of content, pedagogy and technology exist (i.e. Pierson & Borthwick, 2010), investigations of learning outcomes have mixed results and vary by discipline and approach. In some cases, researchers found technology enabled pedagogical approaches positively impacted learning and knowledge transfer. Ladyshewsky and Taplin (2014) found online and blended instructional approaches led to equal and sometimes better learning outcomes than face-to-face instruction. Sherman, Crum, Beaty and Myran (2010) found technology-mediated pedagogy led to positive results for demonstrating knowledge of theory, but less conclusive indications of ability to implement learning into practice. In an investigation of web-based technology simulating human understanding of text, Boyce, LaVoie, Streeter, Lochbaum, and Psotka's (2008) found its application resulting in greater learner satisfaction, but no increase in cognitive processing or knowledge acquisition.

The full embrace of instructional systems and technology requires a comprehensive approach to adoption, pedagogy and assessment.

SEARCHING FOR A SOLUTION

Researchers, teachers, instructional designers, technologists, and other learning professionals are working to collectively solve the challenges of adoption, pedagogy and assessment. As part of the global movement to align solutions for these challenges, this book addresses three overarching needs – appreciation for the evolution of education technologies, frameworks for integrating emerging technologies into successful strategies, and empirical evidence to support adoption of specific methods.

Consideration for the evolution of educational technology provides a window into benefits, challenges and best practices. This type of research is found throughout literature. It provides comprehensive accounts that enable us to better understand the educational implications of phenomena such as digital objects (Reece, 2016) and multiple intelligences (Riha & Robels-Pina, 2009). This book explores the evolution of multiple phenomena across the educational technology spectrum including information security, distance education, massive open online courses, flipped classrooms, digital textbooks, gamification, modular course design, wearable computers, mobile learning, and syndication.

Frameworks help us distill layers of complex ideology into actionable models. Whether it is for assessing technology in teacher professional development (Pierson & Borthwick, 2010), identifying core strategies for leading virtual education environments (Garcia, 2015), or for instructional strategies (Haughton & Romero, 2009), frameworks are useful for guiding educational change. The frameworks presented in this book address design, delivery, assessment, interaction, and professional development among other critical areas.

This book follows the tradition of empirical exploration of education technology in practice. Just as others have investigated faculty online habits (Conceicao, 2006; Shi, 2010), student blogging (Kizito, 2016; Raffo, 2012), gamification (Lisk, Kaplancali, & Riggio, 2012; Roberts, 2014), and social networks (Bertoncini & Schmalz, 2013), the authors here add to our collective understanding of what happens when technology and education come together. The studies in this book offer empirical evidence relative to gender differences in social media, simulation in special education courses, kinesthetic gaming, and human performance technology.

ORGANIZATION OF THE BOOK

The book is organized into 34 chapters. A brief description of each chapter follows.

Chapter 1 identifies the existing challenges in the management of information security in the new millennium. The chapter sets the scene for discussions presented by various authors. In particular, the chapter identifies the global orientation of businesses and the related problems with managing information security. It also identifies the importance of establishing security policies, structures of responsibility and disaster recovery plans.

Chapter 2 charts the evolution of distance education in the digital age. It explores distance shifts in engagement, curricula and learning with digital shifts to the internet, multimedia, and social networking.

Chapter 3 presents a conceptual and practical overview of online learning pedagogies. Problem-based, cooperative, team-based, and collaborative learning methods are discussed in the context of STEM instruction.

Chapter 4 identifies a new outlook for massive open online courses. Proposed strategies in this chapter address the core concerns of students and instructors.

Chapter 5 examines the emergence of blended learning modalities. Enabler and barrier forces are discussed.

Chapter 6 deepens our understanding of blended learning models with empirical evidence regarding student perceptions of their use and application. Results suggest blended learning approaches can support a range of learning styles.

Chapter 7 tackles the emotional experiences of faculty responsible for online course development and instruction. While conceding for the broad appeal of this modality, the study finds negative emotional experiences associated with online delivery.

Chapter 8 offers a model for aligning instructional design, delivery and assessment for online courses. Challenges of interactivity and formative assessment are addressed.

Chapter 9 details an empirical study which examined the effects of human performance technology on web-based instruction. Adverse effects on instruction and benefits leading to performance efficiency are discussed.

Chapter 10 offers a framework for continuous, online, professional development to support teacher curriculum implementation. An applied case study is provided. The proposed framework is compared with traditional professional development approaches.

Chapter 11 explores trends and issues with massive open online courses (MOOCs). MOOCs are encouraged for their potential to positively impact student performance.

Chapter 12 provides a new framework for designing and evaluating learning experience technology. The framework bridges the gap between approaches that are solely technical or pedagogical.

Chapter 13 considers the benefits of flipped classrooms for students and teachers. Advantages of collaboration and teamwork are discussed.

Chapter 14 considers the impact of digital textbooks on active reading and learning. A framework for multimedia active reading is introduced.

Chapter 15 offers a new methodology for creating educational games. Contemporary game-based learning models are reviewed. Recommendations for educators and well as instructional and commercial game designers are provided.

Chapter 16 continues the exploration of game-based learning. This chapter reviews the advantages in engagement, motivation, and feedback achieved with game-based approaches and how those lead to student success.

Chapter 17 showcases results of an empirical study that investigated the effects of a kinesthetic game on student mental computational speed and achievement. Results suggest higher computation and achievement for experimental group participants.

Chapter 18 provides an account of how simulation can be used to connect special education students, teachers and parents. Instructional design and the teacher decision cycle are discussed.

Chapter 19 theoretically examines the connection between virtual work and virtual learning behaviors. Core competencies for virtual success are identified.

Chapter 20 discusses the advantages of modular course design in virtual learning environments. Instructional strategy, content development and content management are reviewed.

Chapter 21 describes how personal learning environments can meet the emerging challenges of 21st century education. This unique attributes of this modality are discussed as transformative spaces that accommodate learning personal interests and educational needs.

Chapter 22 provides an empirical look at gender differences and social media tools. This study sought to understand if there were statistical differences in social media familiarity, usage, and adoption between the genders. Results and implications are discussed.

Chapter 23 delves into serious topic colleges and universities face – sexual assault. This chapter examines the impact of social media and related technologies in the fight against sexual assault and sexual violence on campuses. Strategies for using this technology to enlist campus constituents in the effort to eradicate campus sexual assault are described.

Chapter 24 examines the implications of social media and mobile technology on educational, engagement, collaboration and social learning. Formal and informal applications of these technologies are reviewed in relation enhanced learning experiences and social justice advocacy.

Chapter 25 takes a deep look at the emergence of mobile learning. The growth of mobile technology as an avenue for continuous, lifelong, self-directed, contextual, in-service learning is discussed.

Chapter 26 continues our exploration of mobile technologies and mobile learning. In this chapter, we are introduced to a multitude of overarching lessons from a series of empirical studies of multilingual mobile learning content in South Africa.

Chapter 27 adds a global context to the growing discussion of mobile learning strategies. Mobile access to content, peers and credible sources are discussed.

Chapter 28 examines the use of a flipped classroom approach with post-graduate students. Performance and knowledge creation are discussed. Statistical analysis is provided.

Chapter 29 examines the integration of computational thinking into university curricula. Its application is discussed for instructional technology, mobile learning, and multiple academic disciplines.

Chapter 30 provides a historical and contemporary account of wearable computers and their application in education spaces. Perspectives on the future of this technology in education is described.

Chapter 31 explores how RSS and syndication technologies can positively impact the educational experiences of teachers and students. Underlying technologies are discussed. Strategies for leveraging curated content are described.

Chapter 32 examines the interconnectedness of teacher professional development and technological pedagogical & content knowledge. Professional development structure and technology integration are discussed.

Chapter 33 addresses the role faculty play in leveraging technology for student success. Institutional barriers, faculty responsibilities, and strategies for adoption are addressed.

Chapter 34 explores the impact of emerging technologies on leadership development. The chapter addresses strengths and challenges of technology in related to training, development, and organizational learning.

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Chapter 1
Millennials, Digital Natives, and the Emergence of New Educational Spaces

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ABSTRACT

This chapter serves as an exploration into the landscape of technology use in educational research as it relates to millennials in the United States. The chapter offers a discussion of digital technology and recent studies in educational research as they relate to millennial technology use for educational purposes followed by implications for these environments. Educational scholars and anecdotes from U.S. national digital learning initiatives such as the MacArthur Foundation have promulgated a persona of today's youth in the United States as "digital natives" and "millennial learners" (Strauss & Howe, 2000). This chapter seeks to examine the literature regarding digital narratives and the emergence of new educational and creative spaces as result of digital technology. Findings of this work suggest that students within this case agreed that technology should be used in the classroom based of their learning styles and ability to understand and retain information.

INTRODUCTION

Millennials (Learning Styles, How They Process Data, Use of Technology)

Educational scholars (Lenhart, Madden, & Hitlin, 2005; Lenhart, Madden, Mcgill, & Smith, 2007; Rideout, Foehr, & Roberts, 2010) and anecdotes from U.S. national digital learning initiatives such as the MacArthur Foundation (Ito, Horst, Bittanti, boyd, Herr-Stephenson, Lange, Pascoe, Robinson, Baumer, Cody, Mahendran, Martinez, Perkel, Sims, & Tripp, 2008) have promulgated a persona of today's youth in the United States as "digital natives" (Prensky, 2001) and "millennial learners" (Strauss

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& Howe, 2000). These young people, as described by the recent studies and digital initiatives authored by the scholars noted above, are purported to be online constantly, Internet savvy, and prefer technology enhanced communication channels such as texting, instant messaging, and online posts (Ito, et al., 2008; Lenhart, Purcell, Smith & Zickurh, 2010) to conventional face-to-face interactions. These sources also suggest youth spend approximately 10 hours a day using some form of technology, including social media. Ito (2009) and Mesch and Talmud (2010) for example, suggest digital technology and social media play a large role in the daily lives of youth and that these technologies are deeply intertwined within their daily routines, including social, leisure, and extracurricular activities. While the percentage of those who use social media and other related technologies may be high, it is important to acknowledge there are important differences among these users along gender, racial, and socioeconomic lines in technology adoption and use (Hargittai, 2008b; Junco, Merson, & Salter, 2010). Junco, Merson, and Salter (2010) suggest these inequities can be conceptualized along two dimensions: (a) a digital divide in access to or use of technology, and (b) digital inequalities in how technologies are used and the influence of the digital divide on social media use. As such, educators should be aware that inequalities in technology and social media use still exist between subgroups of students, reflective of a broader sociocultural stratum (Hargittai, 2008b; Junco, Merson, & Salter, 2010). While the position of these and other scholars suggests a positive relationship between youth and technology, prevailing media accounts portray youth media and technological practices as deficient or harmful to academic learning without acknowledging the layered complexities of technology or the experiences of students (Greenhow & Robelia, 2009b; Thurlow, 2006). This dichotomous view between youth experiences and adult perspectives has caused the use of technology by youth, as seen by adults, to be separate from academic processes and practices. Mesch and Talmud (2010) add to the theoretical discussion of youth and their engagement within a social world through the Internet, social media, and mobile technology, suggesting that the Internet and its affordance of social media has displaced other forms of social ties. This displacement has caused a shift in how youth engage with others in their homes, family lives, schools, and workplace.

In modern society there are different types of students and learning styles. Current learning styles that are present in classrooms for millennials have an effect on how well they preform academically. It seems that in current society technology has taken over aspect of learning especially for millennials. Some institutions are transitioning into using more technology in the classroom because of the growing investment and need for institutional advancements. In the journal, *Supporting Millennials to Learn Effectively with Technology Tools* it states that, "Today's youth are exposed to digital technology in many aspects of their day-to-day existence-this has a profound impact on their personalities, including their attitudes and approach to learning" (Keengwe, 2007, p.52). For millenniums, learning styles can include hands on learning and technology based approaches. Using technology in the classroom can help meet students where they are at. Another thing to keep in mind is how Millennials are learning and processing the information they are retaining. Henson purports "Millennials are more comfortable creating and constructing their own knowledge rather than being instructed. The student-centered approach is based on the understanding that students learn more when they take responsibility for their own learning (p.52)". By using technology in the classroom, Millennials have a sense of power and control of what they are learning. Allowing students to use what they do most outside of the classroom, which is texting, instant messaging and social media, inside the classroom in moderation helps create a sense of flexibility when it comes to learning and them retaining what they are learning. Millennials are constantly surrounded by technology and the vast changes that are always taking place. Researchers argue that using technology in education can help benefit students (Keengwe, 2007). Keengwe (2007) suggests that this benefits to students is frame around student centered learning approaches. These learning approaches are based on the understanding that students learn more when they take responsibility for their own learning. Henson, (2004, p.53) suggest similar constructs in that students learning is more powerful when self-directed learning opportunities are engaged. Self-directed learning, as seen in Montessori education, can be beneficial. What makes the Montessori approach distinct from most standard classroom teachings is its concept of work, completed both individually as well as collaboratively, in which a child is expected, "to be invested in his own development, to attain and sustain deep concentration, and to find joy (Cossentino 2006, p. 84)." Meeting first year students where they are at is very important and allowing them utilize technology gives them the freedom to learn on their own instead of the traditional lecture without technology. In order for successful learning to take place in modern day classrooms, flexible rubrics can be established that include putting more emphasis on the use of technology in the grading criteria. Instructors should take time to recognize these new growing advances when working with first year students; this includes instructors encouraging the use of technology and being open to these learning styles. This generation of millennials " have spent their entire lives surrounded by using computers, videos games… and all other toys and tools of the digital age" Prensky, 2001). There is a need to incorporate different active learning styles in the classroom so that Millennials can learn to the best of their ability using technology.

BACKGROND

Current Instructional Methods in Higher Education

Using technology in the classroom can be seen as a positive thing in higher education, especially with first year students. Mobile learning can help provide and foster "collaborative interaction and learning opportunities (Bistrom, 2005: Edwards et al., 2002 p.1)". Integrating mobile learning into classrooms also can help improve critical thinking and thinking skills. In the article, *improving critical thinking skills in mobile learning,* a study conducted using text messaging, multimedia messaging and electronic mail that showed that students "attitudes towards the usefulness of a mobile learning system improved significantly by the end of the study" (Cavus &Uzunboylu, 2009). Mobile learning in the classroom can also help improve student's critical thinking skills, but also their creativity skills both in and outside the classroom. Mobile learning can eventually help move learning outside the classroom and help students communicate questions outside of the traditional classroom setting. In the *Journal of Basic Elements and Characteristics of Mobile Learning*, five key areas were outlined that come into play when dealing with mobile learning. The first concept is the learner. Mobile learning is built off whatever interest the learner. In this case it would be the students. The roles of the learner are "responsibility for their own learning, creating and sharing new information and being able to evaluate themselves and others (Ozdamli & Cavus, 2011 p.939)". Essentially, the student is the center of their learning. Secondly, you have the teacher. The teacher acts as the consultant when it comes to mobile learning. Teachers should be able to recognize what students are interested in and have set goals that offer opportunities to reach these goals. The role of the teacher in mobile learning is to "act as a facilitator guide, being able to learn with the students, increase the motivation of the learners and help eliminate the barriers or obstacles (Ozdamli & Cavus,2011 p.939)" students may encounter.

The next area in mobile learning to consider is the area of content. Content is self-explanatory in this case. It refers to the course material that students are using and learning. Content can range anywhere from video games to a myriad of multimedia elements of technology. In current higher education environments, there are not many video games being used to teach students, rather video PowerPoints, YouTube, Prezzi and other multimedia applications are being utilized. Fourthly is the environment in which students are learning. "Students studying entirely online must have access to all of the assignments and resources (Ozdamli & Cavus, 2011 p.940)." This helps increase co-operative learning and increase in group interaction with the ability to share data. Lastly is the assessment aspect of mobile learning. Using things like daily logs, discussions boards and project evaluations helps provide the pieces that are accurately needed to evaluate a learner's knowledge, skills and creativeness (Odalis & Cavus, 2011). What was interesting about the assessment area was that it wasn't made to discourage students or learners, but to make them understand what it is that they did or do not learn and how it could be better conveyed.

Within the United States, almost "64 percent of all institutions offer at least one online course and 55 percent of all institutions offer at least one blended course (Allen, Seaman, & Garret, 2007 p.1)." Blended courses are another term to explain hybrid classes. As you can see using online learning is already implemented in more than half of institutions in the United States, which shows us the progression or move towards using technology in the classroom. Most common use of technology in the class room is the instructional platforms of Blackboard, Desire2Learn and WebCT. These online learning communities allow students and instructors to communicate using the internet and thus creating an environment of "self-acquisition of knowledge and enables students to share common values, expertise, and understanding of materials (Keengwe, Gerogina & Wachira, 2010). Another method of teaching in higher education is using mobile wireless computers and Persona Digital Assistants or PDAs. Laptops are the most popular use of technology in the classroom and have allowed to students and faculty to communicate and transfer data back and forth in seconds. Laptops and PDAs have many benefits when it comes to instructional methods. Students who use laptops in the classroom have identified that it is "easier, more relaxed, convenient and faster Kim, Mims, & Holmes, 2006 p, 89)".

The Gap Between Millennials and Current Instruction Methods

Within higher education, there can be the assumption that millennials have a better grasp of how technology works in comparison to faculty and stuff. In the journal, *Faculty Training Strategies to Enhance Pedagogy-Technology Integration it* states that "the primary task of technology infrastructure is to support both instructional technology and student learning (Keengwe, Gerogina & Wachira, 2010, p.4)". Stressing the need and importance of technology in higher education can support the fact there is a need for older faculty to learn how to use this new technology especially with the shift and direction in which higher education is going in terms of technology use. It was also interesting to see that in order for faculty to become adaptive to the use of technology in the classroom "the teacher must believe that technology can be more effective in achieving higher level goals than what was previously used… that they have the necessary user proficiencies and resources to use technology (Zhoa & Cziko, 2001, as cited in Keengwe, Gerogina & Wachira, 2010 p. 5)". Self-efficacy plays an important role in faculty use of technology and implementing it into the classroom. It shows that in order for a successful learning environment to occur the user of the technology should be open-minded and confident that the technology will be a useful aid in teaching (Bandura, 1982) as cited in (Cleghorn, Schonwetter & Salajan,) research shows that, *If the hesitant user considers that (s) he saw needs specialized training to perform task simple tasks with digital tools, (s) he might be intimated by technology if (s) he saw the expert handling technology and, thus, feel inadequate in comparison. (p.1394)*

It is important to keep in mind that generational gaps play an important role in terms of how faculty and staff perceive the use of technology in education, specifically in their classroom. If faculty and staff take a liking or more humanistic approach to the benefits of technology in the classroom, the easier it would be for them to use it. Certain technologies are still emerging every day and it seems that with this change in pedagogy students, faculty and administrators will encounter some form of technology within their careers. In the article, *Questioning The Net Generation: A Collaborative Project in Australian Higher Education,* it discusses how "with the support of local staff it aims to develop and implement appropriate technology-based tools in local and learning contexts (Bennett et al: 2006)." Certain institutions should take necessary measures to ensure that faculty/staff are being properly trained and shown the effectiveness of technology in education.

DISCUSSION

Data Collection and Methodological Approach

In order to better assess our hypothesis about digital natives we decided to gather data from a university in the upper east coast. Our group sent out an online survey that consisted of thirty Likert Scale questions. In total we had thirty-eight undergraduate Educational Opportunities Students from a progressive four-year institution in the North Eastern region of the United States of America participate in the study. The age range was between 18-24 years of life. We also had 24 females, participate and 14 males. The data was analyzed by utilizing The International Business Machines-Statistical Package for the Social Science (IBM-SPSS) software to find correlations between the variables.

Findings

Within this table it shows that when we asked the question "I struggle when using technology on my college courses" there was a negative correlation of -.324 in correlation to technology affecting classroom materials. What we took from this correlation was that if a student struggles when using technology, then they won't believe that technology is helping their overall understanding of classroom material at this particular site.

When asked is technology used effectively in my college courses and do students professors support the use of technology in the classrooms at Buffalo State there was a positive correlation of .401. As stated earlier, faculty and staff have to have the mindset and firmly believe that technology is beneficial to the classroom and learning in higher education. One conclusion we drew from the is correlation was If professors support the use the technology, then the better a student's perception of using technology effectively in college courses will be.

Table 1. Correlations

Correlations			
		I Struggle When Using Technology in my College Courses.	**Overall, Technology Helps my Overall Affect Your Overall Understanding of Classroom Materials Presented?**
I struggle when using technology in my college courses.	Pearson Correlation	1	-.324*
	Sig. (2-tailed)		.047
	N	38	38
Overall, technology helps my overall affect your overall understanding of classroom materials presented?	Pearson Correlation	-.324*	1
	Sig. (2-tailed)	.047	
	N	38	38
*. Correlation is significant at the 0.05 level (2-tailed).			

Table 2. Correlations

Correlations			
		Technology is Used Effectively in my College Courses.	**I Believe That my professors Support the use of Technology in the Classroom.**
Technology is used effectively in my college courses.	Pearson Correlation	1	.401*
	Sig. (2-tailed)		.013
	N	38	38
I believe that my professors support the use of technology in the classroom.	Pearson Correlation	.401*	1
	Sig. (2-tailed)	.013	
	N	38	38
*. Correlation is significant at the 0.05 level (2-tailed).			

Table 3. Correlations

Correlations			
		How Often do you use Technology for Academic Purposes?	**Technology is Used Effectively in my College Courses.**
How often do you use technology for academic purposes?	Pearson Correlation	1	.381*
	Sig. (2-tailed)		.018
	N	38	38
Technology is used effectively in my college courses.	Pearson Correlation	.381*	1
	Sig. (2-tailed)	.018	
	N	38	38

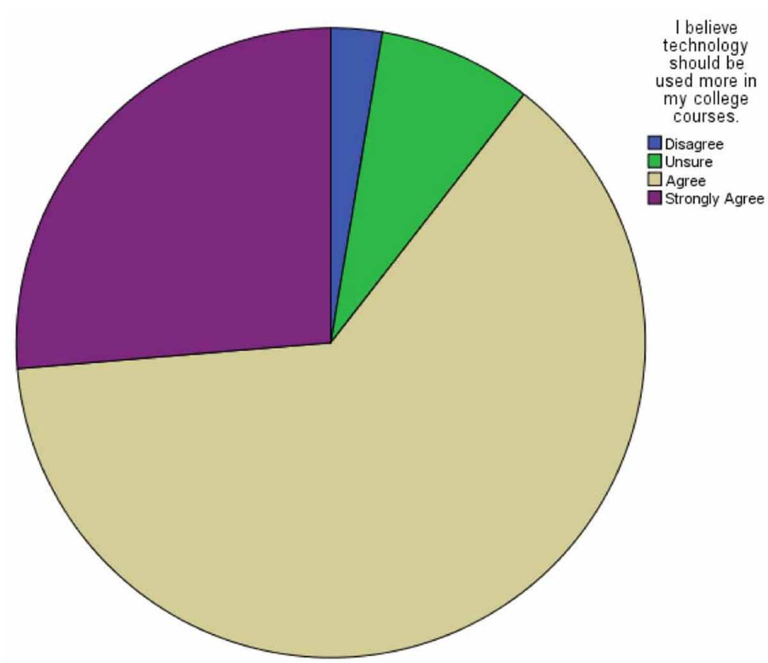
Table 4. Correlations

Correlations			
		I Believe Technology Should be Used More in my College Courses.	**Technology is Used Effectively in my College Courses.**
I believe technology should be used more in my college courses.	Pearson Correlation	1	.362*
	Sig. (2-tailed)		.026
	N	38	38
Technology is used effectively in my college courses.	Pearson Correlation	.362*	1
	Sig. (2-tailed)	.026	
	N	38	38
*. Correlation is significant at the 0.05 level (2-tailed).			

When asked how often do students use technology for academic purposes and if technology is used effectively in their college courses there was a positive correlation of .381 between the two. As a group we drew the conclusion that the more a student uses technology for academic purposes, than there is a perception that technology is used effectively and also if the professors at Buffalo State used technology effectively then students are more likely to use technology for academics.

For our last correlation, we asked students if technology should be used more in college courses and if technology is used effectively in college courses there was a .362 positive correlation. Thus giving us

Figure 1.



the results of perception. If professors at Buffalo State are using technology efficiently, than the students want more use of technology because it is used effectively.

Based on the survey that we used 89.4% of students strongly agreed and agreed that technology needs to be used more in their college courses. Also, we found that the most students agreed that projectors are used the most when it comes to teaching styles and desktop computers being the least.

Limitations of the Study

Students were selected out of convenience, so there were some sampling biases because the researchers did not sample an entire population. Smaller sample sizes, do not allow the findings to be generalized. Use of only quantitative methods versus mixed-methods approach did not allow for a larger scale of research to be conveyed through the study. Students may have felt a sense of pressure in their responses and to participate in the study to gain their professor's approval.

CONCLUSION

Within higher there are numerous ways that technology can be used in teaching and facilitations. Institutions should take the measure to find out what works best when it comes to instructing students because this can effect retention rates. Comparing older learning styles to the way in which technology is moving may be a good start. Bridging the gap may also help guide institutions into using more technology into the classroom. This gap can be closed my encouraging faculty, staff and administrators to see the benefits of the implementation and integration into classrooms. Our findings showed that most of the students at SUNY Buffalo State agreed that technology should be used in the classroom based of their learning styles and ability to understand and retain information. Overall, we found that there was a need for further study because it may have a different outcome if we engaged in a dialogue with the professors and not just student's perception on the use of technology.

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Chapter 2
Mastering Distance Education in the Digital Age

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ABSTRACT

This chapter explains the overview of distance education; the current issues and approaches in distance education; and the implications of distance education in the digital age. Distance education is a viable option for many individuals of all ages who desire to get an education. Distance education provides the opportunity to study more subjects and reach out to programs that are not available in the immediate area. Distance education platforms, when fully developed and built out, can offer strong features that enhance the learning experiences. Through distance education, online classes typically cost less than an education in a traditional classroom environment. There are less space limitations and learning materials required for each student and the savings are passed from the educational institution to each student.

INTRODUCTION

Nowadays, many university-based education methods go online regarding the advanced learning technologies (Safford & Stinton, 2016). Distance education plays an important role in broadening educational access and increasing higher educational opportunities (Tabata & Johnsrud, 2008). Distance education is a method of education in which learners are physically separated from educators (Kaya, 2012), focusing on the pedagogy, technology, and instructional system design (Xueqin, 2012). Distance education becomes the recognized approach for education in the information age (Yilmaz, 2012).

The emergence and application of information and communication technology (ICT) in educational settings significantly imply the changes in the learning tools utilized in the modern learning environments (García-Peñalvo & Conde, 2015). The Internet-based distance education is considerably growing (Guohong, Ning, Wenxian, & Wenlong, 2012). Information technology (IT) and infrastructure development allow the effective delivery of educational contents (Kutluk & Gulmez, 2012) across the globe (Massey, Lee, White, & Goldsmith, 2012). In distance education, the learning material constitutes the

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main access to knowledge for adult students and determines the pedagogical practices (Christidou, Hatzinikita, & Gravani, 2012).

This chapter focuses on the literature review through a thorough literature consolidation of distance education. The extensive literature of distance education provides a contribution to practitioners and researchers by revealing the important perspectives on distance education.

Background

There is the tremendous growth in the use of the Internet to deliver distance education at community colleges (Cejda, 2010). The virtual environment offers many interesting options for continuous dialogue, through the application of such tools as asynchronous e-mail or threaded discussion forums, real-time conferencing platforms, and instant messaging functions (Meyers, 2008). Nowadays, there are numerous alternatives to the traditional learning model which generally try to improve the quality of university education (Abtahi, 2012). Distance education can be defined as a result of the attempt for educational progress (Gündoğan & Eby, 2012). The main goal of distance education is to deliver education to students who are not in a traditional classroom by allowing the self-determined, independent, and interest-guided learning through information systems (Gündoğan & Eby, 2012).

Higher education systems across the globe are challenged by the advent of ICT and the Internet (Guri-Rosenblit, 2005). The effect of using the Internet in modern education has gradually increased, and new technologies have improved the student's learning (Kaya, 2012). The process of modernization leads to the development of new educational methodologies with the utilization of modern IT (Emil, Roza, & Anastasia, 2015). Educational institutions have created the new opportunities regarding development of the Internet, and they also provide electronic learning (e-learning) environment to provide the Web 2.0 support in distance education (Tavukcu, Arap, & Ozcan, 2011). E-learning allows students to select the learning content and tools appropriate to their various learning interests, needs, and skill levels (Kasemsap, 2016a). Web-based learning can support the open learning concept by providing students with the ability to connect to the educational resources (Kasemsap, 2016b).

IMPORTANT PERSPECTIVES ON DISTANCE EDUCATION

This section provides the overview of distance education; the current issues and approaches in distance education; and the implications of distance education in the digital age.

Currents Issues and Approaches in Distance Education

Education is an important factor in economic development and social change (Rashid & Elahi, 2012). Education, especially higher education, is vital for maintaining national and individual competitiveness in the global knowledge economy (Liyanagunawardena, Adams, Rassool, & Williams, 2014). Distance education enables education applications to be shareable and improvable through Internet and Web 2.0 technologies (Erturgut & Soysekerci, 2010). Distance education is an important part of modern education (Kaya, 2012). Distance education is among the significant fields for the application of educational technology (Ding, Niu, & Han, 2010). Distance education is not only significant in terms of finances and student enrollment, but also in terms of meaningful learning (Annetta & Shymansky, 2006).

Distance education is defined as an institutional education activity wherein students, teachers, and teaching materials at separate locations are brought together with the support of communication technologies (Iskenderoglu, Iskenderoglu, & Palanci, 2012). Severino et al. (2011) viewed distance education as a resolution to learning with the exclusive communication modalities and the strong social dynamism in relationships. Yarmohammadian et al. (2011) indicated that distance education is an important approach in which students and teachers are far from each other. Social networking sites (SNSs) allow individuals to be visible to others and establish connections with others (Kasemsap, 2016c). SNSs can increase student's engagement as the distance education learners (Lester & Perini, 2010).

Distance education is of great importance because it is the virtual interaction through modern technologies (Zahed-Babelan, Ghaderi, & Moenikia, 2011). In order to actualize instructional objectives within a virtual classroom, it is crucial to create a secure web-based environment in which technologies are utilized in such ways as to support applied collaborative learning experiences (Kiely, Sandmann, & Truluck, 2004). Regarding distance education, instructional goals are also extended to areas for educational skill building, such as the development of abilities to interact in the meaningful ways in virtual learning environments, collaborate to achieve shared goals, and communicate using various educational media (Palloff & Pratt, 2007).

Three goals direct the continuous use of technologies in distance education: facilitating productive and participative learning communities; enabling assignment delivery; and promoting the development of significant areas of secondary learning, such as mastering the use of new media (King, 2002). Learning communities can provide learners with an environment conducive to the increased interactions and can alleviate their feeling of isolation (Yuan & Kim, 2014). Because high attrition is associated with online distance education, the principles of learning communities may be applicable to online courses (DiRamio & Wolverton, 2006). The development of a sense of learning communities is an effective way to help ensure the success of the distance education program and can directly address the challenge of distance education attrition (Moore, 2014).

Stoessel et al. (2015) indicated that the current higher education is characterized by a proliferation of distance education programs and by an increasing inclusion of nontraditional students. The potential impact facilitated through the introduction of technologies in the experientially based curricula allows the effects of educational service to extend beyond the classroom as students from diverse cultural, social, and economic backgrounds collectively investigate community development and dynamics within the framework of civic engagement, social action, ethics and leadership, thus promoting influence and change in distance education (Guthrie & McCracken, 2010). The ethical standards are expressed as the expectations of good conduct in distance education (Farahani, 2012).

Concerning distance education principles, context, learner needs, goals, characteristics, and the local learning environment can be defined as the learning inputs, whereas effective learning can be defined as the learning outputs in terms of educational sustainability (Gündoğan & Eby, 2012). The integration of computer-aided systems and the utilization of multimedia tools promote the acceptance of distance education in the digital age (Sen & Ucar, 2012). In distance education, students can participate in the education from their houses or from the places where they want or where they are at that moment (Çakır & Yurtsever, 2012). The evaluation process of distance education involves not only online examinations, but also educational modules (e.g., forum, assignment, wiki, and dictionary), thus exhibiting students' learning performance (Karal & Cebi, 2012).

Implications of Distance Education in the Digital Age

Distance education is a systematic approach, which requires a combination of human and material resources from schools, businesses, society, a combination of traditional teaching methods and modern educational technology and a combination of education and teaching activities and business operation activities (Guohong et al., 2012). Development of distance education through modern technology is aimed at creating an effective educational environment supporting the traditional learning in the process of lifelong learning (Emil et al., 2015).

Distance education is a method which helps teacher and student get together in dual interaction, different place and time or simultaneous different places through single or dual interaction and saves up time and place (Sevindik & Cömert, 2010). Adopting the advanced forms of information dissemination and IT solutions has been the main driving force of vigorous development of distance education (Shi, Wang, Qiao, & Mao, 2011). The rapid development and diffusion of ICT has prompted advances in the use of distance education to serve the students' educational needs, particularly those in rural settings (Davis & Niederhauser, 2005). Distance education include video conferencing and resource packages along with online learning components (e.g., discussion board, wiki, podcast, and e-mail).

Distance education is a significant topic of discussion among faculty at all levels of education (Annetta & Shymansky, 2008). With millions of students in higher education enrolling in distance education, it becomes essential to understand student's learning with online education (Liu, 2012). Teaching online requires the different pedagogy and the unique set of skills gained from traditional classroom (Hardy & Bower, 2004). Boling et al. (2012) indicated that as colleges and universities expand their educational offerings of online courses, educators can enhance instruction if they are aware of current research on distance education. Developing online course requires the suitable adaptation in the teaching practices (Koehler & Mishra, 2009).

Evidence-based approaches to the design of the next generation of interactive distance education need to take into account established multimedia learning principles (Kalyuga, 2012). The application of modern technology in education increasingly demands an educational shift from a teaching paradigm to a learning paradigm (Hardy & Bower, 2004). This shift requires online instructors to take on various roles, such as the mentors, coordinators, and facilitators of learning (Smolin & Lawless, 2003). A shift in the educational roles is a major challenge for many faculty, especially those who rely on lectures to engage and instruct students (Desai, Hart, & Richards, 2009). Flexibility, portability, and accessibility contribute to a positive impression on students, while faculty concerns can be achieved with appropriate training and tailoring to the various teaching and learning styles present in distance education (Fuegen, 2012).

In changing the mode of instruction or the educational model of distance education, an institution must transform its organizational structure to enable changes (Aoki, 2012). Distance education-related decision makers, who are determining the future of the distance education, should focus on the capabilities of modern technology and media (Yengin, Karahoca, Karahoca, & Uzunboylu, 2011). Because the student is often learning independently in distance education courses, and because of the potential for non-linear navigation through online learning materials, the careful deployment of self-regulated learning skills is especially critical for successful distance education outcomes (Bol & Garner, 2011).

Distance education course formats can alter the modes of information exchange and interpersonal interaction relative to traditional course formats (Mackey & Freyberg, 2010). Delivery of a distance education program allows students to educationally improve at their own individual pace (Lewis, Osborne, Gray, & Lacaze, 2012). The effective distance education activities should be designed to fit the specific learning context and the nature of subject matter (Yilmaz, 2012). Examples of distance education include multimedia teaching, interactive demonstration, interactive guidance, control of the keyboard, monitoring, classroom management, and online examinations (Guohong et al., 2012).

FUTURE RESEARCH DIRECTIONS

The classification of the extensive literature in the domains of distance education will provide the potential opportunities for future research. Learning analytics applies techniques from information science, sociology, psychology, statistics, machine learning, and data mining to analyze the data collected during education services, teaching, and learning (Kasemsap, 2016d). With the advent of Web 2.0, social media platforms (e.g., Facebook, Twitter, and blog) are the advanced technology and can be utilized to encourage education (Kasemsap, 2017a). Social media allows organizations to improve communication and productivity by disseminating information among the different groups of employees in a more efficient manner (Kasemsap, 2017b). Considering the associations among distance education, learning analytics, and social media platforms in modern education would be beneficial for future research directions.

CONCLUSION

This chapter highlighted the overview of distance education; the current issues and approaches in distance education; and the implications of distance education in the digital age. Distance education is a viable option for many individuals of all ages who desire to get an education. Distance education provides the opportunity to study more subjects and reach out to programs that are not available in the immediate area. Distance education technologies can provide convenient locations for both students and instructors. Distance education is much more flexible than traditional styles of classroom education. Instead of being limited to networking in the local area, distance education enables students to make connections with a more diverse range of learners.

Many patterns of distance education provide both students and learners the educational option to participate whenever they wish, on an individualized basis. Through distance education, online classes typically cost less than an education in a traditional classroom environment. There are less space limitations and learning materials required for each student and the savings are passed from the educational institution to each student. Distance education platforms, when fully developed and built out, can offer strong features that enhance the learning experiences. Utilizing distance education through the support of modern technology has the potential to improve educational performance and reach educational goals in the digital age.

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KEY TERMS AND DEFINITIONS

Distance Education: The learning that uses television, video tapes, computers, and the Internet, instead of physical attendance at the traditional classes.

Education: The process of gaining knowledge.

Electronic Learning: The educational course, program or degree delivered completely online.

Information Technology: The utilization of computers, storage, networking, and other physical devices, infrastructure, and processes to create, store, secure, and exchange all forms of electronic data.

Internet: The global communication network that allows almost all computers to connect and exchange the information.

Learning: Knowledge or skill acquired by instruction or study.

Technology: The system by which a society provides its members with those things needed or desired.

Training: The education, instruction, or discipline of a person or thing that is being trained.

Chapter 3
Distance and Online Learning

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ABSTRACT

The aim of this chapter is to present a conceptual and practical overview of online learning pedagogies for the 21st century courses including science, technology, engineering, and mathematics (STEM) courses. Online learning and various alternative innovative forms of online small-group learning have been developed and implemented worldwide to replace or supplement the traditional face-to-face classroom instruction. Online teaching/learning using small-group learning methods such as problem-based learning, cooperative learning, collaborative learning methods, and team-based learning are examples of such innovative reform-based collaborative student-driven pedagogies that are covered in the chapter. These innovative 21st pedagogies make learning in online environments more stimulating, engaging, and motivating for students to deeply and meaningfully learn the course content and maximize their persistence in the web-based online courses.

INTRODUCTION

O*nline learning,* which is also referred to as e-Learning, Cyber learning, or Web-based learning, is an innovative student-centered instructional method for teaching/learning of the digital course content delivered in distance via the internet and mediated by computer mediated communications (CMC) and web-based computing technologies (Report of the NSF Task Force on Cyberlearning, 2008). The National Science Teachers Association (NSTA) supports online learning as an important component of student's academic learning experience in the 21st century student-driven classrooms and defines web-based online learning as the effective learning process created by combining digitally delivered content of course materials with academic learning support system (NSTA, 2008). Specifically, online learning, which is a technology based student-centered learning approach, refers to teaching and learning settings that employ networked computer mediated communications (CMC) technologies that include the World Wide Web (Internet) and course management systems (CMS) and can be accessed through satellite, cable, broadband, or wireless technologies,

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Historically, distance education has been provided for many years to deliver courses from a distance location, first via postal correspondence and then via the mass media of radio and television. But until the invention and growth of the Internet, it was not possible to provide distance education to anyone, anytime, and anywhere in the world. Distance-based online learning is the latest form of distance education to deliver instruction worldwide, where the learners and instructor are separated by place and time.

For the last three decades, the emergence of World Wide Web (WWW) communication networks, technological advances in Information Technology (IT) and handheld mobile technologies (e.g., tablets, smart phones), and powerful computer technologies has been continuously redefining, reshaping, and advancing the concept of distance learning and computer supported learning (CSL), including online learning to deliver the instructional course content. The Internet provided a rich new technological medium for teaching and learning that has evolved over the last two decades. Meanwhile, it produced research results that have propelled us closer to understanding how to effectively use Internet-based methods for delivering instruction and learning. Therefore, the technological revolution of the internet and the World Wide Web (WWW) has a great impact on the teaching of various subject matters across all levels of schooling.

The online courses are delivered via the internet in the form of Web-based courses with instructional materials that specifically designed for successful implementation of the online courses such as: (a) Electronic written text course materials, PowerPoint slides of course content, instructional digital videos, audio-recorded lectures, and video-taped lectures and course related materials; (b) Interactive synchronous and/or asynchronous group discussions via web-based discussion boards and platforms to share and foster ideas about the various topics of a course; (c) Team-based collaborative projects, and (d) Electronic assessment tools specifically designed to assess the learnt content of the online courses (e.g., quizzes, assignments, exams).

However, for the last two decades, the adoption rates for online learning have been continuously increased in high schools and higher education institutions and various Course Management Systems (CMS) and platforms are used to facilitate the delivery and the process of online courses. Therefore, we are witnessing an exponential increase in designing and delivering online courses by two-year and four-year higher education institutions as well as middle and high school institutions in the United States and worldwide. The increased popularity of online education by students, faculty, and academic institutions stems from its many advantages including, for example, its potential for providing more flexible access to instructional content and materials of web-based online courses to anyone from anywhere and anytime around the world.

Accordingly, there is strong evidence that **o**nline enrollments have demonstrated continued substantial growth at rates of twenty-one percent, which far exceeds the total higher education student population growth of two percent over the same one-year period (Allen & Seaman, 2010). In 2012, there were over 6.7 million students taking at least one online course with an increase of nearly one million students from the previous year (Allen & Seaman, 2013). Globally, there is also growing number of students taking online courses in other countries of the world such as Canada, China, India, United Kingdom, and other countries worldwide. According to the report funded by the National Science Foundation (NSF), online learning has the potential to transform education throughout a lifetime, enabling customized interaction with diverse learning materials on any instructional topic from anywhere and anytime across the globe (Report of the NSF Task Force on Cyberlearning, 2008).

In online courses, instruction takes place and delivered via the internet and web-based platforms that enable and facilitate the use of online chat rooms, threaded discussions, internet learning activities, instructional videos and audios, PowerPoint slides of the course content, and web links to instructional resources. The online course tends to be either asynchronous, allowing students to work on their own schedule from anywhere in the globe or synchronous, where the instructor and students must be present online at the same time to ask questions and discuss the online course content. Contrary to the online courses, in traditional face-to-face classrooms, the instructor and students are in the same fixed physical location (e.g., classroom, laboratory) learning together at the same time.

Therefore, with the continuing rapid adoption of online learning by high schools and higher education institutions as an innovative digital instructional delivery method, the International Association for K-12 Online Learning (iNACOL) called for the development of online models supporting college and career-readiness for all K-12 students (iNACOL, 2013). Meanwhile, educators of higher education has been researching and publishing in the areas of online teaching and learning methods as an alternative innovative instructional delivery mode to the traditional face-to-face instruction.

Consequently, numerous empirical primary studies have been conducted to compare the achievement of students taking online courses to students taking the same course in regular face-to-face classroom environments. These studies have consistently shown that in some cases the academic outcomes of online courses is similar to face-to-face campus courses and in some other cases is superior. Means et al. (2009) conducted a meta-analytic study to examine and synthesize the published research results of 51 comparative primary studies comparing the academic achievements of students in online and face-to-face classrooms. They stated that "the overall finding of the meta-analysis is that both fully online and blended classrooms (i.e., a combination of online and face-to-face classrooms) across all levels of schooling (elementary, middle, high school, and college) and across all disciplines, fields of study, and subject areas on average produced stronger student learning outcomes than classes with solely face-to-face instruction. Their results showed that the overall average effect size for all 51 contrasts was 0.24 indicating that both online and blended learning are more effective than solely on-campus face-to-face classrooms.

ADVANTAGES OF ONLINE LEARNING

There are many educational benefits and advantages for online learning, which is a student-centered and technology-based instructional method that is used in the 21st century classrooms. For example, in web-based online courses, the roles of the students and instructors are switched. Instructors become more akin to be facilitators of learning than lecturers and dispensers of course content, while the students become active, self-directed, and independent learners. In other words, the role of the instructors in online environments shifts from instructor-focused classrooms to learner-focused classrooms. The following is a listing of some of such advantages and benefits of web-based online and virtual learning, which aims to develop and/or improve students':

- Motivation to learn the online course material, especially difficult courses such as STEM courses, which are usually considered to be complex and difficult to learn.
- Ability to meaningfully and deeply learn the online course content of various subjects areas including STEM subjects.

- Ability to become self-directed long-life learners by developing self-regulated strategies to attain their learning goals. Students are continuously self-assessing, self-regulating, self-monitoring, and self-controlling their own cognitive, motivational, and behavioral learning goals. These different goals are some of these self-regulated strategies that often used in online environments. Therefore, success in online courses often depends on students' abilities to direct and regulate their own learning (Cennamo, et al., 2002; Tsai, 2011).
- Collaborative skills to work collaboratively and interactively in teams from different distance locations. The frequent collaborative synchronous and/or asynchronous online activities allow more opportunities for learners to freely participate in online learning activities without any barriers and limitations (e.g., physical disabilities, race, gender, knowledge levels, personalities, and academic experiences).
- Attitudes towards learning the online course content, especially difficult courses such as STEM courses.
- Interpersonal and communication skills via online synchronous and asynchronous interactions with faculty and other online classmates from different distant locations through online video conferencing, emails, wikis, blogs, online chat rooms, and online discussion boards. These online engaging interactions are critical to develop online community of learners and promote learning in online environments (Garrison & Arbaugh, 2007).
- Ability to effectively and efficiently solve complex and difficult real-life problems in online environments.
- Critical thinking, higher-order thinking, meta-cognitive, logical, and reflective skills, which are significant characteristics to develop lifelong learners.
- Ability to work on their own pace, which is important for some students, especially minority and international students.
- Negotiation and conflict resolution skills in a civilized way in online environments, which mirror future workplace settings.
- Access to the online course resources from anywhere (given the availability of Internet connection) in anytime (24/7) and anywhere across the globe. Therefore, providing expanded opportunities for more learners to continue their education with no need to meet face-to-face.
- Ability to construct their own knowledge from previously learned knowledge and experiences based on social constructivism theories.
- Technological skills in using the Internet and online course management system (CMS) tools such as online assessment tools and interactive synchronous and/or asynchronous discussions via computer-mediated communications (CMC).
- Ability to navigate the World Wide Web and digital libraries to find and read the related digital materials for the online courses.
- Ability to more openly and comfortably discuss controversial issues (e.g., academic freedom, diversity, affirmative action, political tolerance, and gender) in online settings than in face-to-face classrooms (Meyer, 2006).
- Writing skills because of the frequent use of online synchronous and/or asynchronous discussion boards and emails necessitate clear writing abilities to communicate with the instructor and students in the online courses.
- Time-management skills for keeping up with completing and submitting the completed assignments and taking the required online quizzes and exams by the assigned due times and dates.

DISADVANTAGES OF ONLINE LEARNING

Compared to face-to-face instruction and despite the many advantages and benefits of online education, online learning also has many challenges and disadvantages. The following is a listing of some of the disadvantages:

- Lack of face-to-face interactions and real-life contact with the instructor and other students in online web-based courses.
- Lack of some students' familiarity with computers, Internet, online courses, online course management systems (CMS). and technical skills.
- Lack of access to computers and internet, especially for students from traditionally underserved populations (e.g., low income families and technically underprepared students).
- Technical problems with Information Technology (IT) and the course website interface such as online submission of assignments and exam taking problems.
- Absence of social presence of instructors and students in the online environments.
- Lack of timely and immediate instructor's feedback, which reduces students' satisfaction with the online course.
- Heavier workload (e.g., discussions) for online courses than the courses that are offered in face-to-face classrooms because of the fact that in face-to-face classrooms, discussions are limited to the time devoted for group activities and class time.
- Slower and less efficient communications in online environments than in face-to-face classrooms because verbally talking and discussing are easier and faster than discussing the course content via text writing.
- Lack of course structure and design for some of the online courses. For example, instructor's lack of ability and experience in designing effective online synchronous and/or asynchronous discussions, online activities and assessment tools.
- Much more frustrating moments of misunderstanding in online discussions than in face-to-face classrooms. In face-to face classes, the instructor can intervene faster to clarify immediately the misunderstandings. Also, waiting for responses from other students in the online classrooms, for example, asynchronous online discussions frustrate the students.
- Students' sense of social isolation and disconnectedness from lack of community learning, which leads to the possibility of experiencing difficulty with the online course and failing grades.
- Less collaboration among students for synchronous and/or asynchronous discussion activities (e.g., cognitive dialogues) in online environments than in face-to-face classrooms.
- Online courses require quality writing skills and it is especially problematic for foreign students and students who lack quality writing abilities. These students probably lack writing skills to express themselves clearly in online synchronous and/or asynchronous discussions. The lack of writing skills also affects students' online learning performance and grades.
- Absence of verbal and auditory communication cues in the online environments.
- Absence of nonverbal cues such as body language communication, eye contact with the instructor and other students in online courses, and facial expressions. The absence of such cues may lead to cold discussions for both instructors and students facing computer screens.
- Difficulty of providing and implementing laboratory experiments for courses that require laboratory experiences in online environments. Science, engineering, and technology courses are

examples of such online courses. In general, laboratory work provide hands-on practical experiences to: (a) engage students in learning the course content, and (b) help students to develop the relevant knowledge, skills, and conceptual understanding of online course content. For example, in engineering education, the engineering design tools often require computing power and graphics software that are not readily available to use by students in web-based online environments (Bourne, et al., 2005)

- Difficulty in providing and implementing STEM online courses that require significant use of mathematics such as mathematical and statistical symbols and formulas (Bourne, et al., 2005).

SMALL-GROUP PEDAGOGIES FOR ONLINE ENVIRONMENTS

Advances in instructional technology and computer-mediated communication (CMC) technologies during the last decade have been contributing significantly to improved student-instructor and student-student interaction capabilities and interactive course design in online instructional environments. In addition, with the rapid growth of online learning (in terms of course and program offering as well as online student enrollments) and the need for innovative online instruction, many educators and instructors have been experimenting and implementing various small-group pedagogies (e.g., collaborative learning, cooperative learning, team-based learning, peer learning, and problem-based learning) for their online courses in web-based environments. The various small-group pedagogies are developed and often implemented in face-to-face classrooms over the last three decades before implementing them in the online environments. These innovative pedagogies stress interactive and collaborative online group learning to replace or supplement the individualized and competitive the traditional online learning methods of instruction, which have been the dominate and common instructional method used for online courses.

Online small-group learning methods are considered as an umbrella for various forms of active student-centered instructional pedagogies that empower the learners in the online teams/groups to work interactively and collaboratively using effective communication and social skills in online synchronous and/or asynchronous team-based environments that mirror the technology-based workplace settings. These innovative forms of small-group methods in online environments are developed as alternative pedagogies to the small-group methods in the traditional face-to-face classroom settings. For information about implementing various small-group learning methods in face-to-face classrooms, the reader is referred to Cartney (2006), Fink (2004), Kalaian and Kasim (2014), Kalaian and Kasim (2015), and Springer, et al. (1999).The following are brief descriptions of some of the innovative small-group pedagogies that are used and implemented in the 21st online (virtual) web-based courses:

Online Problem-Based Learning

Online problem-based learning (PBL) is a systematic and structured student-centered and inquiry-oriented teaching/learning pedagogy, where relevant problems are introduced to the online groups/teams of size five at the beginning of the instructional cycle of the online course. The problems are used as stimulus to provide the context and motivation for learning the online course content, which lead to developing a single or multiple viable solutions to the problems in online synchronous and/or asynchronous interactive teamwork environments (Kalaian & Kasim, 2014; Prince, 2004; Savery, 2006).

Compared to face-to-face classrooms, the design and implementation of PBL in online environments is guided by the following requirements that emphasize that the online course design should:

1. Use ill-structured, authentic, and complex problem (s) as stimulus. The problem (s) might have one solution or many different solutions.
2. Require students to solve the problems collaboratively in online small groups/teams of size 4 or 5 members. The instructor can form the online small groups/teams by using the following two group formation methods: (a) The instructor randomly assigns the students to the online small groups; or (b) The instructor assigns the students to the online small groups based on students' abilities (e.g., students' level of achievement, for example, grand point average).
3. Use computer supported collaborative learning (CSCL) technologies for online interactive synchronous and/or asynchronous group discussions, collaborative problem solving, and other collaborative online activities to develop affective relationships, feelings of belonging, social support, and sense of cohesive and interactive community among students.
4. Include frequent and immediate feedback as well as online assessment tools.
5. Include methods to equip students with strategies to: (a) acquire deep and meaningful domain-specific knowledge, and (b) develop domain-independent skills such as critical thinking, problem solving, meta-cognition, higher-order thinking, reasoning, and reflection.
6. Include frequent monitoring and evaluating students' contextual concept exploration, adequateness of problem-solving strategies, and problem solving progress.

For the last decade, many pedagogical studies provided practical examples of how fully online courses can be structured on the principles of problem-based learning. In addition, many primary studies have focused on examining the effectiveness of online problem-based learning compared to the traditional face-to-face instruction. Primary studies conducted by Baturay and Bay (2010), de Jong, et al. (2013), and Sendağ and Odabasi (2009) are examples of such studies.

Online Cooperative Learning

Online cooperative learning is a structured and systematic student-centered learning approach in which students work together in online (virtual) learning groups of size 3-4 to maximize their own and each other's common learning goals in online environments. It is guided by cognitive and social constructivism principles such as positive interdependence among the online group members, online synchronous and/or asynchronous peer interactions, individual and group accountability of the members of the groups and frequent assessment of group functioning (Johnson & Johnson, 1989; Kalaian & Kasim, 2014; Slavin, 1995). Similar to face-to-face instruction, the online cooperative learning method is often guided by the following five major socio-cognitive principles:

1. Positive interdependence among the members of the online group through adoption of different teacher-assigned roles that support the group's goal for successfully completing and solving the teacher-assigned problems and/or tasks in online web-based environments.
2. Online synchronous and asynchronous interactions among the group members to accomplish the learning tasks.

3. Online group activities and tasks structured by the teacher that emphasize individual accountability and personal responsibility.
4. Development of interpersonal and group dynamics skills in online environments. Effective communications, leadership, time management, and conflict resolution are examples of such skills.
5. Self-assessment of online group/team functioning by periodically reflecting in writing to assess the team's strengths and limitations. These frequent assessments help the students to remedy any shortcomings and improve the effectiveness of their team in an online course (Johnson & Johnson, 2009; Johnson, Johnson, & Smith, 1998; Johnson, Johnson, & Stanne, 2000; Slavin, 1995; Kalaian & Kasim, 2014).

For the last decade, many pedagogical studies provided practical examples of how online courses can be structured on the principles of cooperative learning. In addition, many primary studies have focused on examining the effectiveness of online cooperative learning compared to the traditional face-to-face instruction. The primary study conducted by Hutchinson (2007) is an example of such studies.

Online Collaborative Learning

Online collaborative learning, in contrast to cooperative and problem-based learning, is a relatively unstructured form of small-group learning that incorporates a wide range of formal and informal instructional methods that require grouping students in small groups of at least two students in each group to work interactively and collaboratively towards a common goal of solving problems and/or completing course content related tasks in synchronous and asynchronous online environments (Kalaian & Kasim, 2014; Kalaian & Kasim, 2015; Springer, et al. 1999).

Online collaboration is an active and socially interactive learning process that allows a group of individuals working together online to develop a supportive cognitive and social atmosphere of acquiring and sharing information where the members of each of the online groups can contribute their knowledge to answer the questions and solve the problems via online synchronous and asynchronous interactions and discussions using computer-mediated (CMC) platforms.

Online peer learning, which is referred to as pair learning, pair programming, or peer-assisted learning, where students work interactively and collaboratively in pairs to accomplish a common goal in synchronous and asynchronous online environments. Peer learning, which is commonly used in computer programming and other STEM laboratories, is an example of collaborative learning method in online environments (Kalaian & Kasim, 2015).

For the last decade, many pedagogical studies provided practical examples of how fully online courses can be structured on the principles of collaborative learning. In addition, many primary studies focused on examining the effectiveness of online collaborative learning compared to the traditional face-to-face instruction. The primary studies conducted by Dewiyanti et al. (2007) and Solimeno, et al. (2008) are examples of such studies.

ADVANTAGES OF ONLINE SMALL-GROUP LEARNING

There are many educational advantages and benefits for learning in active small-group online environments. The following is a listing of some of the advantages and benefits of online active small-group learning pedagogies that improve students':

- Collaborative skills in team-oriented online environments that mirror the future real technology-based workplace environments.
- Ability to learn deeply and meaningfully the content of the online course.
- Attitudes towards learning of the various subject matters including STEM subject areas.
- Social skills, interpersonal interactions, self-confidence, and self-esteem by frequently engaging in the online through interactive discussions with the other members of the group in the online course.
- Motivation to learn the STEM course content by students encouraging and supporting each other in the online groups to successfully and collaboratively completing the required tasks of the online course.
- Interpersonal oral (e.g., phone calls) and written (e.g., text messages, emails, discussion boards) communication skills to promote online group (team) cohesion.
- Skills in problem-solving, critical-thinking, and meta-cognition.
- Negotiation and conflict resolution skills in online environments.
- Ability to become active and independent long-life learners.
- Self-directed and self-regulated learning skills.
- Retention of the course content as a result of frequent access and engagement with the content of the online courses.
- Persistence in the online STEM courses because of the frequent cognitive and social support of the group members in the online enviornments.

DISADVANTAGES OF ONLINE SMALL-GROUP LEARNING

Despite the positive views and advantages of various small-group learning pedagogies, the literature suggests that there are some disadvantages, difficulties, and challenges with using the various forms of small-group pedagogies in online environments. These difficulties lead to some of the students to neither function well nor thrive in online small-group team-based environments. These online small-group pedagogical and implementation problems are:

- Lack of structure for effective online courses using small-group learning methods. For example, instructor's lack of ability and experience in designing effective online small-group activities, discussions, assessments, etc.

- Lack of (or minimal) contributions and input by some students in online small groups, especially in group projects and assignments, where few students in the group do most of the work and the others take credit without doing any work. This problem is referred to in the literature as a "*free-ride.*" It is considered as one of the most serious and challenging problem in all forms of small-group learning pedagogies.
- Students' previous negative experiences and reactions to group work in online environments.
- Students' unfamiliarity and unpreparedness with the online small-group processes and pedagogies, which often lead to uncertainty and anxiety. Clearly written tutorials, guidelines, and instructions about small-group processes and functioning guide and help the students to know their responsibilities and how to behave and function with other students.
- Having dysfunctional online groups as a result of poor online communication skills and/or lack of support for each other in the online groups.

FUTURE RESEARCH DIRECTIONS

In the near future, it is expected to witness a renaissance in the adoption and use of online learning as well as the various forms of online small-group pedagogies that are proven to be effective across a broad variety of STEM courses. In other words, it is expected to witness increased use of e-collaboration and virtual teams that rely on technology-mediated communications and computer supported collaborative learning (CSCL) rather than face-to-face interactions to accomplish their common learning goals. As a result, it is expected to witness an increase in the number of empirical studies that examine the effectiveness of online learning compared to face-to-face settings. It is also expected that new and innovative online teaching/learning pedagogies will emerge to promote deep conceptual understanding of the various STEM subject areas (Kalaian & Kasim 2015). In addition, it is expected to witness an increase in the number of empirical studies that examine the effectiveness of online small-group pedagogies compared to small-group learning methods in face-to-face settings.

Similar to face-to-face small-group instruction, virtual (e-collaboration) small-group teams and online groups that are designed and implemented effectively can maximize achievement, performance, and harness talent to solve real-life problems in various disciplines and fields of study, especially STEM disciplines. The increased use of synchronous and asynchronous online and virtual learning/teaching using small collaborative virtual teams will lead to conducting more primary studies that focus on evaluating the effectiveness of the virtual groups/teams in online settings compared to face-to-face classroom settings.

CONCLUSION

Online learning is an innovative, technology-based, and student-centered approach to learning for the 21st century. Online teaching/learning methods via web-based platforms have been developed and implemented nationally and worldwide to replace or supplement the traditional face-to-face instruction in brick and mortar physical classrooms.

With the emergence and the technical advancements of the internet and the increased interest in online web-based learning, the use of information and communication technologies (ICT) via the World Wide Web (WWW) to improve teaching and learning in high schools and higher education institutions worldwide has become a crucial issue. Information and communication technologies are being used to increase access to upper levels of schooling and higher education across the globe by providing flexibilities to students for learning from anywhere, in anytime, and in any pace. Increasing the availability and accessibility of online programs and courses including STEM programs and courses can increase the number of qualified workforce, for example, in STEM disciplines and fields of study.

Some undergraduate STEM education are slow and lagged behind some other fields in adopting online methodologies because some of the special needs of undergraduate STEM education cannot be well-served in web-based online environments. Specifically, STEM practical hands-on laboratories, mathematical equations, and design tools are backbone of various disciplines of STEM education and are difficult, and sometimes impossible to provide and implement in online environments. Therefore, lab-based courses that require physical skills such as automotive mechanics or welding may not be appropriate for fully online course (Meadors, 2012; Strickland & Butler, 2005).

Structuring and designing online courses that include the use of interactive synchronous and asynchronous communications and small-group pedagogies is an important factor and a central element in online education. The main impact of online learning communities on the role of the instructor has been to shift from teacher-centered physical on-campus classrooms to learner-centered online (virtual) web-based classrooms. Palloff and Pratt (2003) stated that collaborative activity in an online course is, if carefully structured, "probably the best way to tap into all learning styles present in the group."(p. 36)

All the evidence suggest that in the future most of the traditional on-campus brick-and-mortar classrooms should be replaced or supplemented by innovative reform-based online pedagogies, which are constructivist and student-centered approaches. Allen & Seaman (2007; 2013) indicated that providing online education is becoming critical to the long-term success of the private and public higher education institutions, which are student enrollment-driven. Allen & Seaman (2010) stated that during fall 2009, the growth rate of online enrollment in higher education institutions was 21.1% compared with just a 1.2% overall growth rate of enrollment in higher education institutions.

In order to be more effective in maximizing students' achievement, motivation, engagement, and persistence in the online classrooms including STEM classrooms, teaching and learning online activities should be designed and implemented by taking into consideration the teaching/learning principles of these innovative online constructivist and student-centered learning methodologies. These methodologies, which are interactive small-group pedagogies, will ultimately assist in equipping students to learn more broadly and deeply to become self-directed lifelong learners equipped with team-based skills that mirror the technology-based workplace environments in the nation and worldwide.

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Chapter 4
A Summary of Four Key Issues Affecting Distance Education

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ABSTRACT

As access to technologies that support higher learning grows exponentially world-wide, it is imperative that companies wishing to make relevant contributions prepare effective tools to address the needs of diverse prospective students and instructors. Through investigating a variety of sources, the author has identified a significant opportunity for massive open online courses (MOOCs) with expertly designed products that are geared to address the most relevant concerns that both learners and instructors have identified as barriers to their adoption. He has drawn conclusions that technology must be aligned to meet the needs of both learners and instructors as both groups respond with unique needs to the challenges that teaching and learning in online environments present. The paper seeks to identify the most relevant concerns of both groups so that the products created will be most applicable to the needs of the learners.

INTRODUCTION

Online learning is known by many names: eLearning, blended learning, mobile learning, MOOC, online education or virtual learning environments. It is reasonable to assume that how people relate to one another through digital content varies directly with their experience with the tools used to deliver it. Consider how people's knowledge of one another grows exponentially when widespread access to the Internet or to social media becomes available. Online educational opportunities have the same potential to expand individuals' access and knowledge in learning environments. For clarification, a MOOC is "a model of educational delivery that is, to varying degrees, massive, with theoretically no limit to enrollment; open, allowing anyone to participate, usually at no cost; online, with learning activities typically taking place over the web; and a course, structured around a set of learning goals in a defined area of study" ("MOOCs II," 2013, p. 1). One might think of this design as an open university, in which a student would choose a stand-alone course from a long list of options. The idea is not a new one: The pre-cursor to the current idea of open online courses originated much earlier in Europe and the United States after the industrial

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revolution, when large numbers of workers required additional training for employment in factories. In fact, students in Australia were taking correspondence courses from the London School of Economics in the 19th century (Marques, 2013), but the materials were all written and without the aid of assistive technology tools to deliver content.

The advent of the Internet has made online courses much more available to learners around the world. The MOOC model is designed to run mostly independently from the instructor, with data analytics, assessments and remediation opportunities integrated within the course itself. Traditional educational models are predicated on frequent, in-depth interactions among teachers and students in the same room. Understandably, traditional models prove to be quite expensive and often result in inequities based on a community's access to resources or its particular inclination to support education for its citizenry. MOOCs are often presented at low cost or for free, an aspect that increases their availability to a wide range of learners across multiple social and economic groups (Marques, 2013). For the purposes of this paper, the term MOOC will encompass a variety of self-directed eLearning courses available to users across multiple disciplines. The focus of the arguments following is to address the lack of a clear pedagogical basis for online course development and deployment decisions. As users engage these open source courses, the pedagogy informing their use is likely to improve. In search of expediting this learning process, this paper will illuminate major areas for consideration so that improvements can be made more quickly and efficiently to many web-based learning programs.

According to a U.N. report, among developed nations, in 2015 an astounding 98.5% of households in the Republic of Korea had access to the world-wide web, while in Cuba fewer than 5% did. To better understand the educational challenges for an increasingly diverse world of learners, some of whom are just getting to online learning options, the author reviewed *The International Review of Research in Open and Distance Learning*, specifically a special issue investigating efficacy of open online courses (MOOCs) and its successive issue exploring factors facing the adoption of MOOCs around the world. Volume fifteen, number five contains thirteen papers from professionals all across the world, and number six includes an additional sixteen. A close analysis reveals several themes that educational professionals must consider when designing quality learning tools for eLearning applications, specifically those in MOOCs: 1) engagement and learning success, 2) MOOC design and curriculum, 3) self-regulated and social learning strategies and 4) social network analysis (SNA) and networked learning tools. Perceptions regarding how emerging markets will influence the design of technology products may prove valuable as well for the reader's consideration.

ENGAGEMENT AND LEARNING SUCCESS

Cormer, Clark and Canelas (2014) suggest that large scale eLearning "limits the extent of student-instructor interpersonal contact, and this leads to a central question involving how a reliance on peer interaction and review impacts student learning" (p. 27). The impact of this change cannot be understated. How do designers mitigate this pedagogical shift with technology? The authors investigate the effectiveness of peer-to-peer writing to mitigate the diminished ability of the instructors to provide feedback. These Duke professors aimed to discover how peer-to-peer interactions impacted student learning in general and whether students identified as less academically prepared and less self-motivated show a higher level of engagement in both English Composition and Introduction to Chemistry as a result of interacting with their peers in online courses. The data were encouraging and dictate that properly designed instruction must facilitate communication between participants if high-level outcomes are to occur. Of particular note is that MOOCs in any form must be designed to keep interaction among students central to the course's framework. Through designing tools that mitigate the loss of face-to-face opportunities for discussion, online courses can better leverage the power of discourse to lead learners to a higher level of content mastery.

Cormer et al. (2014) argue that forum posts for Introduction to Chemistry did not show a positive correlation between peer feedback and learning gains, and they readily admit the reasons why: "The English Composition peer review rubric specifically asked reviewers to indicate what they had learned from reading and responding to the peer-writing project. . . The Introduction to Chemistry peer rubric did not ask this" (p. 53). The implication for design in online learning environments is that student expectations must be made explicit within course documents. In fact, better than 97% of posts in the English class were related to learning gains, and our authors extrapolate from data analyzed that writing in forums is "a key pathway for writing-to-learn and . . . for assessing student outcomes in MOOCs across disciplines" (p. 58). A particular challenge for designers of open source courses is how to further refine data collection tools that can indicate the value of the posted feedback beyond a simple word analysis. An analysis that definitively demonstrates understanding rather than quantifying the number of times students mention their understanding in forums is necessary, a shortcoming in current design that the authors readily acknowledge. In addition, course designers must be reminded of the significant role that socialization plays in effective learning environments, an aspect of online courses that must be maintained even when learners are not interacting in real time.

MOOC DESIGN AND CURRICULUM

A recurring theme among these texts stems from explicit design that supports students' personal needs and goals. With a focused look at learner outcomes, several authors attempted to draw connections between learning and students' social behaviors within MOOCs. Well-designed online courses must integrate various social opportunities for students to actively engage their learning. Kellogg, Booth and Oliver (2014) argue that instructors can mitigate the lack of instructor-to-learner dialogue by recognizing "a unique opportunity for social networking and the development of peer support networks to fill this instructional void" (p. 264). By employing visualization techniques to understand the impact of social network analysis on student interactions, instructors can better identify course design features that support peer-to-peer interaction. In particular, the authors note "NodeXL, a freely available temple for Microsoft Excel, was used to calculate basic SNA [social networking analysis] metrics and create visualizations" (p. 270). There are many tools (both free and fee-based) that instructors can employ to gather data about students' interactive behavior, a feature that curriculum designers should certainly integrate into course design. With data analysis tools embedded in course design, instructors are much more likely to get pertinent feedback quickly and to use it to effect greater learner outcomes. In face-to-face classrooms, instructors frequently make course corrections based on student interactions. Within online courses, however, the instructor will not have timely access to that discourse unless the tool for collecting the information is embedded in the course itself and proves easy and efficient to use.

After analyzing the data, Kellogg et al. (2014) further support earlier work done by Kraut and Resnick (2012), who suggest that online classes embed vehicles to foster specific types of peer-to-peer interactions. Designers "should consider providing discussion opportunities which request quick, practical information that would be of use to other [participants] in the community, such as requests embedded and directly relevant to content and resources provided throughout" (p. 280). The authors generalize that effective online courses must include explicit guidelines for user interaction and that future designers "will likely need to better scaffold social learning processes in order to fully leverage the potential of peer-supported learning" (p. 281). Only through deliberate design can MOOCs mitigate a continuing criticism of technology-based instruction: "How does technology augment learning? How can be it used while preserving the quality associated with traditional faculty-student interaction?" (Campbell and Oblinger, 2007, p. 17). The answers require intelligently designed classes that elicit explicit peer-to-peer interactions with embedded metrics that allow instructors to easily determine which participants need additional support to master training. In addition to the disconnect between instructors and students, teachers have identified the massive bandwidth required to effectively participate in MOOCs can be detrimental to their adoption as well, especially in parts of the world without sustained infrastructure to support the Internet (Oyo and Kalema, 2014).

Ensuring equity of access to online education must not only provide participants the opportunity to take part but also consider the role that unreliable infrastructure might play in undermining the availability of reliable online educational programs. Through designing courses that run effectively even when the infrastructure supporting the Internet varies in quality, course developers and instructors can minimize any negative effects that unreliable access may present the user. A specific way to improve the application and availability of MOOCs to under-served areas is to design them to use as little bandwidth as possible to function properly.

In Africa, for example, a recent study indicates a need for technologies that "enable video transfer in low bandwidth environments, [and that] should be implemented at the content repository end" (Oyo & Kalema, 2014, p. 8) because the growing potential for deployment in the developing world will require courses be designed with lower data transfer requirements. Opportunities exist for companies to make decisions that scale down the size of video, audio, and graphic content while still ensuring a high quality learning experience. The authors provide a lesson for designers of courses to be deployed in such environments: Any "technological structure centred [sic] on eLearning infrastructure that is optimized [sic] for low bandwidth and/or offline accessibility provides a feasible solution to electronic content access challenges in Africa" (p. 11) and in other areas of the world where access to both broadband and reliable technology is not readily available. It would be a fallacy to assume that all training participants have broadband access to the Internet, even in developed countries. Designing modules that deliberately use less data to run course content could minimize both institutional and individual costs if data-use charges are based on a progressive fee schedule. Though the technology itself presents challenges for the development and deployment of large-scale online courses, perhaps a more substantial barrier to high learner outcomes in MOOCs is related to how quickly the instructor can identify when individual learners are falling behind.

Self-Regulated and Social Learning Strategies

A prevailing criticism of online education environments notes that platforms are poorly designed to identify and support students at risk of not mastering objectives. Through self-regulated learning strategies and by analyzing cognitive (memory capacity and previous knowledge) and motivational factors, Kursun, Cagiltay and Can (2014) provide specific design features that can be implemented quite easily in order to identify struggling students. They investigate how class designs can support the identification of struggling students as quickly as possible. A training environment that streamlines this process would enjoy a tremendous advantage with instructors who wish to respond to struggling learners quickly based on specific data characteristics. The open educational resources (OER) movement, which has resulted in the thousands of MOOCs now available from hundreds of institutions of higher learning, has provided access to online courses to participants around the world; however, ensuring the efficacy of those programs is of concern, especially because the sheer number of learners participating in each course can overwhelm instructors as they struggle to respond to the individual learner's needs.

Citing Schunk's work (1991) Joo, Andres and Shearer (2014) acknowledge that students who experience deep cognitive engagement are more likely to use meaningful self-regulated strategies to experience rich learning gains. A particular challenge for learning institutions who deploy online courses is embedding tools that support this level of deep engagement. The authors suggest that "cognitive engagement in relation to online course design supports effective teaching strategies, high learner motivation, and productive distance education pedagogy" (p. 190) and that ensuring teacher presence, learner role assignment and authentic collaborative opportunities will result in a greater degree of engagement in those intellectual behaviors. Another study investigating social learning behavior indicates that students working in MOOCs need incentives to engage in higher level learning tasks. Though this consideration may appear to be outside the influence of a course designer, a closer look will reveal a unique opportunity for instructors to supply incentives that will engage learners more deeply.

Jiang, Williams, Warschauer, He and O'Dowd (2014), working out of the University of California, Irvine, created an online course to prepare incoming freshmen in biology. Students identified as underprepared (based on SAT scores and other factors) were studied to determine if offering an incentive (course credit) would result in higher rates of completion. Not surprisingly, students who were matriculated at the University did complete at higher rates than the general population: 8% of students not receiving course credit actually completed the course, whereas 64% did when they did receive course credit. There is nothing shocking here; however, the researchers at Irvine determined a remarkable difference in course completion (herein lies the lesson for designers) when the course content was aligned with relevant knowledge and skills for a future class, regardless of whether the student was receiving course credit or not (Jiang et al., 2014). As the data suggest, course designers and instructors can foster higher mastery of learner outcomes if individual online courses align with skills vertically from one course to the next.

Remarkably, participation rates can be "boosted to over 60% even when there is no course or university credit involved. The exposure to knowledge and/or skills relevant to a first quarter class" (Jiang et al., 2014, p. 108) proved to be the most important factor contributing to course completion. A curriculum model that vertically aligns content to subsequent learning objectives (whether offered for college credit or not) will realize an advantage when offering ready-made instructional programs for students. With this level of course engagement, a logical outcome would be that both instructors and students would return to that group of training modules for further learning opportunities. Furthermore, if instructors align the knowledge and skills for one course vertically with later objectives covered in new courses, learners are much more likely to complete the current online course successfully.

Social Network Analysis (SNA) and Networked Learning

Applying networked learning and analysis tools to determine the efficacy of social networks will emerge as important design features for online learning. Kellogg et al. (2014) recognize there is a "need for more research in the field of education, and online learning in particular, that explores mechanisms shaping network processes" (p. 277). Emerging research also supports the positive impact of social interaction on learning inside online learning courses. A recurring theme in these papers is the need to engage in social network analysis (SNA) and to identify "qualitative methods" (p. 277) to standardize peer support networks in online courses. Of particular note for designers is to identify peer-networking tools that can be easily integrated into technology-driven online course modules that MOOCs in a variety of disciplines make possible.

Gašević, Kovanović, Joksimović, and Siemens (2014), drawing on earlier work by Chang, Chang and Tseng (2010) and Cheng et al. (2014), indicate that online tools to measure efficacy of learner engagement must include three facets: 1) ways to identify key concepts from each submission, 2) ways to cluster information into important themes, and 3) ways to conduct in-depth analysis of the clusters produced. The speed with which information can be gathered is important as well because an instructional platform that supports faster access to data can result in better outcomes for students. "While the tools exist to gather open-ended assessment data from students in online environments, the scoring and feedback mechanism has proven problematic when scaling to large numbers of students" (Reilly, Stafford, Williams, and Corliss, 2014, p. 85). An innovative company or institution of learning that integrated these analytic features into course design would enjoy an advantage over competitors whose training products do not include these tools. In the competitive market that supports online course development, Coursera, Edx, Moodle and Blackboard offer technologies to support access to a variety of open online courses; however, companies creating courses would be wise to integrate analysis metrics within the modules themselves, thus removing any barriers instructors might feel when adopting the product and then using it to improve the productivity of those who are learning within it.

CONCLUSION AND TAKEAWAYS

In summary, the papers reviewed from *The International Review of Research in Open and Distance Learning* support several interesting conclusions that will be valuable for any institution's development and use of massive, open, online courses to support learning outcomes. First, online courses across multiple disciplines must integrate technology tools that foster a high level of student engagement, both with peers and with instructors. Secondly, engagement tools must include social networking opportunities, which an increasing number of studies suggest are integral for realizing high learning outcomes. Thirdly, MOOC design and curriculum must be systematically focused to support a learner's self-regulation and use of social learning strategies. Access to massive, open, online courses continues to present challenges to both designers and learners as both groups learn to develop and to use these products more effectively; however, deliberate design decisions that foster a high level of peer interaction and student engagement within online courses can significantly minimize the isolation that often results from individualized learning experiences.

Lastly, growing markets around the world will require that content designers minimize the size of modular content. Doing so will minimize the data stream speeds required to successfully participate in these massive online courses. If institutions of learning, both public and private, follow the aforementioned guidelines and implement quality analysis tools to support instructors within online course environments, prospective learners are sure to value both the quality and efficacy of courses in which they participate, both in developed and in underdeveloped nations across the world.

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Chapter 5
Blended Learning and Distance Education:
Enablers and Barriers

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ABSTRACT

The emergence of online technologies generated the belief that traditional print-and-post distance education would be transformed. The need for a compromise between the conventional face-to-face workshop sessions and online learning led to a new approach to teaching and learning called blended learning. Blended learning has become a popular method for the delivery of distance education, however, it has not always delivered on its promised potential. This chapter investigates various enablers and barriers of blended learning and highlights their significance.

INTRODUCTION

The rise of online technologies has the potential to transform traditional education (Bennet, Agostinho, Lockyer, & Harper, 2009). Presently, many educational institutions are struggling to provide economical distance-mode education. Availability of PCs, the Internet, and other developing technologies are expected to allow students choose and review material at their own pace (Eklund, Kay, & Lynch, 2003). Online technologies are considered tools to effectively access students across borders. This increased connectivity can link students with the centers of learning in efficiently, effectively, and economically (Van Dam, 2001). Despite its potential to revolutionize the delivery of learning, technology has not fulfilled its potential (Brabazon, 2002). A number of students studying online expressed dissatisfaction with the offerings of learning platform (Bersin, 2004; Moore & Fetzner, 2009; Moore & Kearsley, 2011; Radwan & Leeds, 2009). The educators have responded by analyzing different models of delivery of online learning to come up with an improved model that could help achieve better outcomes for learners (Holley & Oliver, 2010; Levine & Sun, 2002).

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Blended learning model has emerged as a solution to fulfill the need for a hybrid learning model that combines conventional and online learning (Rogers, 2001). Blended learning is a teaching and learning environment that integrates face-to-face and computer-assisted learning (Stracke, 2007). The benefits of both mediums are well established in literature (Miller et al., 2004; Singh & Reed, 2001). This model offers the most effective elements from both traditional and the e-learning medium. The delivery of blended learning tends to be offered as a 'one-size-fits-all' model (Rossett, Douglis, & Frazeem, 2003). Many studies (Irlbeck et al., 2006; Rossett et al., 2003; Rye, 2009) have claimed that model will not contribute to successful learning experiences for students. This chapter investigates students' perceptions of blended learning designed to meet their individual needs as they participate in various blended learning courses offered by different UK universities. This research is intended to contribute to an understanding and appreciation of the enablers and barriers for learners in a flexible blended learning environment. The questions used in research instrument for this research are designed to understand why students' perceive different aspects of a blended learning model perceived as enablers or barriers to learning through distance education. After introduction, section 2 provides a literature review followed by discussion of research design in section 3. Section 4 provides discussion of findings. Section 5 provides concluding remarks. Limitations of the study and areas of further research are discussed in Section 6.

LITERATURE REVIEW

The literature on blended learning continues to grow, but still remains limited with a lack of effective research into the area of learner engagement (Halverson et al., 2014). The overall experiences in relation to blended learning are reported to be positive. There exist gaps in students' experience of blended learning. This study uses the definition of blended learning provided by Garrison and Vaugham (2008) and Tselios, Daskalakis and Papadopoulou (2011). According to them, blended learning refers to integrating valuable aspects of both conventional and non-conventional methods of learning where the interaction between teachers and students can take place with or without the use of technology. Blended learning can combine different methods of learning (such as face-to-face and online methods) to create different ways of learning (Wu, Tennyson & Hsia, 2010; Lim, Morris, & Kupritz, 2014). Blended learning can 'blend' different forms of instructional technology and classroom teaching. Tselios et al. (2011) develops the claim that blended learning can integrate advantages of online and traditional learning. The findings of De George-Walker and Keeffe (2010), Vaughan and Garrison (2005), and Daouk, Bahous, Bacha, and Blessinger (2016) lend support to the claim of Tselios et al. (2011). According to them, blended learning goes beyond the simple integration of conventional and non-conventional methods of learning. Vaughan and Garrison (2005) argues that effective blended learning leverages strengths of both conventional and non-conventional methods of learning to facilitate achieving greatest learning outcomes for students.

El Mansur and Mupinga (2007) argue that students enjoy certain aspects of blended learning including schedule flexibility, interactivity, and availability of teachers. Garrison and Vaughan, (2008) extends this argument by saying that blended learning increases the quality and quantity of interaction among students and teachers. The findings of Pinto de Moura (2010) and Akhter (2015) lend further support for this argument. They found that 24-hour online availability of teacher combined with physical presence of teacher in the classroom provides new level of interaction that students found beneficial.

According to Li-Ling (2011), blended learning can bridge the gap among teachers and students and among students. Qiuyun (2008) extends support to this argument by saying that blended learning results in development of an effective learning community that not only increase interaction between students and teachers but also enhances the learning experience of the students. The findings of Qiuyun are in line with the findings of Garrison and Kanuka (2004). They found that blended learning provides a learning community with academic standards no less than the standards of conventional learning communities. Blended learning can also produce positive impacts on student performance as well by improving performance in individual courses and decreasing dropout rates (Lopez-Perez, Perez-Lopez & Rodriguez-Ariza, 2011). Besides advantages, there are disadvantages of blended learning as well. El Mansour and Mupinga (2007), Eshet-Alkalai (2004), and Alammary, Sheard, and Carbone (2014) claim that students may find themselves lost in blended learning environment and that can negatively impact their learning experience. The students may feel isolated from their peers and teachers and find them unable to develop relationships with their peers and teachers. Verkroost, Meijerink, Lintsen and Veen (2008) claimed that a mere format-shifting of traditional face-to-face classes into the online environment is not sufficient. We need to rethink teaching methodologies before applying them in the online environment. By integrating the increased flexibility offered by online classes and social interaction provided by traditional classrooms, we can achieve effective blended learning (Akkoyunlu & Soyly, 2008; Alammary, Sheard, & Carbone, 2014).

Eshet- Alkalai (2004) and Shemla and Nachmias (2007) argue that one important issue related to the effectiveness of blended learning environments is the lack of required technology skills. Both teachers and students may not have the skills in use of technology needed to effectively utilize the blended learning environment. Spencer (2006) extended this argument. He found that students' performance affected when they were offered reading material in digital form. The literature supports the notion that flexibility and increased interactivity of blended learning environments are preferred by students (Precel, Yoram, & Yael, 2009; Alammary, Sheard, & Carbone, 2014). However, the findings of recent research studies on the potential benefits of blended learning provide contradictory evidence. It is therefore important that further research carried out so that academicians and practitioners can develop and implement effective program design using blended learning environments.

RESEARCH DESIGN

The 23 participants of this study were students enrolled in blended learning courses provided by different UK universities. For various reasons, Pakistani students find blended learning courses offered by UK universities as a good choice to obtain a reputable foreign degree. One reason for their choice is that they cannot stay outside Pakistan for longer time. The enrolment of participants was on full-time or part-time basis. They were studying for a duration of 12 months to two years).The participants were located in different cities of Pakistan. A case study design was chosen as the best way to collect the emerging knowledge of the participants. The current research was a thorough study with data collected over three months that sought to investigate others' interpretations of events. This approach is regarded as appropriate for research involving small samples of participants (Denzin & Lincoln, 1994). Primarily descriptive data was gathered with an emphasis on exploration and insight into participants' perspectives and experiences. Individual interviews were used as a way to create dialogue between the researcher and the participants in order to identify themes common to each student's experience. Boundaries of the case study were students, studying by distance mode, interacting with a range of blended learning options including some basic technology options.

FINDINGS

This study attempted to discover different aspects of a blended learning model that students perceived as enablers or barriers to learning through distance education.

BLENDED LEARNING EXPERIENCES

Participants were asked about their previous learning experience. The researcher believed this experience would influence students' choice of blended learning mode. For most of the participants, the decision to opt for blended learning model was a decision to continue their formal learning after long time. Nine of the students did not engage in any organized study since they discontinued their formal education. The mean break time from the study was 10 years. Eight participants had positive prior learning experience. This positive experience was related to the support students got from their teachers and fellow students. Seven participants did not have a positive prior learning experience. This negative experience was because they were unable to form adequate relationships with their teachers and fellow students. One student reported that this negative experience was due to the fact that he did not get desired number of practical activities in the course. Another common learning experience for all the students was the minimal experience of using technology for learning.

The blended learning options available to the students were either to access the content of the course using online video conferencing and course guides or access the course work and recorded lectures through the online Learning Management Systems (LMS). Students were encouraged to access the faculty for personal assistance using either the telephone or e-mail so that issues could be discussed and drafts of work submitted for formative feedback.

Emergent Themes

Following themes were identified by the analysis of the interviews of students.

Isolation

Students, for the most part considered that their location acted as an enabler rather than an obstacle to their learning. One student, who lived in a small remote town, expressed that he viewed his circumstances as being favorable. For him, living in a small quite town gave him an ideal opportunity to allocate optimal time to his studies. It was expected that those BLE might attract more those students who lived in remote areas. This is because learning experience provided by BLE can be richer and rewarding. All students who were located in remote areas utilized to the maximum extent possible, all the learning options available in BLE. Probably, their location made them more motivated supporter of technology. They used e-mail frequently to communicate with the teachers.

Technology Use

Of the 23 students, just two had little experience utilizing technology as a part of their past formal learning. Five students had utilized videoconferencing facility before while ten students had used many computer technologies as part of their prior formal learning. For couple of students, the idea of utilizing technology as a method for supporting their learning and encouraging their course participation was a new challenge. Many users well versed with the use of technology may consider the learning technology options offered in BLE as limited. For many students in this study, however, they were new, novel and diverse.

A large proportion of participants had utilized PCs as a part of other work and home settings. Some did not use technology to bolster their learning due to their little experience with technology and its use in a learning environment. Students used a variety of technologies as a part of their course including a PC to get to the Internet and email. They also used Skype to communicate with different learners and the teacher, SMS, and explored LMS. For these students, connecting with each other using these technologies provided a significantly more enhanced learning experience than their past learning experiences.

All of the students found that with ongoing trial and error they were able to discover numerous advantages using learning options available under BLE. Of the respondents, seventeen reported that access to a large number of learning technology options provided them great help to gain knowledge. It was apparent that technology options acted an enabler for the majority of students.

The greater proportion of the participants used word processor and email frequently throughout their courses. Email was considered a strong enabler by all students. Email provided these students to enquire about anything round the clock. All students valued this opportunity especially those living in remote locations. The majority of the students viewed the use of the Internet beneficial for learning and complete their course on time. Not all the participants took full advantage of the available technologies. Most used only email to contact teachers.

All students first used computers to seek information using search engines. This activity continued throughout the course. Those students who did not use Internet before to search required information, this great experience enhanced that personal learning significantly. For majority of students, videoconferencing facilities was an enabler. Few experienced technical difficulties in using videoconference facility. Despite these difficulties, these students appreciated the advantages technology to support learning and did not consider technology a barrier in completing their course on time.

Connectivity and Communication

BLE also provided students to access their teachers for personal assistance. By using either telephone or email, the students were encouraged to discuss various issues with teacher. Students reported that personal communication was important in their studies. This personal communication helped establish personal relationships that served to be the strongest enabler for many of the participants. Effective and quality student/teacher relationship was valued by all participants. For some participants, connectivity was the critical enabler of success in the course. Each student placed different degree of importance on connectivity and communication. However, connectivity and communication appeared to be a significant enabler factor in all the cases. Easy and regular contact with the teacher motivated and enabled students to successfully complete their study.

Motivation

Motivation to participate in study was another enabler. This motivation was influenced by students' previous learning experiences. The quality of these experiences depended on the factors surrounding their interpersonal relationship experiences. This study did not identify previous learning experiences as either a barrier or enabler to student's engagement with BLE. Neither any relationship was discovered between the students' prior learning experiences and their attitude towards BLE. All students with prior positive learning experiences were motivated towards BLE once they started the course and this motivation increased as the course progressed.

Self-Efficacy

According to Bandura (1977), self-efficacy refers to one's belief in his/her our own ability to succeed in certain situations. Self-efficacy was found to be a key enabler to students' encouragement to learning in BLE. Many participants lacked in confidence at the start of the course as they were returning to formal study after a long break and lacked skills of technology use for study and learning. The study discovered a relationship between self-efficacy and their level of encouragement to learn in BLE. Once students settled in the course and understood the options offered to them, they were willing to experiment with new ways of learning.

In short, a majority of the students interviewed expressed positive views about their engagement with the blended learning model of course delivery and accomplishment of their individual learning needs. Five themes emerged from the interviews. These themes related to the student's use of blended learning model. These themes include isolation, willingness of technology use, connectivity and communication, motivation, and self-efficacy. Isolation was considered as an enabler of learning. Students considered isolation something that helped them focus on their studies with minimum interruption. Willingness to use technology was another enabler that enabled students to successfully complete their course. This was expected given that all the participants had significant exposure to the use of technology. Connectivity and communication and student's motivation to participate in their studies were also identified as strong enablers. The fifth enabler identified was students' self-efficacy.

DISCUSSION

Previous studies show that a number factors can inhibit student engagement with blended learning environments (Irlbeck et al., 2006; McVay-Lynch & Roecker, 2007; Roberts, 2004). Roberts (2004) claimed that high level of technology skills of teachers was essential for successful blended learning environments. The findings of this study is in contradiction with the findings of Robert (2004). One reason for this could be that technology options available in BLE today are easy and very user friendly. Since many students are gradually developing their skills of technology use, it is recommended that teachers gradually develop their technology skills as well. Roberts (2004) further claimed that BLE are not able to meet students' requirements of convenience and service delivery. Again, the findings of this study does not support this claim. This study found that current BLE were able to meet students' requirements of convenience and service. Yet, it is debatable whether these requirements can be fulfilled in a cost-effective manner or not. These findings are in line with the findings of Tayebinik and Puteh (2012) who found that blende learning helps eradicate feeling of isolation among students.

McVay-Lynch and Roecker (2007) criticized BLE of not giving needed importance to the material and the instructional design. The findings of this study indicates that students appreciated the choices they had in BLE and appreciated the materials provided to them. This finding is in line with the findings of Miller et al. (2004) and Trasler (2002), who suggested that a BLE should provide appropriate mixture of learning media to meet the training requirements of both the individual learner and the organization.

Miller et al. (2004) claimed that it is the effective integration and interaction of all these elements that a BLE need to provide a culture that is both a positive and worthwhile experience. This study found that the variety of elements available to learners in BLE allowed students gradually try out the options and contributed to their feelings of being supported with their learning.

Irlbeck et al. (2006) claimed that one reason for students' lack of confidence in BLE is complexity of new technologies. The findings of this study support this claim. This study found that technology options available influenced the initial study choices of the participants' as they felt insecure about engaging with new technologies. Once students began the course and started to try some of the blended options available, their confidence increased that subsequently led a growth in self-efficacy. This finding is in line with the findings of McCombe and Vakili (2005) who claimed that effective use of BLE can provide a more learner-centered education environment.

Frank et al. (2002) suggested that BLE must include early and regular face-to-face contact between the teacher and the learner. Many authors (Bennett et al., 2009; Dabbagh, 2004; Irlbeck et al., 2006; Miao et al., 2009) have claimed that educators must have knowledge of pedagogy in order design effective BLE instructions. They can then use this knowledge to develop their instructional strategy and choose the appropriate technology to deliver the instructions in BLE. This study found that the technology option offered in BLE need alignment with prior learning experience of students. The students were successful in using technologies because they were already conversant in their use. This shows that there cannot one-size-fit-all model of blended learning. This finding supports the claim made by Rossett et al. (2003). He claimed that there cannot be a generic model for blended learning. This is because there are too many variables and a one-size-fits-all model of blended learning would be counter intuitive.

This study found that development of a close rapport between the students and the teacher was a key enabler of student encouragement to learn in BLE. This finding support the findings of previous studies (Usta & Özdemir 2007; Akkoyunlu & Soylu, 2006; Ali & Leeds, 2009; Joliffe et al., 2001) that found it important to a person to communicate with while studying. According to these studies feedback and individual coaching can help develop knowledge as well as help resolve difficult issues as they arise.

The findings of this study also support the findings of Khine and Lourdusamy's (2003) who suggested that the learner should be the central focus of any BLE. Joliffe et al., (2001) claimed that blended learning can improve students' learning and provide better communication and collaboration among the students. Many studies (Frank, et al., 2002; Joliffe et al., 2007; Khine & Lourdusamy, 2003) claimed that early and frequent communication can foster positive interactions between the teacher and the students. This study found that early and frequent communication was the most important part of learning in BLE. It was especially important given that they were engaging with formal study after long time and were learning through technology.

Previous research (Sharpe et al., 2006) supports the idea that both prior experience and attitudes positively influence students' experiences of blended learning. However, the findings of this study suggests that previous learning experiences may create a barrier to engagement with technology. This barrier can be removed by supporting students to engage from their own level of competence. In current study, it was only the positive experiences of students during their learning in BLE that encouraged them to try using different technologies.

Previous research (Rabideau, 2003; Piskurich, 2003; Morrison, 2003) supports the idea that that blended learning is just a transient process. Delahaye and Ehrich (2008) provided further support to this idea by suggesting that blended learning becomes successful if educators have a more complete understanding of the significance of individual learning styles. This study found that students chose the mode of blended learning that they felt comfortable with and that best fitted with their preferred learning style. This study also observed the growth in students' self-efficacy to experiment with many of the available blended learning options. The findings of this study suggest that if students offered a supportive and flexible range of blended learning options they will make a conscious, deliberate decision to engage with blended learning (Piskurich, 2004).

CONCLUSION

This study investigated what were students' perceived enablers and barriers to learners using blended learning model. The findings have provided five themes including perceived isolation; uptake of basic technology; communication and connectivity; prior experiences; and self-efficacy.

The findings suggest that blended learning appealed to the participating students because its flexibility assisted the students to deal with their feelings of isolation. The results also indicated that the novice status of the students, in regards to technology, acted as an initial barrier to their learning. The results also indicated that this barrier was only overcome due to the establishment of a supportive climate that came to exist between the students and their trainer. Satisfactory levels of effective connectivity and communication facilitated the development of a blended learning culture. It was this culture that facilitated the gradual uptake of the various blended learning options, and resulted in the students' perception of the learning experience as positive and worthwhile. It was also discovered that the student's prior study experiences can determine their initial confidence and interest in using technology to support their learning experience. It was because of the flexibility students experienced with the blended learning model and the freedom and choice that this allowed them that they were able to grow in self-efficacy. This developing self-efficacy then acted as a catalyst to the students' willingness to try previously untried blended learning options. The overall findings from this research support the assertion that, a flexible and individualized blended learning model, can emerge out of the choices made by the students. It also demonstrated that in most instances this model of blended learning acted more often as an enabler than a barrier to effective student learning.

LIMITATIONS AND AREAS OF FUTURE RESEARCH

A case study design was used as this was a small-scale research, narrowly focused on a specific problem in an atypical context. Because of the novice technology status of the group involved in this research, it was anticipated that any outcomes while relevant in this set of special circumstances, might not be able to be generalized to the larger population. The scope and range of blended learning options that could be made available to the participating students were greatly restricted by the novice status of these learners. Due to limited technological competence, students did not seek to engage with other more advanced forms of technology.

This study has attempted to identify the barriers and enablers to learning in a flexible model of blended learning. The findings of the study has also provided a number of significant and yet unanswered questions. While it could be claimed that the flexible blended learning model associated with this study provided an acceptable product to its students, it is not clear whether this model could be replicated by larger organizations that are more complex. Future researchers can analyze whether the blended learning model studied in this research can be sustainable and effective if applied in other contexts. The findings of this study show that a flexible model of blended learning, which catered for the communication and connectivity needs of a small group of students could be provided. Before further investing in developing communication and connectivity aspects of blended learning, future research is needed to ascertain whether there is value in maximizing these aspects. This study found that self-efficacy of students increased as they gained experience and confidence during their study. Future research is needed to ascertain whether pre-course training can be utilized to encourage students to engage with blended learning. Students involved with e-learning may become disengaged, not only with their studies but also in many cases with the organizations offering their courses. Future research is needed to analyze whether a flexible blended learning model can influence the power relationships between the organization and the student.

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Chapter 6
Blended Learning in Higher Education:
A Developing Country Perspective

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ABSTRACT

This chapter aims to explore Pakistani students' perspective on an appropriate mix of online and-face-to-face activities in different courses offered at various UK universities. Identifying aspects that students evaluate as supportive, challenging and efficient in their learning is important for the design of an appropriate mix in blended learning courses. A questionnaire was provided to the respondents consisting of both open-ended and closed questions. Applying both statistical and content analysis, this chapter provides a deeper understanding of students' responses and concludes that blended learning is an approach that supports a range of learning styles and life styles.

INTRODUCTION

Higher education institutions are cognizant of the fact that introducing new learning approaches that meet the learning needs of today's knowledge society is need of the hour. Higher education institutions must strategically reposition themselves to remain competitive. Higher education institutions can't just develop new technologies and learning models. They must assist the learners to take advantage of these approaches to optimize their learning (Hwang, Hsu, Tretiakov, Chou & Lee, 2009; Coffrin, Corrin, de Barba, & Kennedy, 2014; Clark & Mayer, 2016). The review of available literature shows there exist between learners' requirements and what the learning online environments offers. Many issues, such as sense of isolation, lack of motivation, ineffective communication, avoidance of online communication, and ineffective guidance provided by the educators, have affected the learning of the learners in online environments (Hanisch, Caroll, Combes & Millington, 2011; Coffrin, Corrin, de Barba, & Kennedy, 2014). The available literature raises some insightful questions about providing the right blend of traditional and online teaching models. This chapter seeks to explore these questions by asking Pakistani

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students about their experience of blended learning in different courses of study offered by various UK universities. In these programs, all students have equal access to all online tools and materials, as well as the option of attending face-to-face activities. Students can mix the activities and tools to suit their needs. After introduction, section 2 provides a literature review followed by discussion of research design in section 3. Section 4 provides discussion of findings. Section 5 provides concluding remarks and future research directions are provided in section 6.

LITERATURE REVIEW

There exist gaps in students' experience of blended learning. This study uses the definition of blended learning provided by Garrison and Vaugham (2008) and Tselios, Daskalakis and Papadopoulou (2011). According to them, blended learning refers to integrating valuable aspects of both conventional and non-conventional methods of learning where the interaction between teachers and students can take place with or without the use of technology. Blended learning can combine different methods of learning (such as face-to-face and online methods) to create different ways of learning (Wu, Tennyson & Hsia, 2010; Lim, Morris, & Kupritz, 2014). Blended learning can 'blend' different forms of instructional technology and classroom teaching. Tselios et al. (2011) develops the claim that blended learning can integrate advantages of online and traditional learning. The findings of De George-Walker & Keeffe (2010), Vaughan and Garrison (2005), and Daouk, Bahous, Bacha, and Blessinger (2016) lend support to the claim of Tselios et al. (2011). According to them, blended learning goes beyond the simple integration of conventional and non-conventional methods of learning. Vaughan and Garrison (2005) argues that effective blended learning leverages strengths of both conventional and non-conventional methods of learning to facilitate achieving greatest learning outcomes for students (Waha & Davis, 2014).

El Mansur and Mupinga (2007) argue that students enjoy certain aspects of blended learning including schedule flexibility, interactivity, and availability of teachers. Garrison and Vaughan, (2008) extends this argument by saying that blended learning increases the quality and quantity of interaction among students and teachers. The findings of Pinto de Moura (2010) and Akhter (2015) lend further support for this argument. They found that 24-hour online availability of teacher combined with physical presence of teacher in the classroom provides new level of interaction that students found beneficial.

According to Li-Ling (2011), blended learning can bridge the gap among teachers and students and among students. Qiuyun (2008) extends support to this argument by saying that blended learning results in development of an effective learning community that not only increase interaction between students and teachers but also enhances the learning experience of the students. The findings of Qiuyun are in line with the findings of Garrison and Kanuka (2004). They found that blended learning provides a learning community with academic standards no less than the standards of conventional learning communities. Blended learning can also produce positive impacts on student performance as well by improving performance in individual courses and decreasing dropout rates (Lopez-Perez, Perez-Lopez & Rodriguez-Ariza, 2011). Besides advantage, there are disadvantages of blended learning as well. El Mansour and Mupinga (2007), Eshet-Alkalai (2004), and Alammary, Sheard, and Carbone (2014) claim that students may find themselves lost in blended learning environment and that can negatively impact their learning experience. The students may feel isolated from their peers and teachers and find them unable to develop relationships with their peers and teachers. Verkroost, Meijerink, Lintsen and Veen (2008) claimed that a mere format-shifting of traditional face-to-face classes into the online environment is not sufficient.

We need to rethink teaching methodologies before applying them in the online environment. By integrating the increased flexibility offered by online classes and social interaction provided by traditional classrooms, we can achieve effective blended learning (Akkoyunlu & Soyly, 2008; Alammary, Sheard, & Carbone, 2014; Waha & Davis, 2014).

Eshet- Alkalai (2004) and Shemla and Nachmias (2007) argue that one important issue related to the effectiveness of blended learning environments is the lack of required technology skills. Both teachers and students may not have the skills in use of technology needed to effectively utilize the blended learning environment. Spencer (2006) extended this argument. He found that students' performance affected when they were offered reading material in digital form. The literature supports the notion that flexibility and increased interactivity of blended learning environments are preferred by students (Precel, Yoram, & Yael, 2009; Alammary, Sheard, & Carbone, 2014). However, the findings of recent research studies on the potential benefits of blended learning provide contradictory evidence. It is therefore important that further research is carried out so that academicians and practitioners can develop and implement effective program design using blended learning environments (Waha and Davis, 2014).

RESEARCH DESIGN

The 27 participants of this study were students enrolled in blended learning courses provided by different UK universities. For various reasons, Pakistani students find blended learning courses offered by UK universities as a good choice to obtain a reputable foreign degree. One reason for their choice is that they cannot stay outside Pakistan for longer time. The enrolment of participants was on full-time or part-time basis. They were studying for a duration of 12 months to two years).The participants were located in different cities of Pakistan. The respondents were provided with a self-administered online questionnaire. A questionnaire is considered a common research instrument to study students' perspective on blended learning (Akkoynlu & Soylu, 2008; Blankson & Kyei-Blankson, 2008;Kember, McNaught, Chong, Lam & Cheng, 2010). The questionnaire was adopted from Waha and Davis (2014) and Lim, Morris, and Kupritz (2014). The questionnaire was modified to suit the present study and research context/objectives. The questionnaire contained both open-ended and close-ended questions. These questions collected both quantitative and qualitative data. The closed-ended questions were used to gather quantitative data regarding the frequency, effectiveness and use of different tools and resources provided by the blended learning environment. The students were also given option to provide comments against each question. The open-ended questions were used to gather qualitative data regarding students' feelings, motivations and satisfaction regarding the blended learning program. To analyze the data, statistical analysis and content analysis techniques were used. Statistical analysis was used to analyze the quantitative data. Content analysis was used to analyze the qualitative data gathered from open-ended questions and comments provided against closed-ended questions. The study was able to gather a rich dataset about students' experience of bended learning environments. However, the sample size was too small. As such, the study couldn't make strong statistical claims and unable to generalize the findings for blended learning environments provided by other universities. However, a mixed method research approach provides a basis that future studies can use to build their hypothesis about blended learning environments.

DISCUSSION OF FINDINGS

The results of quantitative analysis are presented in Table 1. The statics show the analysis of students' feedback on various tools of blended learning. The number in percentage shows the percentage of respondents.

When asked about their preference of a particular mode of study, more than 50% of participants reported they would prefer a fully online model of learning. Out of this group, only 33% preferred exclusive synchronous online learning model. They indicated their desire to engage with material at a specific date and time. When asked about the characteristics of online learning that they preferred, students reported the features such as flexibility, convenience and independence. A round the clock access to learning resources was also valued by the students. 33% students preferred conventional face-to-face mode of learning. These students felt that the frequent interactions with teachers and peers in traditional class rooms made it convenient to develop a personal learning network. These students preferred to ask in-class questions directly from the teacher. Three students preferred traditional classes because they perceived them as a good way to engage with their peers and teachers. Two students mentioned that they were not motivated for online learning because they needed some enforcement to do their work on time. This enforcement was provided to them in traditional classrooms where they could have real time interaction with their peers and teachers.

Table 1. Results of quantitative analysis

Tool	Support	Effectiveness			Usage (Frequency)	Enjoyment	Extent of Usage	
Material	Aids my Learning	Interaction		Encouragement With Courseontent			Discussion With Peers	Discussion With Teacher
		With Peers	With Teachers					
Short videos	88%			`		94%		
Screenshots	85%					86%		
Lecture Audios	76%			72%	66%	56%		
Lecture Videos	83%					78%		
Lecture Power Points	81%					72%		
Videoconference	78%	58%	62%	59%	58%	67%	38%	43%
Recommended reading	82%					74%		
Course announcement	81%					76%		
LMS discussion forum		33%	53%	45%	35%		33%	39%
Social media		67%	74%	69%	68%		68%	71%
Attending traditional classes		78%	82%	78%	58%		73%	65%
Email		77%	93%	76%	79%			
Skype								41%

25% of respondents preferred blended learning model. To these students, this model was beneficial for learning and its flexibility allowed them to study in way that fitted with their busy schedule. To these students, blended learning model provided them the opportunity to engage with their peers to participate in synchronous activities. Overall, students who preferred blended learning valued the liberty in choice of ways of learning offered by the blended learning model. Flexibility, convenience, interaction with peers and teachers, and work-study balance were some of the common factors mentioned for students' preference of blended learning model.

When asked about the tools and methods they used as learning aid, students reported that their feelings were mixed. The tools they enjoyed using were not beneficial for them. In contrast, the tools they found beneficial were not enjoyable. Table 2 shows students' responses. The results show the combined percentage of students who either strongly agreed or agreed to the statement.

Majority of the students reported that short vides and screenshots were the most enjoyable tools that were beneficial for learning as well. The reasons for this were that short videos and screenshots made students easily engage with the course. These videos and screenshots were accessible in many ways. Few students reported that these tools made their learning more valuable. Some students mentioned that they preferred these tools because they preferred learning tools that have visual appeal. The students' responses clearly show that students attached a lot of importance to the convenience, flexibility and their ability to use the learning materials in a way that suits that their individual preferences and needs. This also indicates that students preferred content that short and concise. This idea was also supported when looking at students comments. 76% students found lecture audios as helpful in their learning but only 56% enjoyed using them. Contrary to this, 78% of students found lecture videos enjoyable and 83% students found that useful in their learning. That indicates a mixed feeling of students towards shifting of format of traditional classes. Video conferencing is a method that allows students to attend and participate in the live lectures online. Students can interact using audio, video, and text chat. Students can also view the lecture slides during the lecture. To participate, students need a good speed Internet connection and a computer with acceptable configuration. A microphone is needed if students wish to speak rather than type. These lectures are also recorded and these recordings are made available for download. 78% of students found videoconferencing as beneficial for their learning and 67% found them enjoyable. It clearly shows that students value the content that allow them to revisit what they studied at the time that suits them. It also shows that videoconference is an effective tool for learning. Unsurprisingly, students

Table 2. Students' responses: Methods and tools used for learning aid

Material	Helpful in Learning (%)	Enjoyable (%)	Not Enjoyable (%)
Short Videos	88	94	0
Screenshots	85	86	0
Lecture Audios	76	56	18
Lecture Videos	83	78	14
Lecture PowerPoints	81	72	13
Lecture Video Conference	78	67	14
Recommended Readings	82	73	5
Course Announcements	81	76	2

reported that they used videoconference recordings more than they attended the live sessions. Some students reported that they were frustrate because of various technical issues of videoconference (such as problems with audio/video and Internet connection). Students' comments also revealed that their frustration was with the tool itself and not with the synchronous method of learning i.e. online classes. It shows that there is still room of improvement in videoconferencing tool.

Students were also asked about the methods they used to interact with their peers and teachers. Teachers use a variety of methods to connect with the students. Some important methods include email, Skype, and social media tools such as Facebook and Twitter. Skype is a preferred method of communication because it allows video and screen sharing so that students can jointly work with other peers on assignment problems. Twitter can be used to facilitate group communication in which both students and teachers can participate. Hashtags are used to group conversations relevant to the class.

Students were asked about the effectiveness of these tools for interaction with teachers. Surprisingly, more that 93% students reported that they found email as an effective tool for interaction. Students reported that they received quick response from the teachers when they communicated them using email. This finding is supported by the findings of Robinson (2011) who found that email was the preferred method of communication for student-teacher interaction. These findings show that prevalence of the use of a tool and availability of teacher through this tool, makes this tool highly desirable for students.

Students were asked how important they think was their personal interaction with their peers and teachers. 81% students reported that attending traditional face-to-face classes was very effective to communicate with their teachers and to interact with their peers. One student commented that face-to-face classes helped him build relationships. Even those students who preferred online model of learning, reported that they considered traditional classes' facilitated interaction with teachers and peers.

87% of students repotted they considered social media effective in interacting with their peers. 72% reported that social media was effective in interacting with their teachers. A student commented that the prevalence of use a tool of communication determined its effectiveness for communication. More the peers and teachers used a particular tool, more the students considered it effective for communication with peers and teachers. Few students mentioned that they consider their learning enquiries as personal and it should be dealt by teacher in a personal way. Some students commentated that traditional methods of communication were better because they were help to get specific answer from the teacher. Most students reported that they used Facebook as the preferred method of communication with their peers about the course content. Facebook was also regarded as the tool that increased the learning effectiveness. Many students commented that they thought their learning could increase if the teacher effectively mediated the learning tool (such as videoconference). Some students commented that the good design of the tool made them highly motivated and satisfied to use it. Most of the students did not have prior experience of using the Learning Management System (LMS) a particular university used in blended learning. This finding supports the notion that LMS and its functionality alone may not be sufficient to provide an optimal learning experience. Teacher's preference and comfort level with a particular learning tool also affected the effectiveness of the tool. Five students commented that they found the tool used could have been more effective if the teacher was more comfortable in using it. Three students commented that teachers should only use a limited tools of communication because using too many methods can also clog the information and diminish the worth of communication. One student found that social media tools are not suitable to discuss personal learning enquiries.

It appears that peer discussion or (learning community) is the vital factor for students' motivation and satisfaction in blended learning model. These findings are contrary to Reisetter, LaPointe and Korcuska

(2007) who concluded that the students of traditional classes gave more importance to learner community for their motivation and satisfaction with the learning model. All students independent learning but considered it important to build good relationships with peers and teachers. Students feel more motivated to meet in person and on social media and consider them as effective methods of collaboration. So (2009) and Diaz and Entonado (2009) claim that students feel more motivated to engage in communication when they feel connected with others. Mackey and Ho (2006) claims that online mode of learning cannot be a replacement of traditional mode of learning. He claims that online classes can complement traditional classes to enhance blended learning. However, the findings of this study reveals that a better and effective design of online model of learning is valued more. While collaboration in learning community was valued by the participants, few students reported that working with peers who didn't prefer to work in online communities was challenging. This highlights that students' choice of a particular mode of study can adversely impact their collaboration with peers.

Following are all adjectives that participants used in their feedback about blended learning environment. These adjectives reflect their attitudes, beliefs, and feelings about blended learning environments.

- Balanced,
- Beneficial,
- Bothered,
- Clogged,
- Convenient,
- Difficult,
- Direct,
- Easy,
- Effective,
- Enthusiastic,
- Flexible,
- Focused,
- Good,
- Hard,
- Helpful,
- Ineffective,
- Irrelevant,
- Limited,
- Missed-out,
- Openly,
- Painful,
- Preferable,
- Productive,
- Real,
- Satisfied,
- Self-Conscious,
- Successful,
- Suitable, and
- Time-Consuming.

It appears that participants have used a wide range of positive and negative adjectives. As a whole, their views are positive. The most cited adjectives were flexibility and effectiveness.

Participants were asked about the learning tools they would like to see in future. Most students reported that they would prefer communication tools. This finding reflects the importance of effective communication in blended learning environments. Students found videoconferencing beneficial and also enjoyed using it. This finding is in contrast with findings of (Waha & Davis, 2014) who found that students found videoconference beneficial but didn't enjoy using it. One reason for this is that videoconference tool has developed considerably and the technical problems and issues are now much less frequent. When asked about the appropriateness of blended learning for their respective fields of study, 91% students reported that blended learning model is appropriate for their field of study. Despite their difference of choices of learning modes, majority of the students was aware of the potential benefits of the blended learning environments.

CONCLUSION

This findings of the study has pointed out that the each individual has a different blend of learning that provides optimal learning. This right blend of learning is dependent on an individual's learning style and situation. This finding is in line with the findings of previous studies) Akkoyunlu & Soylu, 2008; Waha & Davis, 2014). This right blend is also dependent on the field of study. Since each field of study may require a different mix of online and traditional teaching. The findings of this study has provided new perspectives on students' motivations in blended learning model from a developing country perspective. The views of students show that the students generally hold a positive view about blended learning. Even students having a desire for more traditional classes understand the benefits of blended learning. Participants vary in their preferences for individual and independent learning. It is important that future blended learning environments take into account these preferences to better meet students' needs.

AREAS OF FUTURE RESEARCH

Future studies can use interviews or focus groups to perform a deeper and complex analysis of the students' perspective of blended learning environments. Such a study can provide determination of other factors that could further enhance students' motivation for and engagement with blended learning.

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KEY TERMS AND DEFINITIONS

Blended Learning: Refers to a formal education program in which a student learns at least in part through delivery of content and instruction via digital and online media with some element of student control over time, place, path, or pace.

Content Analysis: Refers to a research technique used to make replicable and valid inferences by interpreting and coding textual material.

Higher Education: Refers to education at universities or similar educational establishments, especially to degree level.

Learning Community: Refers to a group of people who share common academic goals and attitudes, who meet semi-regularly to collaborate on classwork.

Optimal Learning: Refers to learning attained when the learner can command the new information to create valuable outcomes.

Pedagogies: Refers to the methods and practices of teaching, especially as an academic subject or theoretical concept.

Chapter 7
The Rhetoric of Fear: Voices and Stories Told of Faculty Who Engage in Online Teaching

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ABSTRACT

Amongst the glamour and allure to teach online, the literature indicates faculty often see and experience teaching online as daunting, painful, and time consuming. While, many studies seek to detail faculty experiences with course and program design, few studies seek to understand the faculty emotional reaction and their response to online course development and online course teaching. Using phenomenology this preliminary research study sought to explore and document faculty involvement in online teaching using theories of experience, postulated by Dewey (1938) and the Unified Theory of Acceptance and Use of Technology, by Venkatesh, Morris, Davis, and Davis (2003) to analyze and give voice to the emotional experience and reaction of faculty who are involved in online teaching.

INTRODUCTION

Over the past decade, the number of online courses and programs has grown tremendously promoting a need for institutions to seek faculty who are willing to accept and participate in online teaching. Like most disciplines, faculty have been expected to respond to the increasing demands for online learning (Allen & Seaman, 2010). Such response requires exploration into the experiences of faculty in online teaching. Supporting faculty and providing support is crucial for the process of designing, developing, and instructing online programs and courses (Bruner, 2007; Kyei-Blankson, 2009). To date, few studies provide a discussion to the emotional reaction and response of faculty who engage in online teaching. While current research on faculty participation in online learning has focused on program and course design, issues related to the faculty's experience developing and teaching online courses has largely been ignored (Chen & Chen, 2006), therefore, this study taken from a larger study provided an opportunity to highlight the emotional responses of faculty involved in online teaching, but also discuss their voices and stories told. This will serve as a platform to inform those involved in online teaching.

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REVIEW OF THE LITERATURE

In more recent years faculty have been expected to participate in online learning as a part of their regular duties as faculty (Appana, 2008). Despite this expectation, faculty have still been hesitant to convert their traditional courses to an online format (Fish & Gill, 2009). These authors found that faculty felt uncertain and uneasy towards online learning due to perceived assumptions regarding the quality of learning and student learning outcomes. This uncertainty stemmed from assumption concerning the nature of learning and mode of learning (Appana, 2008), subscribing to myths and misconceptions of online learning (Li & Atkins, 2005), lack of competency in technology and online learning methods (McGuire, 2005) and institutional incongruence with relation to faculty, attitudes, beliefs, and practices (Mitchell & Geva-May, 2009; Simpson, 2010). Further, Saba (2005) revealed that faculty who teach online are oftentimes unsure how to teach online, due to a lack of skills sets and experience in online environment. This ultimately leads faculty to experience anxiety and negative feelings towards online teaching.

As faculty engage in online teaching, the pathway of course migration to online environments often begins with the assumption that instructional designs, grading procedures, and other methods that typically work in the traditional classroom would remain the same in online settings. When faculty come to terms with the reality that these two environments are entirely different, they suddenly become frustrated (Bruner, 2007; Conceicao, 2006) and realize the need for professional development activities and support programs that will help them teach successfully online. Instructors face the challenge of the preponderance of online courses, a distinct set of online student needs (e.g., independent learning, unlimited access to course content) and the need to promote interaction in online learning (Conceicao, 2006). This placed a burden on experienced instructors who have taught exclusively in face-to-face settings.

The acceptance of online learning within universities and individual curricula has challenged previously established teaching methods and faculty responsibilities (Dabbagh, 2004). The transition to online teaching for experienced faculty is not easy and has been labeled as “daunting”, “painful” and “stressful” (Grosse 2004). In addition, there is considerable evidence that teaching online requires additional extensive preparation time (Lorenzetti, 2006) and this preparation time was found to add additional stress on faculty (Lorenzetti, 2006). Further, Grosse (2004) found that veteran face-to-face instructors had to revise their teaching methods. This was found to cause a sense of uncertainty and frustration for veteran faculty (Grosse, 2004).

According to Campbell (2006, p. 00) with the new teaching role, faculty have expressed “concerns for the loss of personal and intimate interactions” with their online students. Some veteran faculty who were new to online learning have expressed concerns about their lack of ability to teach skills requiring “hands on” instruction at a distance (Conceicao, 2006). Osborne, Kriese, Tobey, and Johnson (2009) and Tallent-Runnels, et al. (2006) state that it is imperative to address instructors’ concerns and obstacles that lead to anxiety, apprehension and stress as they teaching at a distance. Despite faculty’s emotional reaction to online teaching, online teaching presents a learning curve that may be difficult for faculty to undertake. As noted by Gerlich (2005, p.8) online teaching presented a “steep learning curve associated with learning to teach online.” Because of the many tools and strategies associated with online learning, faculty are sometimes left frustrated, overwhelmed, and exhausted, due to the intense work needed to teach online (Bruner, 2007; Conceicao, 2006; Kyei-Blankson, 2009). Becoming a successful online instructor requires a change of the instructor’s perspective and role as well as opportunities for effective professional development (Lee & Busch, 2005). This transformation was reportedly a painful, yet exhausting and was found to be overwhelming (Hinson & LaPrairie, 2005; Sieber, 2005) for both new and veteran.

Moreover, research has shown that faculty regard online teaching as more difficult and intensive than teaching traditional courses (Gerlich, 2005; Wegmann, and McCauley, 2008). They found that faculty believed online courses were to be more difficult to teach because of workload increases due to more interaction with students, grading paper, designing assignments, and assessments. This resulted in being overwhelmed and stress, which lead to anger. Similarly, Sellani and Harrington (2002) found that faculty became overwhelmed with designing online courses and their other demands as faculty including research and service commitments interfered and cause workplace stress. Lao, and Gonzales (2005), found that faculty who taught online felt teaching online difficult due to technological constraints. They also found that faculty would not want to teach future online courses because adequate technical support was lacking in their first online teaching experience. Lack of adequate technology led to feelings of anxiety, stress, and anger associated with online learning and technology.

THEORETICAL FRAMEWORK TO GUIDE THE STUDY

In developing this study, two concepts emerged; the first being adoption and the second being experience. Adoption according to Straud (2009), examines the individual and the choices individuals make to accept, participate, or reject a particular innovation. Experience, according to Dewey (1938), allows one to understand how past events and the interactions of past environments shape what is learned from a given experience. Taken together, these concepts bring meaning and understanding to the elements that influence and shape the emotional response and experience of faculty who engage in online teaching. In order to explore the emotional construct of this phenomenon more in depth, a framework that encompasses both experience and adoption of technological innovation were used to guide the study the Unified Theory of Acceptance and Use of Technology model (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003).

The literature on the use of technology has identified various technology acceptance models and frameworks for factors influencing individual decisions to participate in an innovation. Venkatesh, Morris, Davis, and Davis (2003) formulated a new theoretical model based on the more salient characteristics of the eight models to form a unified model for understanding technology use and acceptance - Unified Theory of Acceptance and Use of Technology (UTAUT). The Unified Theory of Acceptance and Use of Technology (UTAUT) model states that four key determinants of use, three secondary determinants of use, and four moderators of individual use behaviors play a significant role as direct determinants of user acceptance and use behavior. These determinants include performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy is defined as the degree to which an individual believes that using a particular technology or system will help him or her to attain gains in job performance. The effort expectancy is defined as the degree of ease associated with the use of a technology or system. The social influence is defined as the degree to which an individual perceives how important others believe he or she should use a new technology or system. Facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the technology or system (Venkatesh, Morris, Davis, and Davis 2003). The three secondary determinants include attitudes toward using technology, which is defined by the degree to which an individual believes he or she should use a particular technology; self efficacy, the degree to which an individual judges his or her ability to use a particular technology to accomplish a particular job or task; and lastly anxiety, which refers to the anxious or emotional reaction associated with the use of a particular technology. The four moderators include gender, age, experience, and voluntariness. Venkatesh, Morris, Davis, and Davis (2003) states that gender reflects being male or female; age reflects a continuous time variable reflective of the person adopting the technology; experience represents prior interaction and knowledge gained from previous and current events and interactions with similar technologies under adoption. Voluntariness refers to ones' participation in using technology as either being forced or being willing to try a technology or system due to ones' own interests. Specific to this study, the determinant that relates to emotions are used to analyze the stories and voice of faculty who engage in online teaching.

The Unified Theory of Acceptance and Use of Technology (UTAUT) model, according to Jaaiji & Schepers, (2006) represents a significant step forward in analyzing behaviors and experience of technology associated with technology adoption. Further, when exploring and analyzing the outcomes of a technology adoption experience Venkatesh, Morris, Davis, and Davis (2003), Cron, Glocum, VandeWalle, and Fu, (2005), and de Vries, Midden, and Bouwhuis (2003) suggest that the Unified Theory of Acceptance and Use of Technology (UTAUT) model provides a platform as to how attitudes towards computers, emotions, self efficacy, and computer anxiety play an important role in shaping one's use and experience with technology and whether the experience is positive or negative based on failing or succeeding in one's efforts to participate in a particular innovation. These authors continue to suggest that for some, failing at one's efforts results in negative emotions and future efforts relating to innovation. In reference to technological innovation, which can include online teaching (Ndubisi, 2006); these authors suggest that an individual's failure to successfully learn a technology may induce a negative cycle of non use. This negative cycle may affect self confidence, emotions, and trust in technology and may have implications for self efficacy when using technology. As the current study seeks to explore the stories and voices regarding the emotional response and reactions of faculty who engage in online teaching, these constructs become important to analyzing the elements that shape the experience of faculty who are involved in online teaching.

DESIGN OF THE STUDY

Exploring the emotional reaction of faculty involved in online teaching stemmed from a larger project related to faculty involvement in online teaching at one school of public health. The study was based on the phenomenology research design (Moustakas, 1994). The purpose of the larger study was to research the phenomenon of the experience of public health faculty who develop and teach online courses, by obtaining verbal and written descriptions of their perceptions and experiences developing and teaching online courses in a public health context. From these descriptions, the underlying structures and essence of how public health faculty engaged in online teaching were extracted. Two research questions guided this study: How do public health faculty describe their experiences of in online teaching and what barriers and/or challenges were voiced by public health faculty while in the process? To accomplish this, three major processes were undertaken: epoche, phenomenological reduction, and imaginative reduction. In general, these processes required the primary researcher to bracket assumptions regarding the phenomenon; analyze verbal or written data to discover emergent themes; uncover clusters of themes and; prepare a creative description of the phenomenon that articulates its underlying structures and essence as depicted from the themes discovered in the data. Additionally, a purposive (criteria) sampling was used to identify participants (Moustakas, 1994). Those who developed and taught an online course were selected.

After receiving a list of twenty-eight candidates, five faculty agreed to participate in an intensive data collection process involving written narratives, intensive one hour interviews, and an analysis of their online courses, and any course documents or evaluations. Data were analysis using the inducted grounded analysis technique (Blasé' & Blasé', 1999), which the categories, themes, and patterns emerged inductively from the data. The interview data were analyzed using the phenomenological technique Stevick-Colaizzi-Keen Method (Moustakas, 1994). Based on the intensive data collection and analysis process, three salient perspectives emerged that influenced the experience of faculty to engage in online teaching. These perspectives included the individual, technical perspective, and the organizational perspective.

This review suggests that elements relating to participants' experience in online teaching could be framed around the above three key perspectives: individual perspective, technology perspective and organizational perspective. According to the data that emerged from participants' narratives, the individual perspective can be described as the skills and knowledge needed to develop and teach online courses. The technology perspective can be described as the availability and capacity of a technology tools including hardware, software, and peripheral used to compliment and support the development and teaching of online courses. Lastly, the organizational perspective can be described as a social, political, and technical infrastructure that influences the faculty's' ability to develop and teach online courses. The three perspectives were identified from the data and were found to be direct influences on the emotional responses, reaction, and experience of public health faculty who develop and teach online courses.

PRELIMINARY RESULTS

Using a recursive approach to study the participants' transcriptions and the analysis for each one, the researcher constructed a textural-structural description of what and how the participants experienced developing and teaching online courses. Three major themes emerged, including fear, transformation, and support. This preliminary study focused on the construct of fear, as this is a prevailing emotional and psychological response associated online teaching. A few excerpts are provided below to give context and meaning.

Fear, as described by the participants was to be afraid or apprehensive about a possible or probable situation or event. Participants experienced fear in the process of online teaching. They described their fear in terms of being apprehensive to new experiences brought on by their lack of experience and preparation developing and teaching online courses. When experiencing fear or apprehension, the participants described their lack of experience to develop and teach online courses as a source that stimulated their fear. They described developing an online course as a "*painful, time-consuming process*" that made the process of online teaching "*daunting*" due to the amount of work that lie ahead. Dr. EPI01 said:

I knew it was going to be an enormous amount of work; I felt inadequately prepared; I had never even used Blackboard, so my expectations were a combination of excitement, dread, and fear. I thought to myself how am I going to get this done." Likewise, she also stated that "It can be a bit scary learning a number of new things.

Similarly, Dr.HPBS005 described her lack of experience and preparation developing and teaching online courses that contributed to her apprehension towards developing and teaching online courses were as follows:

I was really very fortunate not to have to start from scratch. Because of course I really knew nothing. I never even logged onto Blackboard prior to - I guess fall of 07, I never even logged on – my secretary would do it in Minnesota. It was really a whole different way of approaching things. So she or my graduate student would post things online. They would do all of that. So I pretty much didn't know anything. This was an uneasy position to be in. It's actually quite scary.

Further, describing fear brought on by the lack of experience, being prepared, or the assurance from school leadership and support personnel, Dr. BIO01 said:

My lack of training and support for reassurance left me to spend much of my time developing and teaching these online courses without any guidance or support. This made him feel like I was not developing the online course correctly. I felt that administration left me to be alone in this endeavor.

A second component to Dr. BIOD01s' experiences of fear dealt with administration. He said:

Administration does not support online course development efforts, therefore I for one became apprehensive, once I figured there was little to no support offered. I did it all by myself, not knowing the outcome.

Dr. EPI01 described a similar experience relating to the lack of reassurance for course development, saying "*I oftentimes find myself second guessing if I am doing something right or wrong. I don't know how the course will come out."* Likewise, when experiencing unknown outcomes of developing and teaching online courses Dr. EOHS04 perceived a similar experience, saying, "*the feeling of being unsure as to how the online course would turn out or if the quality of the course content would diminish lead to being apprehensive of developing online courses*."

When experiencing fear the process of developing and teaching online courses Dr. EOHS04 said "*I still have fear that I will not be able to do a good job developing or teaching online because I was not formally trained*." Dr. EOHS04 also said "*I had some concerns about making it [the online course] work in the sense that students could understand what I was trying to teach them to an online interface. This was a fear of mine*." Conversely, Dr. EOHS03 said "*lurking in the back of my mind is the fear I would fall behind and that I wouldn't be able to catch up."*

Dr. EOHS03 described fear in the process of developing and teaching online courses relating to safety brought on by the lack of interpersonal intimacy and relationships with students. He said:

All that was interesting [developing and teaching online courses] but it taught me to blame the personality of the person not necessarily seeing their face, however I then came back to Houston and within the first few weeks the students would stop by and of course I didn't recognize them, but they recognized me and that always worried me. You know, I have an office that has one door and there's nowhere to escape. They could corner you and you didn't know if they were going to kill you or not. This is a fear of mine.

In summary, participants experienced fear as a byproduct of their lack of experience and being ill-prepared to develop and teach online courses. This fear manifested itself in how participants felt in regards to support, training, technology, and safety. This is evident by the description of fear they experienced in the process of developing and teaching online courses at this school of public health. In brief, participants experienced fear as being part of the experience navigating through the process of developing and teaching online courses, while trying to come to grips with this new modality of teaching, learning, and ultimately the environment.

DISCUSSION

The essence of faculty who engaged in online teaching at this particular school were perceived and described their experiences as a difficult, daunting, painful, and time consuming. This left the faculty feeling frustrated, exhausted, stressed, disgusted, fed up, and in some cases, discouraged. At the individual level, the study reveals that the degree of knowledge and skills in online content design and delivery would influence faculty participation in online teaching, their experience in developing and teaching online courses, and the decisions to embrace new forms of instructional practices. Fear in essence is a psychological barrier.

Psychological barriers dealt with the cognitive or mental aspect of how participants felt and thought about online learning. Participants' thinking, perceptions and belief towards online learning was largely influenced by past experiences and assumptions of other faculty in academia. This caused participants in the current study to accept and believe negative suppositions and opinions concerning the quality and nature of online learning. This in turn influenced the participants in their pursuits of online teaching, which ultimately led to a state of apprehension and fear. As participants undertook the activities of developing and teaching online courses, they found themselves in a state of dissonance, struggling to change their thinking about online teaching. This dissonance and struggle facilitated negative emotional reactions towards online teaching. The lack of experience and knowledge of online learning, coupled with the negative predisposition of online learning also led to apprehension and fear about online teaching. Additional fear manifested itself in the idea of safety and loss of social interactions. When experiencing fear of safety and the loss of interactions with students, participants described this as a source that stimulated their fear toward online teaching. Participants from the current study also revealed that online teaching as a complex activity that often resulted in anger and frustration due to time spent learning new technologies, new methods of teaching, frustration with malfunctioning technology, lack of institutional and peer support, and lack of training.

Theoretically, Dewey (1938) teaches that experience consists of continuity and the second is interaction. Continuity refers to past events influencing the present and interaction refers to present experiences arising from interactions between past experiences and present situations. Together, one's experience of an event, observation, or moment is unique and is profoundly influenced by one's experience of past moments. In essence an individual's internal state, including knowledge, skills, and attitudes are shaped by prior and current experiences. Based on past interactions with faculty and organizational structures that help shape their thinking about teaching and learning in general and online teaching, participants in this current study found themselves in a condition where there was a lack of experience with online teaching. This lack of experience with online teaching, brought on by a lack of preparation and training, as well as lack of support, led faculty in this study into a state of apprehension, anger, frustration, and dissonance. This caused the process and activities of online teaching to be a painful, stressful, and daunting experience. This element of fear is what UTAUT refers to as anxiety, which refers to the anxious or emotional reaction associated with the use of a particular technology, in this case online learning. This anxiety, according to UTAUT influences attitudes toward technology, which is defined by the degree to which an individual believes he or she should use a particular technology. This indirectly influenced the participants' self efficacy, which UTAUT defines as to the degree to which an individuals' judges his or her ability to use a particular technology to accomplish a particular job or task. These feelings in turn presented an experience where participants would develop negative expectations in a combination of excitement, dread, and fear regarding online teaching.

Not only did fear or apprehension reveal itself in developing and teaching online courses, fear and apprehension revealed itself in how participants in the current study approached online learning, their interactions with students, and their interaction with administration. Further, their own lack of awareness of online teaching presented an environment where participants had to accept and expect the unknown. This environment of the unknown was experienced through their new roles as online instructors, how they as online instructors were to interact and navigate in an abstract non tangible environment, where students were invisible, and ultimately how to conceptualize teaching and learning in a foreign environment. Dealing with the unknown added to a sense of fear and frustration and in some cases anger, with online teaching. When it came to interacting with students in the online environment, participants again showed fear and apprehension and ultimately bringing into question their physical safety, as one described a situation of being "killed" because he did not know the faces or personalities of the students whom he had taught online.

CONCLUSION

In summary, participants experienced fear and other emotions as a byproduct of their lack of experience and being ill-prepared for online teaching. This fear manifested itself in how participants felt in regards to support, technology, safety, and online teaching itself. These experiences of fear, apprehension, pain, anger, anxiety, and daunt are well connect with the Unified Theory of Acceptance and Use of Technology model (UTAUT) as discussed by Venkatesh, Morris, Davis & Davis, (2003). This study suggests that attitudes towards technology, self efficacy, and computer anxiety played an important role in shaping one's use and experience of the public health faculty who engage in the activities of online teaching, as well as their emotional reactions and responses. Understanding that past experiences influence the present, present attitudes toward online learning and the emotional outcomes expressed, are deeply connected and influenced by previous and current experiences, which in turn produce attitudes that influence participants' self efficacy related to developing and teaching online courses and their levels of anxiety, emotional reaction, and fear related to the task of developing and teaching online courses.

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Chapter 8
Structuring Online Instruction by Dynamic Design, Delivery, and Assessment

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ABSTRACT

Over 900 colleges and universities across the U.S. have adopted the Quality Matters Rubric for the design of their online courses with the intention of providing guidance to both instructors and peer reviewers. Given the challenge of how design components align with Web-based instruction delivery in terms of interactivity and formative assessment, there is a need to develop guidelines to establish a strong connection between design and delivery. Such information could support a dynamic, balanced, and student-centered approach to instructional development in virtual learning environments. This chapter proposes a matrix built on the linkage among well-established design practices, delivery methods or strategies, and assessment routines.

INTRODUCTION

A number of quality assurance programs for online courses have been developed over the years. Most widely adopted is the Quality Matters™ (QM) Rubric Standards used by over 900 colleges and universities to ensure student success in online learning (Quality Matters, 2015). Not only do the QM standards help faculty in their design of online courses, but they also emphasize continuous improvement and consistency in the quality of online learning in individual courses and at institutional levels.

The most recent iteration of the QM Rubric identifies eight general standards for designing online courses along the following criteria: course overview and introduction, learning objectives, assessment and measurement, instructional materials, course activities and learner interaction, course technology, learner support, accessibility and usability. These critical areas of interest are supported by 41 Specific

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Review Standards, 21 of which are considered essential, meaning that not meeting any of them in this latter set would result in a course not being QM certified. The QM Rubric (2015) emphasizes the alignment of course materials, activities and course objectives. The associated standards prompt online faculty, instructional designers, and institutions at large to refine the design of their course/program offerings for virtual delivery by using a complex peer review system. Research reviewed by Woods (2014) indicates that applying the QM review process results in greater student learning outcomes that rely on stronger, clearer connections to course objectives as well as assessment tools. Similar positive results have been reported by other researchers who completed recent studies (Little as well as Puzziferro & Shelton, as cited in Roehrs, Wang, & Kendrick, 2013, p. 55). As an illustration, faculty participating in a research project focused on QM rubric training based on which to review and update their respective courses expressed the fact that the process was useful to them as it prompted these participants to enhance the learning experiences of their online students (Roehrs, Wang, & Kendrick, 2013).

In this chapter, the authors propose a matrix - Dynamic Design, Delivery and Assessment (3DA) - built on the connection among well-established design practices (as guided by QM processes), delivery methods or strategies, and assessment routines (see Table 1 below). The number of students taking online courses has been growing continuously, reaching over 7 million in 2012, based on enrollment in at least one Web-based class (Allen & Seaman, 2014). Consequently, the shift from a focus on developing the infrastructure to ensuring effectiveness (McKnight, 2004). The inherent paradigm change from quantity to quality (Liu & Johnson, 2004) implies bridging the apparent gap between design and delivery of online instruction (Southard & Mooney, 2015). Under these circumstances, the proposed theoretical matrix correlates in a bidirectional manner the aforementioned elements by grounding them in teacher presence as well as student social and cognitive presence, as outlined by Garrison, Anderson, and Archer (2000). This matrix can be used by instructors who plan to design online courses or improve their teaching by making the theoretical and practical connections between design, delivery and assessment.

BACKGROUND

Designing an online course needs to be based on a systems approach that considers all aspects of online instruction. Faculty who teach online or plan to teach online can benefit that from a dynamic, balanced and student-centered approach to design, delivery and assessment of instruction. As online course effectiveness depends a great deal on instructional design (Gunawardena, Ortegano-Layne, Carabajal, Frechette, Lindemann, & Jennings, 2006; McGahan, Jackson, & Premer, 2015), rubrics or standards, such as QM or iNACOL as well as faculty professional development programs, can be supported by this systematic approach to teaching online.

The QM program features rigorous training for faculty interested in teaching online by relying on a peer-review system for the purpose of improving the quality of virtual learning environments design. The peer review process and built-in feedback loop represent critical components of the continuous improvement cycle supported by QM (Schwegler & Altman, 2015). As faculty-driven process connecting outcomes, objectives, and assessments (Swan, Day, Bogle, & Matthews, 2014), the fifth edition of the QM Rubric consists of 43 specific review standards that are distributed across the eight general standards mentioned earlier. There are "21 "Essential" standards worth three points each, 14 "Very Important"

Table 1. Structuring online instruction by dynamic design, delivery and assessment (3DA)

QM General Standards	Connecting Dynamic Design, Delivery, and Assessment (3DA)			Practice Notes to Apply 3DA
	Design	Delivery	Assessment	
1. Course overview and introduction	QM Review standards 1.1-1.9	- Establish social presence to support community building	- Pre-assessment of student background/skills - Formative assessment focused on community building	- Moving beyond the initial introduction to connect individuals to course content and each other - Online interactivity connecting social presence and cognitive presence - Developing a community of inquiry - Transfer of skills/strategies from face-to-face to online
2. Clear and measurable learning objectives	QM Review standards 2.1-2.5	- Connect learning objectives, activities, and assessments during instruction - Facilitate cross-curricular connections - Promote meaningful curriculum-driven interactions among community of inquiry members in the online environment	- Frequent communication of learning objectives to students - Development of an awareness of learning objectives for students' metacognitive skills and reflective learning	- Through formative assessment techniques (e.g., Minute/Muddy Point papers, exit slips, or journaling) students are prompted to reflect on questions such as, "How is my learning related to course/learning objectives?" "What have I learned?" "What do I need to revisit or I have not understood?"
3. Assessment strategies aligned with learning objectives, as they measure student progress & learning	QM Review standards 3.1-3.5	- Develop teacher and student presence (social, cognitive, emotional) supportive of assessment as learning (Earl, 2003)	- Formative assessment focused on teacher and student presence (social, cognitive, emotional) - Student self- and peer-assessment	- Instructors use formative assessment data to refine subsequent instruction and assessment procedures - Instructors and students develop collaboratively scoring rubrics to promote cognitive and social presence
4. Instructional materials are comprehensive and aligned to course objectives	QM Review standards 4.1-4.6	- Reinforce and extend learning by covering the full extent of Bloom's taxonomy (Bloom et al. 1956; Krathwohl, 2002) - Promote cross-curricular connections guided by learning objectives - Emphasize applications of curriculum to broad-based student engagement based on their prior knowledge and experience	- Formative assessment focused on student engagement and meaning-making - Academic help seeking	- The constant interaction with curriculum within a community of inquiry relies on frequent evaluations of quality of teaching and learning - Model and promote the use of academic help seeking tools and mechanisms by students
5. Course interactivity motivates students and promotes learning	QM Review standards 5.1-5.4	- Employ questioning strategies, engaging discussions based on learning objectives - Develop and sustain a community of inquiry - Motivate and sustain social and cognitive presence	- Formative assessment focused on teacher and student presence (social, cognitive, emotional) - Student self- and peer-assessment	- Move beyond instructor-driven questioning - Promote student-initiated/mediated inquiry - Ensure that interactivity supports student cognitive presence prompted by formative assessment - Blend formal and informal learning
6. Course technologies support learners' achievement of course objectives.	QM Review standards 6.1-6.5	- Promote cognitive presence by meaningful, content-focused interactions	- Continuous review and improvement	- Connect and evaluate technology, content, and pedagogy - Promote interface/learning platform interactivity - Embed formative assessment
7. Learner support services are identified.	QM Review standards 7.1-7.4	- Model and promote help-seeking behaviors	- Diagnostic assessment	- Provide technical help seeking tools, such as how-to videos or modules, Help Wall, FAQs, etc. - Emphasize academic help-seeking behaviors
8. Accessibility and usability for all students is ensured.	QM Review standards 8.1-8.5	- Establish social presence	- Diagnostic assessment	- Provide technical help seeking tools, such as how-to videos or modules, Help Wall, FAQs, etc. - Emphasize academic help-seeking behaviors

worth two points, and 8 "Important" worth one point. A course must meet all the 3 point standards and score 84/99 to become a QM certified course (McCormick, 2014). "Based on 2,665 completed course reviews ... over the three-year period from 2011 to 2014, 69% of courses submitted met standards without revision, 25% required modest revision… and only 6% required major reworking to meet standards (Legon, 2015, p. 167).

Sun and Rosa (2015) investigated the relationship between faculty training using QM standards and online course quality as perceived by students. Their study found that faculty QM training significantly enhanced learning interaction. The same researchers also found that the effects on learning objectives, outcome assessments and instructional materials were marginally significant while not demonstrating much influence on the use of technology. A holistic perspective on how the QM standards might influence the design skills focused on online learning environments is provided by outlining the standards most frequently met as well as those missed over two multi-year cycles of course reviews included in their study (Shattuck, Zimmerman, & Adair, 2014). According to these researchers, the most frequently met QM standards during the period of time spanning 6 years (two cycles of 3 years each) were as follows: 6.1 - the tools used in the course support the learning objectives or competencies (for both 3-year cycles); 6.5 - links are provided to privacy policies for all external tools required in the course; and 7.2 - course instructions articulate or link to the institution's accessibility policies and services. On the flip side, the most frequently missed QM standards were 3.5 - the course provides learners with multiple opportunities to track their learning progress (for both 3-year cycles); and 8.2 - information is provided about the accessibility of all technologies required in the course (also for both 3-year cycles). While reviewing, reflecting, and revisioning online instruction represent critical phases in the complex process of ensuring high quality course offerings in virtual learning settings, allowing instructors to find the time to apply the QM program is essential as a professional development opportunity (Roehrs, Wang, & Kendrick, 2013).

As mentioned earlier, the appeal of online education has grown constantly over the past decade. Concurrently, attrition and retention rates in these virtual courses have been high in a concerning manner. Some of the reasons behind this phenomenon include insufficient engagement/interaction, ineffective or inappropriate pedagogical strategies and/or tools, faculty ability or effectiveness in online settings, student readiness to perform in virtual learning environments, infrastructure capability to support various aspects of online instruction, meeting the needs of students with disabilities, etc. (Williams van Rooij & Zirkle, 2016). Overall, institutional strategic planning that does not invest in both developing a robust infrastructure and in the continuous training of online faculty and instructional designers could lead to a widening gap between the potential of Web-based education and what it has been able to accomplish thus far (Bonk & Zhang, 2008). The constant refining of the QM Rubric should be coupled with the iterative identification of strategies that contextualize effective online pedagogy in the virtual reality that immerses communities of inquiry that relies on the synergy among social presence, teaching presence, and cognitive presence (Garrison, Anderson, & Archer, 2000). Enhanced educational experiences in virtual settings rely on inserting formative assessment as a way to create a dynamic course design that capitalizes on the three components of a community of inquiry mentioned earlier (Boboc, 2015). Under these circumstances, current explorations of how to connect the QM Rubric with online learning processes mediated by communities of inquiry and course outcomes (Swan, Day, Bogle, & Matthews, 2014) could include negotiations on how to contextualize online design by way of relevant, effective pedagogical strategies and tools.

MAIN FOCUS OF THE CHAPTER

Issues, Controversies, Problems

A review of relevant literature on factors that seem to have a significant impact on online delivery reveals several sets, as follows: technology, the instructor, student familiarity with the instructional technology being used, on the one hand, as well as human factors (such as the ability to use computer technology and motivation), course-specific organizational and curricular structure, instructor training and technological support, pedagogical strategies and tools, and presentation modality [such as (a)synchronous discussions and multimedia capability]. Additionally, meeting student learning outcomes, coupled with positive learner satisfaction and retention rates in virtual learning settings have been noted (Williams van Rooij & Zirkle, 2016). Looking holistically at these critical variables that have been associated with effective online instruction, it is clear that the design of such curricula is one of the major considerations that should be made as we continue to strengthen e-learning as a field of practice and inquiry.

As higher education has become increasingly more job market-focused and it has been placed under greater scrutiny in terms of how it delivers specialized services (Maor & Volet, 2007), online instruction has followed suit. Therefore, the analysis of what constitutes effective teaching and learning in virtual settings has to be both complex and comprehensive. As mentioned earlier, the QM Rubric ensures quality control with regard to design of Web-based classes. Non-design factors, such as instructor presence, the magnitude of course structure or requirements for collaboration versus individual work, can also influence the impact of course implementation on student achievement and how course outcomes could be met. Therein lies the challenge of how design components align with the online course delivery in terms of interactivity and formative assessment of teaching and learning. Assessment from a formative perspective is an integral part of the design and delivery of online learning. Data derived based on an emphasis on assessment for learning can support a dynamic, balanced, and student-centered approach to instructional development for virtual learning environments.

Interactivity

The concept of interaction is considered to be one of the central characteristics of well-implemented/taught online courses (Roblyer & Wiencke, 2003). The same researchers also point out the lack of a convergent definition that has led to the inability to quantify any traits associated with the concept. The three ways in which to conceptualize interaction relate to the members involved in the exchange (student-content, student-instructor, and student-student), the transmission of complete messages, as well as socio-psychological connections. Under these circumstances, interactivity appears to be greater than the various ways in which participants in online courses interact – Wagner interprets it as the capability of instructional platforms to support different types of interaction that can occur at several levels of engagement (as cited in Roblyer & Wiencke, 2003, p. 81). The authors of this chapter propose using interactivity as a term that could apply both to features of the learning platform as well as to the full range of course-specific exchanges that support instruction. In this light, interactivity demonstrates a range from the highest level where learning communities rely on the use of appropriate, responsive pedagogical structuring to the lowest level that demonstrates a reduced opportunity for meaningful exchanges in the virtual setting (Maor & Volet, 2007).

Online discussions are central to the design of most online courses and serve a critical role in engaging students with the content and other students. The separation of instructor and learners creates a psychological and communications space that needs to be bridged. According to Moore and Kearsley (1996), this space is called the transactional distance. If designed properly, online discussions can serve as a critical pedagogical tool that encourages student and instructor presence as well as cognitive presence eliminating this transactional distance that can be a barrier to an effective course. Three key elements determine the extent of transactional distance are: structure, dialog, learner autonomy (Moore & Kearsley, 1996). As a key component of online courses, discussions need to be designed with these key elements in mind to foster a community of inquiry.

Formative Assessment

Summative or formative, assessment plays an important role in the learning process. Assessment becomes formative when the information is used to adapt teaching and learning to meet student needs (Boston, 2002). The purpose of formative assessment is to "enable students, through effective feedback, to fully understand their own learning and the goals they are aiming for" (Elwood & Klenowski, 2002, p. 243). Vonderwell and Boboc (2013) discuss the importance of utilizing formative assessment in online course design and learning (pp. 26-27):

Instructional design and technical considerations are interdependent, meaning that the online learning platform has to accommodate the nature of the class and its requirements for student success. An integral part of this planning process relates to the use of a comprehensive range of assessment strategies. Generating an assessment plan for the whole online class helps instructors to map out their pedagogical strategies and materials. Consequently, student engagement and overall online interactivity are enhanced.

Assessment from a formative perspective is an integral part of the design and delivery of online learning. There is a need to develop guidelines for the delivery and assessment aspects of teaching and learning to connect design, delivery, and assessment more flexibly. The main rationale stems from issues related to details related to what actually happens during online instruction as a way to set in motion the design features guided by the QM standards. In other words, it is worth investigating how design support instruction while assessment informs them both in a formative manner during the teaching and learning process. Based on these considerations, there is a need for guidance bridging theory and pedagogy allowing instructors to engage in a continuous comprehensive improvement of online instruction.

SOLUTIONS AND RECOMMENDATIONS

The proposed dynamic design, delivery and assessment matrix (3DA) is intended to guide online instructors to connect design, delivery, and assessment. In the left-hand column we list the QM General Standards, from which we create linkages to how the corresponding review standards come to life during the delivery of instruction as well as the implementation of assessment strategies and tools. Finally, the practice notes are designed to provide examples from our own pedagogical experience as online instructors that could help with the identification of context, content, and infrastructure-specific applications of the 3DA matrix.

Looking across the 8 general QM standards, the connections to delivery and assessment are intended to represent strategies and associated tools that would create and sustain communities of inquiry while enhancing interactivity based on social and cognitive parameters. While the list of such items is not exhaustive in any way, the notes in the right-hand column represent starting ideas online instructors could consider.

Lowenthal and Hodges (2015) randomly selected six STEM-focused MOOCs (Massive, Open, Online Courses) from two of each of the three leading MOOC providers in order to analyze the quality of those courses using the Quality Matters Rubric Standards. Although none of the MOOCS passed their review, the authors note that their informal QM review does not suggest that those courses were poorly designed. Particularly QM Standard 2 which focuses on learning objectives was found to score low. Lowenthal and Hodges (2015) argue that while learning objectives serve a purpose, making them visible for the students with measurable verb, condition and criteria is not the hallmark of a quality course and that this practice ignores a school of thought in instructional design.

The failure of meeting Standard 2 is more about transparency than whether or not the course was designed around learning objectives. For instance, the courses could have been designed to meet clear and measurable objectives, but the course itself does not clearly communicate these objectives (in a traditional format) to the learner. (Lowenthal & Hodges, 2015, p. 91).

The same researchers further note that Standard 2, Learning Objectives, assigns more points and review standards other standards, such as # 5, Course Activities and Learner Interaction. “The Quality Matters rubric might focus too much on the basics (e.g., clean learning objectives) and not enough on instructional approaches for active engagement, communication, and collaboration” (Lowenthal & Hodges, 2015, p. 93). Although the design and delivery methods of MOOCs are different than traditional online courses, this investigation “has the possibility of informing and further evolving online quality assurance systems like Quality Matters” (p. 94).

Garrison, Anderson, and Archer (2000) consider “teaching presence” the core of the online instructional design process emphasizing the instructor’s role for student engagement and interactions supporting social and cognitive presence. Instructor presence can inform formative assessment of student learning as well as instructor’s teaching. Vonderwell, Liang, & Alderman (2007) note that “asynchronous online discussions facilitate a multidimensional process of assessment demonstrated in the aspects of discussion structure, self-regulatory cognitions and activities, learner autonomy, learning community and student writing skills” (p. 321). Such components in the instructional design process of an online course need to be taken into consideration when developing and implementing assessment tasks (Vonderwell & Boboc, 2013).

FUTURE RESEARCH DIRECTIONS

In addition to continued work focused on refining the QM Rubric (Legon, 2015), future research could investigate how effective design features translate to student-centered pedagogy and enhanced student learning in virtual settings. Moreover, training on how to connect design, delivery, and assessment based on case studies from a range of online classes would also address the principle of peer review as highly contextualized professional development. At the same time, as curriculum relevance has become a major criterion in the evaluation of academic programs in higher education, flexible curricula that feature real-world connections imply an increasingly complex interactivity traits in Web-based courses. Therefore, researching formative assessment as a set of strategies designed to tailor interactivity in a non-linear fashion to the needs of instructors and learners could inform the redesign of the QM Rubric. Finally, policy setting that could govern the continued development of Web-based education should rely on data provided by research into the linkages among the QM Rubric, online pedagogy, and the various regional accreditation standards. The latter are increasingly paying close attention to the quality of instruction in virtual settings. Consequently, the 3DA matrix presented in this chapter expands in a dynamic fashion the Linkage Model for Online Teaching that connects instructional materials, learner engagement, and technology (Warford, 2014).

CONCLUSION

The 3DA matrix presented in this chapter is intended for course developers and instructors to design and deliver effective online instruction by connecting design, delivery, and assessment in a flexible, research-driven manner. Social presence, cognitive presence, community of inquiry and formative assessment are explored as foundational for the 3DA matrix intended as a starting point for discussions on a comprehensive view of dynamic online course design and delivery.

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KEY TERMS AND DEFINITIONS

Formative Assessment: Information used to adapt teaching and learning to meet student needs during the process of instruction.

Help-Seeking: Important self-regulatory and metacognitive skill defined as an achievement-focused behavior involving the search for and employment of a strategy to obtain success.

Quality Matters (QM) Rubric: Set of design standards for online course, a peer-review process, and also a path for professional development.

Social Presence: Degree to which participants in online social interactions are perceived to be “real” by means of computer-mediated information exchanges.

Student Engagement: Outcome of involving learners in information exchanges aimed at making meaning via a variety of instructional strategies in face-to-face and/or virtual learning environments.

Transactional Distance: Separation of instructor and learners that necessitates bridging the psychological and communications space; it is the space that constitutes the transactional distance which is understood not simply as a geographical distance, but also a pedagogical concept. Three key elements determine the extent of transactional distance are: structure, dialog, learner autonomy.

Chapter 9
Human Performance Technology and the Effects on Web-Based Instruction Performance Efficiency

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ABSTRACT

Human performance technology (HPT) is a field of applied sciences involving the identification of the causes of actual performance problems of organizations, development and implementation of solutions to such problems and evaluation of the outcomes for every step of the performance improvement processes. In addition to its operability with organizations and corporations for varying purposes, HPT can also be employed as an educational tool designed to solve performance problems and improve performance. This study aims to assess how the HPT operates within the scope of web-based education. The study identifies the primary factors which have adverse effects on web-based instruction including non-interactivity, infrastructural and systematic incompetence, ineffective course materials, unproductive feedback systems and discusses some potential solutions which can be designed using the HPT processes and explores the effects these solutions may have on performance efficiency.

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INTRODUCTION

Human performance technology has gained prominence as an applied scientific study aimed at improving performance issues thanks to its capability to develop goal-oriented, comprehensive and system-based solutions. Operating in a model, which comprises the phases of perception and analysis of problems, development and implementation of solutions, and evaluation, HPT aims to push the performance of all stakeholders in a system to the maximum level. Not only can HPT be aligned with the operations of organizations and corporations for different purposes but it can also be used in educational fields to fulfill similar tasks of solving performance problems and improving performance. Hence the primary aim of this study is to present an evaluation of HPT processes with regards to web-based learning. For the purposes of the study, students who are registered at distance learning programs of Afyon Kocatepe University Vocational School were asked for their views about and expectations from distance learning practices. This was followed by the next phase of identification of system performance problems and subsequently the next one, which involved development of solutions to terminate the identified problems. The study was conducted among 300 students who are registered at distance learning programs of Afyon Kocatepe University Vocational School. Study sample was based on the 182 students' response to the survey. Students' views of the distance learning practices were analyzed and interpreted in terms of frequency (f) and percentage (%).

The first phase of the human performance technology study involved getting to know the educational medium and analyzing the actual performance in web-based learning settings. Responses of the students taking the survey were cited to this end. As a result, a number of performance problems were identified. These performance problems involved the following findings: that distance learning course materials are not effective, feedback from tutors to students was insufficient, students are unable to build interaction with the tutors and there is a lack of a platform where students can enjoy interaction with their peers. Once the problems were diagnosed, HPT professionals were sought for advice to identify the root causes of these problems and design interventions to mitigate or terminate them. A feasibility study was conducted, in which each intervention was assessed in terms of their cost, applicability to the educational setting, and the time required for the implementation and their potential value. Proposed interventions were then prioritized and the best fitting interventions were selected. This phase was followed by the final phase of evaluation where the contributions of feasible interventions to web-based instruction were evaluated.

The contents of the subsequent sections of the study are as follows: Next section provides an exploration of the concept of human performance technology as well as explanations of the performance improvement model used in the study, and where it can be used. Section three focuses on the application of the relevant human performance technology processes to performance productivity of Afyon Kocatepe University Distance Learning System. The section introduces the model, scope and sample of the study, describing the application of the measuring tool used to collect data and presenting a comprehensive evaluation of the study outcomes. It also contains information on how the analysis of these data by performance improvement process can aid the production of solutions to improve performance. Finally, an evaluation of the feasibility of these solutions is offered. The study concludes with the "Results and Proposals" section.

DEFINITION OF HUMAN PERFORMANCE TECHNOLOGY AND PERFORMANCE IMROVEMENT PROCESS

Human performance technology is an applied science that identifies the actual problems of organizational performance, analyzing the root causes of these problems, develops solutions, implements these solutions in the organizational system and evaluates all performance improvement processes (Çakır, 2013). Human performance technology uses a wide range of interventions that are drawn from many other disciplines including, behavioral psychology, instructional systems design, organizational development, and human resources management (ISPI, 2005). Human performance technology, performance systems (PS), or performance improvement (PI), among other terms, represents a fundamental shift in thinking about how to improve performance (Surry & Stanfield, 2008).

Human performance technology has made impressive strides since it first became a term and an emerging field of practice in the 1970s (Stolovitch & Keeps, 1999a). The dawn of the 21st century finds HPT flourishing. The literature has expanded fivefold in the last years; the number of professional practitioners has multiplied at an even greater rate and the list of academic institutions offering graduate courses as well as full degree programs has become impressive (Stolovitch & Keeps, 1999b). Since the 1960s, the number of members in professional associations that pursue performance improvement has increased. The more than 10,000 members of the International Society for Performance Improvement (ISPI), working throughout the globe, and all the members of the American Society for Training and Development (ASTD) who are involved in workplace performance manifest the growth in the field of human performance technology (Pershing, Lee,& Cheng, 2008). Human performance technology is gaining traction in both the academic and corporate world as an applied science. Its usefulness is being replicated across academic disciplines and within a multitude of industries (Wells, Stanley, & Martin, 2014).

The steps in the performance improvement HPT model are still similar to another process model, the ADDIE model, which instructional systems design (ISD) practitioners use to analyze, design, develop, implement, and evaluate education and training programs and products. Both models use a systems approach; however, their language and focus are different. The HPT model goes beyond ADDIE because it is designed to meet the broader requirements of performance improvement practitioners and the organizations that seek their help. The analysis phase focuses on performance needs and opportunities and includes gap and cause analysis; the intervention selection; design and development; and intervention implementation phases include instructional and non instructional performance improvement interventions (Van Tiem, Moseley, & Dessinger, 2012). The ubiquitous ADDIE model is morphing to add "assessment" and become the AADDIE (Assessment, Analysis, Design, Development, Implementation, Evaluation/Continual Improvement) model. This added variable of assessment allows for a human performance technology model that can verify that presenting problems are valid before resolving the gaps in the results and their consequences (Kaufman & Bernardez, 2012). Problem-solving models such as ADDIE were contrived to aid in navigating the complexity. Experts believe that good analysis is necessary for good design; the design must be developed, implemented, and evaluated. Th e ADDIE process can be quite difficult and demanding; if a problem is important, a sense of urgency to implement sometimes pushes aside the urge to analyze, design, and develop carefully. Jumping to the solution is common in any problem-solving arena; performance improvement professionals and clients are not immune (Brethower, 2012).

Because training, in and of itself can do little to resolve the performance issues of the employees in a corporation or organization, more and more stress has been placed on the analysis of the factors that may have an effect on performance. Offering a wide range of effective solutions to performance issues, Human Performance Technologies are designed specifically to ensure improvement in performance. Human performance technologies have originated from the field of instructional design. Human performance technologies have been getting increasing attention now that it is widely-accepted that relying solely on education to solve workplace performance problems does not suffice. To improve performance in the fields of work or education, a series of solutions, including but not limited to, training can be developed.

As potential problems in a system may vary, practitioners will need standardized processes to design effective solutions to such problems and run them within the framework of performance technologies. Run systematically by HPT specialists, these processes are referred to as models. Models provide practitioners with the blueprints of how performance problems may be solved. Although there may be some differences of terms in HPT models, all models appear to have four basic phases. These phases are mostly referred to as performance analysis, needs analysis, intervention selection and design, implementation of intervention and evaluation.

Human performance technology is a practical field that addresses systematical processes to improve human performance in working setting and develops with reflections and experience of professionals and practitioners (Stolovitch & Keeps, 2006). Human performance technology (HPT) is a process that solves performance problems. Practitioners use different types of models (Hemalatha, Venkatram, & Krishnaveni,2014).

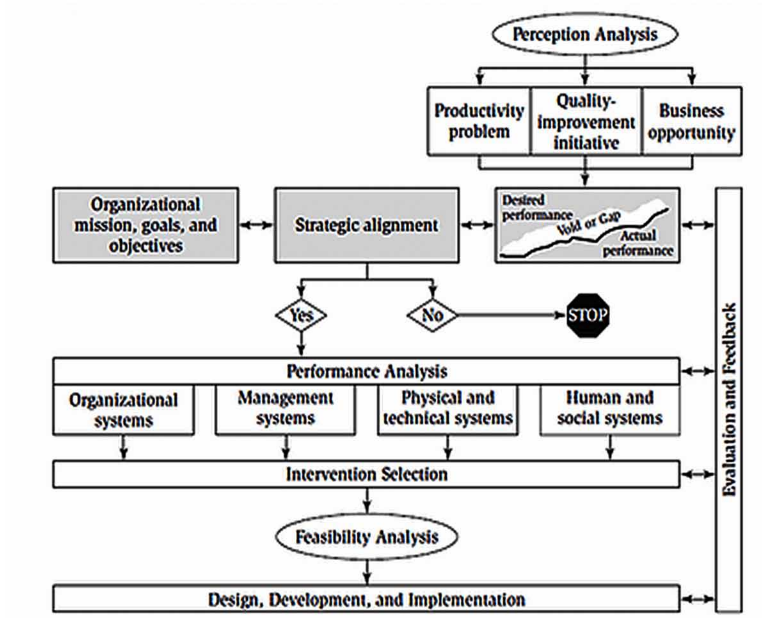
In this study, performance improvement process model by Pershing was adopted as human performance technology. In collaboration with ISPI and thanks to advance in relevant academic studies, J. A. Pershing, updated the model in 2006, producing a more effective and easy-to-implement version. Figure 1 below is the model in the third edition of his book titled “Handbook of Human Performance Technology”.

PERFORMANCE EFFICIENCY IN WEB-BASED EDUCATION AND HUMAN PERFORMANCE TECHNOLOGY

Web-based distance education has been providing low operational cost and means to solve problems of education in the various disciplines and fields of public and private sectors. It also creates opportunities such as professional development, personal development, attending certification or academic programs for the people who are already employed. Web-based education is a type of learning which bears close resemblance to computer-based learning. However, instruction is mediated via internet connection, a web browser or using other tools. It offers a learning opportunity free from time and space constraints. Web-based instruction is hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported. Web-based education may also be regarded as a new educational trend whereby the web is utilized as a tool to deliver education to distance learners.

Utilizing web-based courses, both as independent and as a support to in-class courses, is becoming more prevalent and important. While creating web-based courses, instructional systems design principles should be utilized for developing an effective learning environment (Ozen & Kahraman, 2001). Efforts to design and conduct the courses via the web call for rigorous analysis, though.

Figure 1. Pershing performance improvement process
(Stolovitch & Keeps, Pershing Ed., 2006)



Recent years have seen the rising popularity of web-based education practices at universities in Turkey. At Turkish higher education institutions, web-based education is generally delivered by vocational schools with distance learning programs and distance learning centers. In Turkey, there are a number of Distance Learning Vocational Schools (UEMYO) and Vocational Schools which have integrated distance learning programs. Designed specifically to meet educational needs of learners who are unable to attend classes for work or family reasons, UEMYOs offer two-year degree programs via distance learning instruction.

To analyze the factors influencing the performance efficiency of the distance learning system, this study adopted a scanning model designed to find out students' views of the distance learning practices. The study was conducted among 300 students who are registered at the distance learning programs of Afyon Kocatepe University Vocational School. Study sample was based on the 182 students' response to the survey. Students' views, which were meant to measure the efficiency of distance learning system performance and the responses in the survey items, which were formulated to identify the state of actual performance were arranged according to multiple-item likert scale that has pre-defined responses including: not at all, a little bit, somewhat, quite a bit, very much. Respondents took the survey online and it was evaluated via computer. The data was interpreted in terms of percentage (%) and frequency (f).

Regarding the instruction techniques of the distance learning system, 15.93% of the 182 students surveyed think they are not satisfied at all whereas 53.84% consider themselves a little bit satisfied. 25.82% think they are somewhat satisfied while merely 4.39% state that they are quite a bit or very satisfied. It can be inferred from the results of the survey that 69.77% of the students are not satisfied with the distance learning techniques. Whereas 81.55% state that accessing the relevant internet services for educational purposes s never a problem at all, 14.28% believe it is a little bit troublesome. Only 1.09% of the distance learners surveyed are not satisfied at all with the availability of the learning technologies, tools, equipments and the materials whereas 40.65% turned out to be somewhat satisfied. 45,05% consider

Table 1. Results of the survey administered on the sample group to evaluate performance efficiency of the distance learning system

	Not at All		A Little Bit		Somewhat		Quite a Bit		Very Much		Weighted Average
	F	%	F	%	F	%	F	%	F	%	
How satisfied are you with the techniques of the distance learning system?	29	15,93	98	53,84	47	25,82	8	4,39	0	0,00	2,19
To what degree do you have trouble accessing the Internet?	148	81,31	26	14,28	8	4,39	0	0,00	0	0,00	4,77
How satisfied are you with the availability of the distance learning technologies, tools, equipments and the materials?	2	1,09	19	10,43	74	40,65	82	45,05	5	2,74	3,38
To what degree are you satisfied with the course materials used in the distance learning system?	36	19,78	71	39,01	66	36,26	9	4,94	0	0,00	2,27
To what degree are you satisfied with the quality of the internet / network connection of the distance learning system?	15	8,24	22	12,08	103	56,5	34	18,68	8	4,39	2,99
To what degree are you satisfied with the video quality of the distance learning system?	1	0,54	8	4,39	73	40,10	81	44,50	19	10,43	3,60
To what degree are you satisfied with the audio quality of the distance learning system?	0	0,00	7	3,84	72	39,56	96	52,74	7	3,84	3,57
To what degree are you satisfied with the provision of feedback to students in the distance learning system?	36	19,78	52	28,57	77	42,30	12	6,59	5	2,74	2,38
To what degree are you engaged in interaction with the tutor during a course?	11	6,04	89	48,9	74	40,65	7	3,84	1	0,54	2,44
To what degree are you engaged in interaction with fellow students by means of interactive tools of the system, i.e. message exchange, forum etc.?	141	77,47	28	15,38	13	7,14	0	0,00	0	0,00	1,27

themselves very satisfied with the availability of the course material. This is the survey item where the highest degree of satisfaction was expressed. The degree of satisfaction with the course materials used in the distance learning system stands at 4,94% while somewhat satisfied learners account for 36,26%. Nevertheless, 58,79% of the sample group think they are not satisfied with the materials. Concerning the video quality of the current distance learning system, negative thoughts constitute 4,93%. While 40,10% say the quality is somewhat good, 54,93% describe it as very good. The degree of dissatisfaction with the audio quality of the system is stuck at 3,84% while 39,56% consider the audio quality to be somewhat good. For the same question, 56,58% responded they are very satisfied. 48,35% expressed dissatisfaction with the provision of feedback to students within the distance learning system. In response to the survey question about the effectiveness of the student-tutor communication during a course, 45,03% answered negatively. The average of the students who think they are able to communicate effectively with the fellow students is only 7,14%. In contrast, 92,86% believe they are unable to have effective communication. Weighted average value was used in the prioritization of the performance problems that were structured on the grounds of these data.

APPLICATION OF HUMAN PERFORMANCE TECHNOLOGY PROCESSES TO PERFORMANCE PROBLEMS

Step 1: Perception Analysis

Human performance technology is a systematic approach committed to the concept of performance efficiency. Education is per se a whole system, being part of a greater and more complex social system, though. Identifying the factors that affect the performance in a system has immediate implications for its vision, mission and strategic goals. The primary aim of education is to maximize learner outcomes. The factors that may inflict adverse effects on maximization process eventually give rise to performance problems within the system. If this were the case, human performance technology processes may be called into action. The first and the most prominent phase of such processes is the perception analysis.

Perception analysis study is conducted so that practitioner will be introduced to the system and the system to itself. Emphasis during this process is on the diagnosis of the needs or opportunities that require performance improvement. Perception analysis is devoted to answering the questions of who will be included by performance improvement initiative, how performance improvement will be achieved and why it is needed.

With the system's objectives taken into consideration, the study has made several diagnoses as to who will take part in the process, what kind of a medium best fits for maximum learner gains and how crucial such a medium is and so on. The survey data obtained from the sample group were used to this end. It turned out that the chief factors affecting the performance in the distance learning system are easiness of availability, course materials, interaction and video and audio quality etc. Therefore, the first step of this study is the perception phase where the actual states of these performance-affecting factors are recognized.

Step 2: Performance Analysis

The second phase in the performance improvement process is to identify and clarify the opportunity or problem. The HPT model suggests conducting gap, and cause analyses(Van Tiem, Moseley, & Dessinger, 2012). The nature, causes and the consequences of the gaps between the desired performance and the actual performance are studied in performance analysis, which is carried out in two phases. First one aims to determine the gap and specify its importance. Gap analysis is carried out for this purpose. The second one is the root cause analysis, where the actual causes of the performance gap are determined.

Step 2.1: Gap Analysis

Gap analysis identifies the difference between desired and actual performance. This can be a mathematical statement, such as "actual = 10 widgets per hour; desired = 75 widgets per hour; gap = 65 widgets" (Van Tiem, Moseley, & Dessinger, 2012). For the purposes of this study, the discrepancy between the actual and the desired performance in the web-based education is called the gap. Actual performance was analyzed on the basis of the survey results of the sample group. The desired performance was, however, determined on the basis of the opinions of distance learning professionals. A comparison between both performances led to the conclusion that where there is a gap, there exists a performance problem and that resolving the root causes of these problems lay the foundation for the solution development phase. Below are the results obtained through the gap analysis.

When the results of the gap analysis were examined, a total of five, presumably interrelated, performance problems were detected. Whereas the expectation was that all the students in the sample group be satisfied with the education they are receiving, only 30,21% were actually found to be so. This is considered a performance problem and calls for the development of appropriate solutions. Another performance problem involves the effectiveness of the materials used. Professionals expect the materials to be 100% effective and yet only 41,2% of the students seem to agree. The third performance problem relates to the approach assumed in providing feedback to students. The desired percentage here is 100% whereas the actual one is 51,63%. This means that only half of the desired performance could actually be achieved. Professional opinion holds that the communication between the student and the tutor during a course should be 75%. However, only 45,03% of the students think they are actually engaged in conversation. A final performance problem was detected in the peer interaction among students who are registered on the same course. Again, only 7,14% think they are interacting effectively with the other students. Here, the gap is 92,86, which represents a big discrepancy. Once these gaps have been identified, the action that needs to be taken is to determine the root causes that give rise to them in the first place.

Table 2. Gap analysis of the data obtained through the survey

	Actual Performance	Gap	Desired Performance
The degree to which the distance learning techniques satisfy students	30,21%	69,79%	100%
Trouble students have accessing the internet services	4,39%	4,39%	0%
Availability of the distance learning technologies, equipment, tools and materials	88,44%	11,56%	100%
Effectiveness of the course materials used in the distance learning system	41,2%	58,8%	100%
Internet / network connection quality of the distance learning system	79,57%	20,42%	99,9%
Video quality of the distance learning system	95,8%	4,1%	99,9%
Audio quality of the distance learning system	96,14%	3,85%	99,9%
Provision of feedback to students in the distance learning system	51,63%	48,37%	100%
Interaction with the tutor during a course	45,03%	54,97%	100%
Interaction among fellow students using the system tools, i.e. message exchange and forum	7,14%	92,86%	100%

Step 2.2: Root Cause Analysis

Cause analysis is now within the performance analysis phase. It provides the final link between performance analysis and intervention selection and design. It clarifies whether the identified gap is rooted in environmental or individual factors(Van Tiem, Moseley, & Dessinger, 2012).

Inasmuch as the performance-affecting factors in web-based education are, by themselves, the main contributors, it is likely that there is also an interplay of factors at work. The examination of the performance gaps established by the gap analysis supports the assumption that the problem-causing factors trigger one another. In this sense, the first performance problem of “students not being satisfied with the distance learning instruction techniques” was found to be directly linked to the other performance gaps pointed out by the analysis. The performance problems caused by the ineffectiveness of the course materials, insufficient student-tutor interaction, poor feedback approaches etc. all share the blame for students feeling dissatisfied with the distance learning system. This being the case, the root causes giving rise to the performance problems in the first place need to be addressed first.

One of the pillars of efficient education is the efficiency of the materials. They are even more essential in web-based education where there is less interaction. In this respect, eliminating the performance gap of 58,8% as revealed by the analysis, is of critical importance. Ineffective course materials may result from the lack of skills and knowledge on part of the course designers.

As Web-based education lacks the element of face-to-face meeting with students, all kinds of feedback to them plays a crucial part in keeping the system well functioning. Gap analysis found a performance gap of 48,37% in this aspect of the system. This may be caused by the fact that the system does not have a built-in application that would stream constant feedback to students. It may also be due to the fact that the existing feedback approaches are not exploited effectively.

What makes formal education more advantageous than other types of education is the possibility between students and tutor of a one-on-one, real time and noticeable interaction. Engaging in interaction with the tutor helps to ensure that students stay highly-motivated and the learning is lasting and efficient. Gap analysis found a performance gap of 54,97% in this aspect of the system. Exploration of the factors causing this gap revealed that although there is already a platform where students can communicate with the tutor during a course, most of them just do not use it. One reason may be that students are too shy to ask questions. Another reason may be inability of the tutors to encourage the students to do so.

In web-based education, a learning environment where students on the same program actually communicate and share information with one another will contribute substantially to learning efficiency. The fact that there is not such a platform where fellow students can share material and exchange opinion explains the relevant performance gap of 92,86%.

Step 3: Intervention Selection

Intervention analysis represents the critical link between a performance problem and the solution. The performance and cause analyses focused on identifying where the most important performance gains could be realized in the front-end of the process (Massey, Montoya-Weiss,& O’Driscoll, 2005). HPT practitioners should develop and implement performance interventions that fit various cultures yet remain aligned with the core values and traits that characterize and differentiate corporations (Schneider & Barsoux, 1997).

In intervention analysis, the performance problems, identified by virtue of the analysis, were prioritized on the basis of their weighted average values. Put in a prioritized order, the performance problems are as follows:

1. Students are incapable of interacting via the system tools, i.e. message exchange and forum.
2. Distance instruction techniques do not satisfy students.
3. The course materials used in the distance learning system are not as effective as expected.
4. Provision of feedback to students in the distance learning system is not sufficient.
5. Interaction between the students and the tutor during a course is not sufficient.

Problem: The course materials used in the distance learning system are not as effective as expected.
Interventions:

- Training the material development unit members who design the materials to be used in the distance learning system,
- Providing the tutors who teach via the distance learning system with private training on how to use the materials in an effective way,
- Providing the students who learn via the distance learning system with guidance on how to use the materials in an effective way.

Problem: Interaction between the students and the tutor during a course is not sufficient.
Interventions:

- Arranging for the students and the tutors an orientation session on how to achieve effective communication during distance instruction,
- Urging the tutors to include active student attendance in their assessment criteria,
- Removing the user ID from the system log when asking questions,

Problem: Provision of feedback to students in the distance learning system is not sufficient.
Interventions:

- Ensuring that students get feedback via e-mail all the way through the system,
- Providing technical assistance and support immediately responsive to the needs of the students and the tutors. Having technical teams to respond quickly in cases of disconnection and system failures.
- Given the number of the students, it may be challenging to provide feedback on an individual basis. Therefore, it is critical to assign one academic counselor to feedback a certain number of individuals.

Problem: Students are incapable of interacting via the system tools, i.e. message exchange and forum.
Interventions:

- Integrating into the current distance learning system, a new platform where the students will be able to share knowledge and information and communicate with one another,
- Organizing social events, i.e. seminars and conferences, during which the students can meet in person.

Step 4: Feasibility Analysis

A feasibility analysis was conducted, and the proposed interventions were rated on a scale of one to five, with five being the most favorable to the organization, across the categories of time, cost, and value. Scores were averaged to assign an overall rating. Higher scores indicate the most efficient, effective use of resources to address performance gaps (Boykin, Leitheiser, & Martin, 2015). A key component of human performance technology studies, feasibility analysis is conducted to evaluate the strategies or the interventions for potential success. The purpose is to assess the cost/value of the investment before performance improvement interventions were put in effect and to determine whether to proceed with the solutions or not.

In this study, each of the interventions developed through the analysis was assessed in terms of the required time, cost and value in order to select the best-fitting one. The table below utilizes a 1-5 point scale for those factors which were identified on the basis of the opinion of the professionals. In this scale, 5 points represents the intervention which requires the most time whereas 1 point represents the one with the least required time. The intervention with the most cost is represented by 5 points, while the one with the least cost is represented by 1 point. When the cost factor was reverse coded, the intervention which was estimated to attain the most value assumed 1 point, while the intervention which was estimated to attain the least value assumed 5 points. The intervention assuming the least point in the time/cost/value factor was hailed the best-fitting one.

The feasibility study of the proposed intervention to mitigate or terminate the performance problems led to the conclusion that the interventions with the least score in their total point column are the best-fitting ones.

Step 5: Design-Development-Implementation

Noting the causes identified and the information collected during the analysis phase of the project, it was ascertained that organization design and development interventions were needed (Hayes, Godwin, Butts,& Martin, 2015). Before implementing the interventions, which are by virtue of the human performance technology's performance improvement initiative, supposed to close the performance gap, designing a prototype is crucial for the preparation of the tools and equipments required for the implementation and early detection of any type of deficiency, which may call for an intervention. This is to make sure that the implementation phase will produce the most efficient results.

Step 6: Evaluation

The last phase in the performance improvement/HPT model process is to define the evaluation plan for the selected interventions and to assess if the solution met its intended purpose (Rush, 2012). In human

Table 3. Feasibility analysis of the proposed interventions

Proposed Intervention	Time - T	Cost - C	Value - V	Total T+C+V
Problem: The Course Materials Used in the Distance Learning System are not as Effective as Expected.				
Training the material development unit members who design the materials to be used in the distance learning system	3	3	1	7
Providing the tutors who teach via the distance learning system with private training on how to use the materials in an effective way	3	3	2	8
Providing the students who learn via the distance learning system with guidance on how to use the materials in an effective way	2	2	4	7
Problem: Interaction Between the Students and the Tutor During a Course is not Sufficient.				
Arranging for the students and the tutors an orientation session on how to achieve effective communication during distance instruction	3	3	1	7
Urging the tutors to include active student attendance in their assessment criteria	1	1	1	3
Removing the user ID from the system log when asking questions	1	1	1	3
Problem: Provision of Feedback to Students in the Distance Learning System is not Sufficient.				
Ensuring that students get feedback via e-mail all the way through the system	2	1	1	4
Providing technical assistance and support immediately responsive to the needs of the students and the tutors. Having technical teams to respond quickly in cases of disconnection and system failures	2	4	1	7
Given the number of the students, it may be challenging to provide feedback on an individual basis. Therefore, it is critical to assign one academic counselor to feedback a certain number of individuals	1	1	1	3
Problem: Students are Incapable of Interacting via the System Tools, i.e. Message Exchange and Forum.				
Integrating into the current distance learning system, a new platform where the students will be able to share knowledge and information and communicate with one another	3	2	1	6
Organizing social events, i.e. seminars and conferences during which the students can meet in person	3	3	2	8

performance technology, an evaluation is performed both during and after the process. The evaluation during the process is referred to as “formative evaluation” and helps to obtain efficient results throughout the process. Conversely, the evaluation made after the process is called “summative evaluation” and is mostly used in the achievement assessment of the proposed solutions and the performance improvement process as a whole. Thus it contributes to the development of human performance technology.

CONCLUSION AND RECOMMENDATIONS

Today, there is a growing trend for Web-based learning in the field of education. Today’s education via the Web, where information spreads swiftly and widely, shapes the way future education is evolving. At Turkish higher education institutions, web-based education is generally delivered by vocational schools with distance learning programs and distance learning centers. There is an inevitable need for the improvement of actual performance in this field. This is the very rationale behind the performance improvement initiatives using human performance technologies.

In this study, human performance technology processes were implemented in order to minimize or terminate the performance problems that were detected in the instructional practices of the distance learning system. Views of the students registered on the system were taken as the basis when determining the actual performance of the distance learning system. The findings were then compared against the desired performance. This comparison revealed the performance problems that needed to be addressed. This was followed by the proposal of a series of solutions, the development of which involved the opinions of professionals. A conclusion was reached that implementation of these solutions would lead to performance improvement. The proposed solutions include:

- Material development unit members who design the materials to be used in the distance learning system must be provided with a private training on the subject
- The students registered on the distance learning system must be provided with guidance on how to use the materials in an effective way.
- Tutors must be urged to include active student attendance in their assessment criteria
- The students who perform active participation in the course must be given motivational feedback.
- Given the number of the students, it may be challenging to provide feedback on an individual basis. Therefore, for effective flow of feedback, one tutor must be assigned as the academic counselor for a certain number of students.
- The current distance learning system must be expanded to include a new platform where the students will be able to share knowledge and information and communicate with one another.

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KEY TERMS AND DEFINITIONS

Distance Education: A method of study where teachers and students do not meet in a classroom but use the Internet, e-mail, mail, etc., to have classes.

Performance Problems: The problems of a given task measured against preset known standards of accuracy, completeness, cost, and speed.

Performance Technology: A field of applied sciences involving the identification of the causes of actual performance problems of organizations, development and implementation of solutions to such problems and evaluation of the outcomes for every step of the performance improvement processes.

Web Based Education: It is anywhere, any-time instruction delivered over the internet or a corporate intranet to browser-equipped learners.

Chapter 10
Defining and Designing Responsive Online Professional Development (ROPD):
A Framework to Support Curriculum Implementation

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ABSTRACT

Teacher professional development programs typically do not meet teachers' ongoing, long-term needs that arise. In this chapter, the authors forward a systematic framework called responsive online professional development (ROPD) that can be used by instructional designers to provide continuous, online PD for teachers in the service of curriculum implementation fidelity. The systematic process afforded by the ROPD framework promotes teachers' reflection on their individual classroom practice as they implement new curricula or standards and provides support to teachers as they are implementing new curricula, standards, and pedagogies. Design elements of the proposed ROPD framework are discussed by the authors, and an illustrative example of the implementation and observed outcomes of a previously enacted ROPD Program (GE2PD) are discussed. When compared to conventional PD programs, professional growth from ROPD is emphasized during the implementation process through a systematic approach that intentionally connect teachers with the instructional designers of a curriculum.

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INTRODUCTION

When policy makers and school district leadership require new pedagogies and standards, teachers are required to implement these methods in their classrooms with high fidelity (Dutro, Fisk, Koch, Roop, & Wixson, 2002; Marrongelle, Sztajin, & Smith, 2013). As such, formal education presents two layers of learning in any given classroom: the everyday learning of students from their curricular activities, and the professional learning by teachers as they go about their daily work. As teachers are ultimately responsible for implementation, professional development (PD) is essential for preparing teachers to teach with educational reforms and adopt new pedagogical strategies (Hochberg & Desimone, 2010; Schnellert, Butler, & Higginson, 2008). However, PD programs that operate as one-time workshops or seminars typically do not meet teachers' ongoing, long-term needs that arise as they are implementing new methods. To ensure that teachers are well versed in how to conduct the pedagogies and activities in the particular contexts of their own classrooms and schools, many scholars have argued for more extensive, continuous PD programs (Lawless & Pellegrino, 2007; Penuel, Fishman, Yamaguchi, & Gallagher, 2007).

In this chapter, the authors forward a framework called *responsive online professional development (ROPD)* that can be used by instructional designers of novel curricula to provide continuous, online PD for teachers in the service of curriculum implementation fidelity. The systematic process afforded by the ROPD framework promotes teachers' reflection on their individual classroom practice as they implement new curricula or standards and provides support to teachers *in situ as needs emerge*. As such, ROPD emphasizes systems for expert support and ongoing iterative improvement of classroom curricular and pedagogical implementation.

PRINCIPLES FOR PROFESSIONAL DEVELOPMENT DESIGN IN SUPPORT OF CURRICULUM IMPLEMENTATION

Over the last three decades, there have been many types of teacher PD programs that operate under different timeframes. Previous reviews of teacher PD programs have indicated that programs typically have teachers participate in "one-shot", up-front, one-time programs ranging from one hour to one week (Lawless & Pellegrino, 2007; Garet, Porter, Desimone, & Birman, 2009). However, research has documented that PD interventions that have participants spend more time have been found to increase both teacher and student learning outcomes and increase practice and professional reflection (Dede et al., 2008; Penuel et al., 2007). These longer-term PD interventions should be specifically developed to de-emphasize memorization, promote reflection, and encourage teachers to implement new skills, pedagogies, and curricula over time in order to be effective (Lawless & Pellegrino, 2007).

In addition to the length of time that teachers spend in PD, research in professional learning over the last 20 years have demonstrated the importance of *reflection* as a process of professional growth. As such, processes of reflection should be promoted in PD. Teachers make sense of their experiences through continual reflection, which involves teachers' perceptions, analysis, and inferences about what happens in their classrooms (Gikandi, 2013; Hoban & Hastings, 2006). Regular opportunities for reflection provide teachers with an opportunity to analyze their own experiences and practice and to gain insights on how their students learn (Hammerness, Darling-Hammond, Bransford, Berliner, Cochran-Smith, McDonald, & Zeichner, 2005). Reflective opportunities also provide coaches and support staff with important empirical information about the events that are occurring in teachers' classrooms. In effect, reflections can give an opportunity for instructional designers to "listen to the teachers" and adapt curriculum based on their needs and the challenges they face (Riel, Lawless, & Brown, 2016a).

In addition to the professional learning principle of reflection, teacher professional development programs should also be designed based on the principle of *ongoing support*. In the service of curriculum implementation fidelity, ongoing support from instructional designers that respond to emergent needs can promote learning and beneficial changes in teacher practice (Flint, Zisook, & Fisher, 2011; Green & Cifuentes, 2008). Teachers cannot be immediately expected to completely understand the motivations and have the required skills to enact new curriculum. For PD to be effective, long-term coaching and dedicated support should be available to teachers to provide helpful reminders and notifications of valuable resources as they became important (Mushayikwa & Lubben, 2009). Long-term PD and dedicated support reduces the one-time, up-front PD memorization burden of teachers and allows teachers to try new practices with opportunities for feedback from experienced teachers and instructional designers. For example, Anderson et al. (2011) found that a dedicated staff providing regular technical, pedagogical, and curricular help as requests come up can help ease the implementation process of new curricula. Teachers should be continually supported if they are to implement a curriculum with a high degree of fidelity of implementation to the intent of the instructional designers (Ertmer & Simons, 2006; Hoekstra & Korthagen, 2011). A dedicated support staff can specialize in supporting teachers' implementation, which can make the implementation process a constructive experience.

Access to information is also useful for teachers. Weekly ROPD reflection-support cycles should also include an online library of resources should always be available for teachers in an ROPD. Newcomers to any novel pedagogy or curriculum will not likely immediately memorize all the necessary information beforehand for successful implementation (Ball, & Cohen, 1996; Drake, Land, & Tyminski, 2014). To support ongoing growth, teachers should have persistent access to supportive materials and information (e.g., teaching examples, lesson plans, guidebooks, multimedia, handouts) that can be readily used in class to facilitate intended activities.

THE ROPD FRAMEWORK: A PROCESS FOR INSTRUCTIONAL DESIGNERS TO RESPOND TO AND UNDERSTAND EVERYDAY TEACHER NEEDS

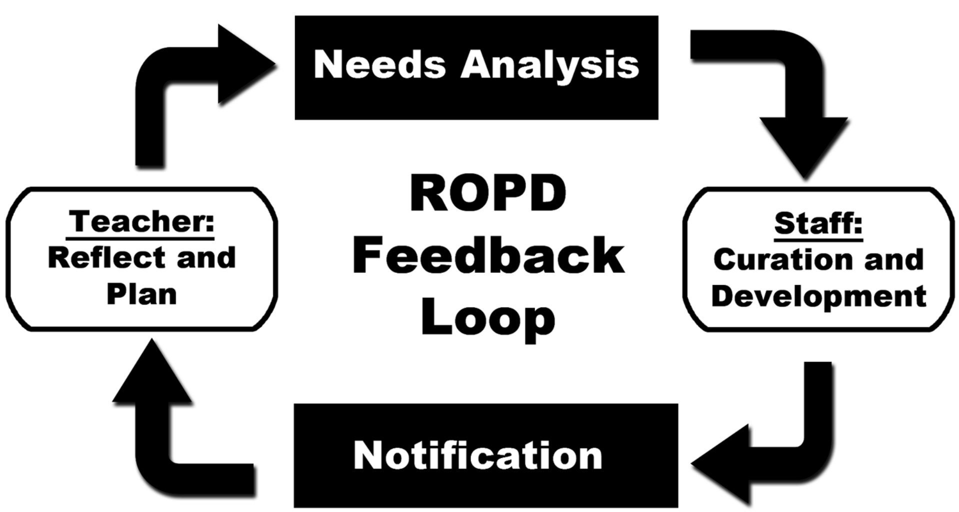
Responsive Online Professional Development (ROPD) is a solution to meeting the ongoing challenges of teachers when implementing new curricula or learning new skills. ROPD is a framework for systematic *responsive* support as teachers learn in formal PD that leverages what is known about professional learning to systematically provide supportive structures for successful teacher implementation of new curricula. It should not be expected that teachers that are new to a curriculum will be immediately able to implement it in the exact way that instructional designers intended. Teachers implementing a new curriculum or pedagogical approach will experience practical challenges specific to their classrooms that designers cannot anticipate as they design the curriculum. In the ROPD framework, instructional designers take responsibility for, and are committed to, responding to the implementation needs of teachers as they emerge. Thus, ROPD is a systematic process to link dedicated curriculum experts with practitioners to address challenges as they arise and to ensure that curricula are being implemented as intended in a collaborative effort.

One-time PD courses are not made obsolete by ROPD. One-time programs are essential to provide basic familiarity with the core features, concepts, and procedures associated with new curricula and pedagogies. The ROPD framework is strategically employed by instructional designers alongside one-time PD to offload the immediate requirement of information memorization and to support learning during the process of implementation. As such, the primary goals for one-time PD workshops are for participants to gain a basic familiarity with the key concepts that will be encountered during their work and to know where and how to find on-demand resources when issues arise. In short, one-time PD should provide enough information to begin working with new curricula and pedagogies, and to prepare participants to be successful with long-term ROPD.

Based on the principles of *reflection* and *ongoing support* that are known to support teachers' learning of new curricula, the ROPD framework calls for a systematic approach to facilitate communication between *instructional designers* and *teachers*. In other words, instructional designers do not abandon teachers as they learn to implement new curricula. Instead, the groups work together toward the common goal of curriculum implementation fidelity. The ROPD framework promotes communication between these two groups via weekly *feedback loop* cycles. The feedback loop maintains a constructive dialogue between teachers and support staff, which results in specific recommendations for practice and the development of new resources that teachers can use to support their work.

As illustrated in Figure 1, four steps occur in each ROPD cycle, with each step founded on the principles of learning new curricula discussed in the sections above. In examples of previously enacted ROPD interventions (e.g., Riel, Lawless, Brown, & Lynn, 2015), a week-long ROPD cycle works well as it is a natural unit of time for a classroom teacher using a five-day teaching schedule. Thus, the four steps of an ROPD cycle follow sequentially within any given week, and cycles are repeated indefinitely until either curriculum implementation stops or a break is desired for ROPD program evaluation.

Figure 1. The Responsive Online Professional Development (ROPD) framework. The key feature of the framework is an opportunity for instructional designers to facilitate activities with teachers within a continuous feedback loop.



Step 1: Reflective Journaling

Each week starts with a *reflective* component of the cycle, based on the PD principle that teachers learn as a result of experiencing and reflecting upon everyday practice. Setting aside time for reflection in an ROPD intervention gives teachers the opportunity to consider how classroom activities went in the previous week, plan activities and changes they want to try the next week, communicate any challenges that they faced the previous week to the support staff, and receive new coaching resources from the support staff. Despite the professional learning benefits of reflection, teachers' reflective practices may not be well developed (Killeavy & Moloney, 2010). Online journaling activities that have flexible journal prompts and open sharing among participants can be effective for facilitating teacher reflection (Gikandi, 2013). In addition, reflective teacher logs can also be used to support professional development, as a curricular support staff can subsequently review teachers' journals to identify areas in which teachers need help (Rowan, Camburn, & Correnti, 2004). Thus, structured weekly prompts that are completed online can provide an easy format for facilitating the teachers' reflective and planning processes, as well as to provide real-time curriculum implementation information to a support staff of instructional designers.

Step 2: Needs Analysis

The support staff must solicit feedback from the teachers in order to understand how a curriculum is being implemented. In the second step of the ROPD framework, instructional designers can use teachers' regular reflections to better understand implementation challenges as they occur. As such, the instructional designers, serving as a *dedicated support staff*, review regularly submitted teacher reflections and identify challenges that can be addressed through the needs analysis. Needs analysis is a semi-formalized procedure of systematically reviewing teachers' expressed concerns and challenges and developing items on which to take action to support the teachers. Methods that solicit information on and investigate the pedagogical and curricular events in classrooms are essential for the dedicated support staff to provide responsive feedback to teachers on their implementation. An example of this occurs in a previous ROPD study in which the authors developed a formal inductive approach for analyzing classroom events as reported by teachers in their weekly teacher logs (Riel, Lawless, & Brown, 2016a).

Step 3: Support Staff Curation

The third component of ROPD aligns with the principle of professional learning that holds that teachers who are learning new skills, knowledge, and ideas need community and expert interaction in order to continually refine their understanding (Hammerness et al., 2005). In the ROPD framework, experts and dedicated support staff can provide critical and timely feedback for teachers on their own practice from an outside perspective, which may be difficult to identify via reflection alone (Bonk, Ehman, Hixon, & Yamagata-Lynch, 2002). The primary goal of the support staff is to *respond* to teachers' expressed implementation issues that are identified in the needs analysis in Step 2 of the framework. This step of the framework has an added effect of making teachers a collaborative and critical part of the curriculum implementation process through iterative design changes, adaptations, and employing strategies to address particular contextual challenges. In this step, the support staff promotes teacher learning by curating an online collection of on-demand resources for each cycle in response to teacher needs. These resources can be accessed on-demand by any teacher at any time via an online permanent resource library.

Step 4: Notification

Once a collection of resources has been assembled to respond to issues in the needs analysis, teachers are notified of the week's curated responsive content. Email systems and SMS text messages can particularly useful in this process, as both systems have the ability to unobtrusively track teachers' interactions with the notifications. This allows the support staff to know if teachers have seen notifications or have used any of the given resources. Embedded in notifications are links to navigate to responsive content that address teachers' needs.

AN EXAMPLE OF ROPD IN ACTION: THE GLOBALED 2 ROPD PROGRAM

About GlobalEd 2 and the GlobalEd 2 ROPD Program

An illustrative, applied example of the ROPD framework is in the history of the GlobalEd 2 ROPD Program (GE2PD) since 2013 to support the GlobalEd 2 (GE2, www.globaled2.com) curriculum. GE2 is a blended, multi-classroom social studies curriculum for middle school that emphasizes problem-based activities and the development of 21st-century literacies among students. The key feature of GE2 is students' interaction in an online negotiations simulation in which they communicate with other students from multiple classrooms to develop solutions to real-world socioscientific problems. Each classroom is assigned the role of a "country" to play in the negotiations simulation, and approximately 15-20 classroom "countries" participate in each simulation. Students assume the role as a "delegate" to the negotiations simulation for their assigned country and are assigned a *problem scenario* that all countries are asked to solve in an online negotiations environment with other classrooms.

Because GE2 is a complex, blended curriculum that is conducted partially online, the GE2 instructional designers anticipated a significant PD effort would be necessary to promote the implementation of GE2. The GE2PD program was first developed in early 2013 to provide "up-front" information to teachers as they joined GE2, as well as ongoing support from a dedicated instructional design staff to help solve implementation challenges as they arose. The goal of GE2PD was to facilitate teachers' professional development with the new pedagogies promoted by the curriculum through systematic, structured supports. This approach was well received by GE2 teachers and proved to be highly supportive of curriculum implementation.

During the "up-front" PD portion of GE2PD, teachers were provided with information on the curriculum, its processes, and expectations. The workshop was divided into a number of modules, with each module containing videos from curriculum experts, content experts, and other teachers on the things that were most pressing to know before implementation started. Teachers were not expected to memorize everything in the up-front PD, but instead were expected to gain a familiarity with the curriculum, its main activities and timeline, and to know where to go to find additional information about implementation as they were in the process of teaching. The upfront PD portion was shown to help teachers improve their knowledge around key features of the curriculum and the pedagogies it used (Riel, Lawless, & Brown, 2016b).

The GE2 instructional designers complimented the up-front PD with ongoing support that used the ROPD framework. As teachers implemented GE2, a dedicated support staff implemented each of the four steps in the framework to identify challenges being faced by teachers and to provide timely support in response to teachers' needs. In any given week during implementation of the GE2 curriculum, teachers were expected to participate in reflective activities to help promote their understanding of GE2. The GE2PD staff, in turn, responded to the feedback provided by teachers during their weekly reflections on curriculum implementation.

Elements of Weekly ROPD in the GE2PD Program

The goal of the GE2PD was to provide structured support for teachers' implementation *as they were implementing the curriculum*. Each of the four elements of the ROPD framework were used in the GE2PD weekly to provide implementation support over an extended period of time.

To begin each ROPD cycle, the GE2PD staff provided a structured website and reflective activity for teachers to reflect on GE2 implementation at the end of each week of implementation. This reflective activity represented Step 1 of the ROPD framework. The GE2PD staff asked teachers to reflect weekly in an online journal on how GE2 activities went in their classroom, to express any challenges they faced, and to plan their next week's activities. Over the last four years, reflective journals in GE2PD were collected using a web-based form via Google Forms. In the form, teachers responded to specific prompts inquiring about what activities they did each week, how these activities went, what teachers planned to do the next week, and if teachers observed any challenges to implementation. An example of these reflective teacher log prompts are illustrated in a study by Riel, Lawless, and Brown (2016a).

Representing Step 2 of the ROPD framework, the GE2PD staff evaluated the reflective teacher log responses on Fridays of each week during implementation to identify teacher challenges and needs that arose in the previous week. Due to the immediacy of teacher needs and the need to stay on a curricular schedule, the needs analysis had to be conducted quickly and responses generated rapidly. As a result, the responses generated by the staff were not expected to be perfect, but instead simply a substantive contribution to help teachers meet particular issues identified in the needs analysis. In this process, it is necessary to examine curricular implementation events in depth to identify areas of support that capture both the areas of need that were specified by teachers, as well as those that were not directly expressed by teachers. An example of a more detailed needs analysis procedure is discussed in Riel, Lawless and Brown (2016a).

The GE2PD staff was responsible for the responsive and resource curation activities outlined in Step 3 of the ROPD framework. As such, the GE2PD staff developed text, video, and classroom organizer tools (e.g., worksheets, articles for students on complex concepts, graphic organizers, lesson plans) that teachers could immediately use to address the needs and challenges that had been identified in the needs analysis for a given week. To develop these resources, the support staff frequently conducted research on teacher issues, followed up with certain teachers for additional information or to conduct a coaching session, drafted lesson plans and worksheets, and requested and conducted interviews with outside experts based on particular needs. The GE2PD support staff maintained a permanent online resource library for teachers in which curated resources were placed.

Finally, Step 4 of the ROPD framework was represented by weekly notifications that were sent to teachers via email newsletters. These newsletters contained all of the curated collection of resources that were intended to meet the identified needs of the previous week. Over the last five years, the MailChimp email service (mailchimp.com) has been used to develop and deliver HTML-enabled emails to participants. A number of curated resources were embedded in each weekly notification email, each with a unique URL. A valuable feature of the MailChimp service and others like it are the robust data analytics features that allow researchers to analyze the degree to which participants have received, seen, and interacted with the email notifications. An example of the email newsletters used by the GE2PD appear in Riel, Lawless, Brown, Lynn (2015).

Since the start of the GE2PD, significant effects of the use of the ROPD framework have been observed with both teacher and student learning outcomes. In terms of teacher development, spending more time in the GE2PD was predictive of higher increases in knowledge and skills related to curriculum implementation (Riel, Lawless, & Brown, 2016b). In addition, the authors found that merely completing required activities was not enough to predict significant increases in knowledge and skills, suggesting that there are various dimensions of participation that influence learning within the GE2PD and online PD programs in general. In terms of student achievement, students whose teachers had high degrees of participation in the GE2PD had higher levels of positive affective growth when compared to students with low-participating teachers (Riel, Lawless, Brown, & Lynn, 2015). As argued in that study, student affect directly influences scholastic achievement, which can in turn be influenced by positive teacher affect toward curriculum. As such, positive increases in affect and disposition to curricular interventions by students via a teacher that participates in ROPD is a secondary learning feature further promoted by ROPD. Although research on ROPD is in its infancy, these initial studies are promising as to the positive effects this form of PD can have on both teachers and students.

DISCUSSION AND FUTURE RESEARCH DIRECTIONS

In this chapter, ROPD was suggested as a systematic approach for PD to be used in instructional design to support new curriculum implementation. Inspired by known principles of professional learning, the ROPD process allows instructional designers to meet teachers' ongoing needs and challenges as they implement new curricula, standards, and other reforms in the classroom. ROPD addresses needs where other PD approaches fall short by providing ongoing *responsive* feedback and resources to teachers as challenges arise. ROPD emphasizes the processes involved with teachers' classroom practice and valuable reflective opportunities that can occur in everyday work. As such, ROPD is a long-term approach as it seeks to simultaneously influence teachers' growth and improve curriculum implementation.

Unobtrusive data collection and data analytics capabilities from server interaction logs highlight the potential of future research of ROPD interventions. However, it will not only be important to understand what works by studying the efficacy of ROPD programs on achieving desired teacher and student learning outcomes, but also to investigate *why* certain ROPD interventions and design elements work (Fishman et al., 2013; Lawless & Pellegrino, 2007). To make substantial claims as to whether or not ROPD programs meet teacher and student learning goals, future research will need to clearly define the outcome measures that designers seek to realize as a result of ROPD participation. However, conventional efficacy trials and experimental designs may fall short in describing the effects of interventions in the new world of online, long-term ROPD programs due to their open-ended nature. As teachers can interact with ROPD in an almost-infinite number of ways, it is more difficult to describe the degree to which a participant interacted with the system when using conventional experimental interventions. As such, the long-term and diverse nature of ROPD participation promotes a new strand of research that examines the degree to which teachers interacted with or were exposed to various elements of ROPD programs over extended periods of time.

The ROPD framework represents a systematic process for instructional designers to understand and respond to teachers' everyday needs as they implement new curricula. The ROPD process allows instructional designers to immediately identify and respond to challenges as curricula are implemented and adapted to meet local classroom needs, complimenting processes of professional learning. To this end, ROPD affords instructional designers the ability to correct implementation challenges *during curriculum implementation* – not after. Thus, perhaps most importantly, students who use ROPD-supported curriculum stand to benefit the most from improvements to the curriculum as their teachers participate in ROPD.

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KEY TERMS AND DEFINITIONS

Dedicated Support Staff: A team of instructional designers, curriculum and content experts, and administrative staff to help support teachers' implementation of new curricula and to facilitate ROPD. The support staff responds to teacher requests in an ROPD by developing a curated set of resources that targets teachers' expressed needs and challenges.

Feedback Loop: A process by which teachers communicate needs and challenges to support staff, and in turn the support staff provides resources and coaching to address these needs. Ideally, feedback loops should be unbroken and iterate through multiple cycles.

Notification: The process in an ROPD cycle by which teachers are notified of the dedicated support staff's responses to the needs and challenges identified in the needs analysis.

Reflection: A professional development process in which professionals critically analyze past experience in order to perceive inferences and plan future activity. Reflection is regarded as a necessary component of professional learning and skill acquisition.

Responsive Online Professional Development (ROPD): A systematic framework used by instructional designers to promote professional development of teachers while emphasizing long-term, regular improvement of curriculum by identifying teachers' needs and challenges in everyday practice.

Chapter 11
Trends and Issues With Massive Open Online Courses

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ABSTRACT

This chapter reveals the overview of Massive Open Online Courses (MOOCs) and the implications of MOOCs in the digital age. MOOCs are the Internet-based courses which have large numbers of students involved. MOOCs have a potential for helping college students succeed and for giving a preview of a particular university's teaching style to potential applicants. MOOCs can bring students from all over the world and encourage engagement between staff and students of a given university to interact with the wider public. Offering diverse classes on different topics through MOOCs makes it easy for students to keep up with the latest trends and be on top of their professional field. The chapter argues that encouraging MOOCs has the potential to improve educational performance and gain educational goals in the modern learning environments.

INTRODUCTION

Massive open online courses (MOOCs) attract many learners with a wide variety of educational backgrounds (Liyanagunawardena, Lundqvist, & Williams, 2015). MOOCs are advanced in their educational design in that they serve to motivate student engagement, and include the utilization of videos, blogs, forums, and podcasts, as an educational method of communication of both learning material and lecture delivery (Valentin, 2015). With improved learning framework from traditional open courses and enhanced digital contents, MOOCs provide various opportunities for online learning on a large scale with massive number of students, making distance learning more effective (Chung, 2015) regarding web-based learning in modern education (Kasemsap, 2016a).

MOOCs are an effective tool to deliver training to a large number of teachers and to facilitate their professional development in those areas whose skills are scarce (Hernández, López, & Barrera, 2015). MOOCs utilize networks that connect people across the globe to foster education that cannot be replicated in any walled classroom (Camilleri, Busuttil, & Montebello, 2015). Many prestigious universities have

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collaborated to develop MOOCs that are made available to public either free of charge or at a nominal cost (Gupta, Taneja, & Kumar, 2015). Formal education models of curriculum design need to be refined to take advantage of MOOCs (Vovides & Inman, 2016).

This chapter is based on a literature review of MOOCs. It provides an overview of MOOCs in various disciplines, methods, and applications. It is hoped that this review will provide a contribution to practitioners and researchers by revealing the trends and issues with MOOCs in order to maximize the impact of MOOCs in modern education.

Background

The revolutions in the information and communication technology (ICT) in the 21st century have led to the tremendous innovation in education technology (Tezcan, 2014). In recent years, technological advancements have enabled higher-learning institutions to offer millions of independent learners the opportunity to participate in the open-access online courses (Mesquita & Peres, 2015). The increased flexibility in course offerings provides students with greater choice to engage in a range of quality educational experiences that are locally and globally contextualized (Hawkins, Martin, McKay, & Pattanayak, 2015). In terms of adopting new technologies to teaching, new forms of teaching (e.g., MOOCs) are increasingly recognized as a feasible future form of learning (Xia, 2015).

MOOCs have a large number of student's subscribers, which are geographically dispersed and not affiliated with the education institution (Reis & Escudeiro, 2016). Most universities have implemented virtual learning environments in an effort to provide more opportunities for current students seeking alternative and more affordable learning solutions (Mendoza-Gonzalez, 2016). Many universities and institutions are using platforms for MOOCs, characterized with a great diversity of topics and a huge number of enrolments. The real-time feedback is important for the effectiveness of MOOCs (Queirós, 2015). Learner interaction is central to knowledge creation and a key component of measuring learning outcomes in MOOCs (Chauhan, 2015).

SIGNIFICANT ASPECTS OF MASSIVE OPEN ONLINE COURSES

This section emphasizes the overview of MOOCs and the implications of MOOCs in the digital age.

Overview of Massive Open Online Courses

MOOCs are the online educational course that is open to anyone to participate, often free of cost (Riel & Lawless, 2015). Pursel et al. (2016) indicated that MOOCs continue to appear across the higher education landscape, originating from many institutions in the United States and around the world. There is a wide variety of designs in the proliferation of the learning courses which have been offered (Blake & Scanlon, 2014). Luaces et al. (2015) indicated that the success of MOOCs is based on the fact that several MOOC providers are spin-off from the most reputable universities.

González et al. (2016) indicated that the main aim of MOOCs is to provide new opportunities to a massive number of learners to attend free online courses from anywhere across the globe. In contrast to the traditional forms of face-to-face education, MOOCs enable the flexible learning styles, where learners can choose which classes they take, as well as when and where they do their work (Walker, Schmidt, & White, 2016). Most of the course activity takes place in social learning environments, where participants interact with the online learning material (Baturay, 2015). Many students sign up for the MOOC course and listen to the lectures and engage in the forums, taking a more casual approach to taking an online course.

With MOOC providers in the United States (e.g., Coursera, edX, and Udacity), Europe (e.g., FUN and Iversity), the United Kingdom (e.g., FutureLearn), the Middle East (e.g., Rwaq and Edraak), or Australia (e.g., Open2study), students can work on learning content outside the classroom, at their own pace, and review the application of what they learned in class (Brahimi & Sarirete, 2015). In Coursera, learners can open discussion threads to ask questions and then receive answers from other students as posts and comments (Vu, Pattison, & Robins, 2015). The current MOOCs' management systems utilize the content management platforms where content are organized in a hierarchical structure (Zhuhadar, Kruk, & Daday, 2015).

The market potential for MOOCs lies with those who do not have a college degree (Starr-Glass, 2015). The quality of learning is an ongoing topic of debate as to whether MOOCs are effective for learning (Bagley & Weisenford, 2015). Learners with a high-reflective learning style tend to have less experience in using MOOCs (Chang, Hung, & Lin, 2015). Participation in relevant MOOCs can provide the appropriate professional development for academicians and can encourage them to develop their teaching practices (Salmon, Gregory, Dona, & Ross, 2015).

Implications of Massive Open Online Courses in the Digital Age

García et al. (2016) indicated that MOOCs increase the learners' capacity to appreciate the complexity of sustainability issues and to apply both thinking and critical reflection systems on the information flow in public media. MOOCs encourage students to independently work, provides online assignments that frame the information in such a way that students apply knowledge to more educational problems (Sánchez & González, 2016). MOOC providers help universities promote the mission of transferring knowledge to society in any kind of area, supporting lifelong learning and adopting internationalization strategy (Montes, Gea, Bergaz, & Rojas, 2014).

By knowing the desired learning outcomes in advance of developing the lesson plans, educators have the opportunity to consider various learning theories, teaching methods, and pedagogical strategies to select the suitable items to use when creating course content for MOOCs (O'Donnell, Lawless, Sharp, & O'Donnell, 2015). Those in library and information science can facilitate learning through MOOCs and also benefit by using the platform to build awareness of the professional field (Wilson & Gruzd, 2014). MOOCs expand corporate training options and provide innovative marketing (Dodson, Kitburi, & Berge, 2015).

MOOCs enhance electronic learning (e-learning) by giving the opportunity to students to have both official certificates and high-qualified instructors in the renowned institution (Robles, González, Gaona, & Rodríguez, 2016). E-learning coupled with social and informal learning can help shift the working environment to become more collaborative (Kasemsap, 2016b). Students can develop the sense of being a learner and the understanding of being an expert through the use of educational computer games, educational video games, and serious games (Kasemsap, 2017a). It is vital to introduce gamification elements in MOOCs in order to encourage learners to accomplish the courses with willingness and pleasure (Kalogeraki, 2016). Promoting the widespread development of the set of educators' skills essential to fully implement connectivism is needed in order to gain the potential benefits of MOOCs (Coelho, 2015).

Online learning environments require greater levels of self-regulation, and that high levels of motivation are crucial to activate these skills (de Barba, Kennedy, & Ainley, 2016). Digital literacy skills, individual differences in motivation, and self-regulation are the significant learner attributes in the context of MOOC-based learning (Terras & Ramsay, 2015). Assessment is an important aspect for every learning process (Muñoz-Merino, Ruipérez-Valiente, Moreno, & Kloos, 2015). MOOCs can include formal assessment, such as assignments, examinations, and peer-based assessment (Stockport, 2014).

The learning in MOOCs is enhanced by participation both in the creation and sharing of personal contributions, and in the interactions with the contributions of others (Baturay, 2015). The accessibility needs have to be considered in the design and implementation of MOOCs' interfaces, contents, and assessment activities (Sanchez-Gordon & Luján-Mora, 2016). The intention to continue using MOOCs is influenced by the courses' perceived reputation, perceived openness, perceived usefulness, and overall user satisfaction (Alraimi, Zo, & Ciganek, 2015).

FUTURE RESEARCH DIRECTIONS

The classification of the extensive literature in the domains of MOOCs will provide the potential opportunities for future research. MOOCs are built on efficiency of scale, giving access to the teaching of world-class professors to thousands of students at once. Students across the globe are venturing into online courses to accomplish higher studies from reputed universities or colleges. MOOC participants can join the classes from any part of the world having connected to the web. Big data contains very large sets of data that are produced by people using the Internet, and that can only be stored, understood, and utilized with the help of special tools and methods (Kasemsap, 2016c). Big data represents an important trend in technology that leads the way to a new aspect in understanding the modern business world and making business decisions (Kasemsap, 2017b).

Learning analytics applies various techniques from information science, sociology, psychology, statistics, machine learning, and data mining to analyze the data collected during education services, teaching, and learning (Kasemsap, 2016d). Digital libraries comprise digital collections, services, and infrastructure to educationally support the lifelong learning, research, and conservation of the recorded knowledge (Kasemsap, 2016e). Data mining plays a key role in organizing huge amount of data and condensing it into valuable information (Kasemsap, 2016f). Web mining is the application of data mining techniques to discover the interesting patterns from web data in order to better serve the needs of web-based multifaceted applications (Kasemsap, 2017c). Investigating the associations among MOOCs, big data, learning analytics, digital libraries, data mining, and web mining in modern education would be beneficial for future research directions.

CONCLUSION

This chapter explained the overview of MOOCs and the implications of MOOCs in the digital age. MOOCs are the Internet-based courses which have large numbers of students involved. MOOCs are the programs of learning offered by a university, open through the Internet to users worldwide, free of charge. MOOCs are a preferred way of interactive online learning. Students across the globe are now venturing into online courses to complete higher studies from reputed universities or colleges. MOOCs have great potential to expand knowledge and perspectives. MOOCs encourage both staff and student to engage with each other.

MOOCs encourage both staff and student to engage with each other. Students can argue on the philosophy of the course through visual speaking method. In educational terms, this is a better way to learn about the course and have a good learning experience. The best thing about offering MOOCs is it reaches a wider audience, especially those which is out of reach. MOOC participants can join the classes from any part of the world having connected to the Internet. Those who complete MOOCs may return to the new perspective to facilitate the course or migrate to active learners.

MOOCs have a potential for helping college students succeed and for giving a preview of a particular university's teaching style to potential applicants. MOOCs can bring students from all over the world and encourage engagement between staff and students of a given university to interact with the wider public. MOOCs offer many online learners the opportunity to learn new skills and expand their knowledge base for quite some time. Offering diverse classes on different topics through MOOCs makes it easy for students to keep up with the latest trends and be on top of their professional field. Encouraging MOOCs has the potential to improve educational performance and gain educational goals in the modern learning environments.

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KEY TERMS AND DEFINITIONS

Education: The program of instruction of a specified type or level.

Electronic Learning: The learning utilizing electronic technologies to access educational curriculum outside of a traditional classroom.

Knowledge: The body of truths or facts accumulated in the course of time.

Learning: The mode of teaching or of procedure in a private school, college, or university.

Massive Open Online Courses (MOOCs): The online courses that have the open access and interactive participation by means of the Web 2.0.

Motivation: The desire or enthusiasm to accomplish or achieve something.

Skill: The ability to effectively do something arising from talent, training, or practice.

Technology: The scientific method and material used to achieve a commercial or industrial objective.

Training: The status or condition of a person who has been trained.

Chapter 12
Towards the Learning Experience Technology Usability Framework

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ABSTRACT

The availability of learning technology has increased over past decades; however, severe usability issues that cause adverse effects on the learning experience can be found in many available technologies. Learning solution usability is commonly evaluated by focusing on either technical or pedagogical usability and rarely both. This artificially separates the two important aspects of learning technology usability. This chapter provides a new framework for designing and evaluating learning solutions that synthesizes the above usability types to consider them a part of a complex and dynamic whole comprising of learning, technological design, content-related issues and context. The proposed Learning Experience Technology Usability (LETUS) framework will help bridge the gap between theory and practice to provide learning solutions that have usability in relation to both the technological and learning related aspects of the solution.

INTRODUCTION

Development in and access to learning technology has been increasing over the past few decades. While vast progress has been achieved in relation to research and design of learning solutions, still major work needs to be undertaken in order to properly understand the dynamics and underlying processes involved in technology mediated learning. There are numerous gaps and variances between industry design-

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based knowledge and academic knowledge regarding the topic of usability, especially in relation to the design of digital learning technologies (Lee, Trauth & Farwell, 1995; Rynes, Bartunek & Daft, 2001; Susman & Evered, 1978). Unfortunately, even with this basis it seems that the small and medium sized enterprises that dominate the digital learning technology scene (Tekes, 2015), do not necessarily have the resources to develop their products to their full potential. Influential factors contributing to this include misinformed or absent knowledge regarding the specifics of designing digital learning solutions for various learning experiences.

Rather than simply specifying notions such as learning, teaching, education and pedagogy, here, the term learning experience is adopted, to emphasize the nature of learning as a continual, and ever changing flow of knowledge development (Dewey, 1938/1997). Through recognizing learning as an experiential process, connotations of performance and outcomes-based learning, and the necessity to specify parameters for its measurement is alleviated. The term learning experience refers to the impressions, sentiments and memories, which go on to provide the building blocks for further learning encounters, processes, and in turn experiences, across the curriculum, in a wide spectrum of contexts (see e.g., Kolb, 2014). As psychologist and philosopher John Dewey (1938/1997) states in his seminal Experience and Education, that while "[e]xperience and education cannot be equated with one another…every experience lives on in further experiences" (p. 27) which ultimately affects how individuals approach learning and what they learn as a result.

The aim of this chapter is to provide a new framework for designing learning solutions that promotes and enhances learning and can be used without significant technical barriers or issues hindering the learning experience. The data for this chapter consists of an analysis of previous research, and original empirical research on both technical and pedagogical usability of recently developed digital learning solutions. Previous work on technical usability has revealed several issues related to the set of heuristics used (Nielsen's heuristics, 1994a) in this study (e.g., see Mayes and Fowler, 1999; Nokelainen, 2006). In this paper, previous frameworks for the usability of digital learning solutions are also scrutinized. However, the frameworks of previous scholars mentioned in this chapter are valuable resources as they inform the basis of a more suitable evaluative framework through which the usability of digital learning solutions maybe be both assessed and developed.

As a result, this work provides a new revised framework that can be used, when designing and evaluating software intended for educational and learning purposes. The proposed Learning Experience Technology Usability (LETUS) framework aids in bridging the gap between theory and practice within the field of learning and usability studies. This subsequently enables the provision of digital learning solutions that have usability in relation to both the technological and learning related aspects of the solution. What many frameworks neglect is the relevance of the context of use and the situation in which the learning solution will be used, as well as the sometimes unpredictable nature of learning (Mayes & Fowler, 1999). Efforts have been made to create methods to design learning technology with a broader view of usability, but there still remains a need for an easy-to-adopt and efficient way to design the usability of learning technology in a way that includes both the technical and pedagogical aspects, as well as knowledge about the learning experience and context as they all impact the overall usability of the chosen technology. The proposed framework attempts to combine all these perspectives of digital learning technology usability to provide an efficient way of evaluating the technology used to support learning experiences.

The chapter begins with a background into previous studies addressing the issue of usability in digital (e-learning, online learning, computer-aided etc.) learning solutions. Here, some of the main contributions to the field are discussed, which is followed by the canvassing of existing models intended to solve the digital learning solution usability query. The influencing factors of the usability of learning experience technology chapter delves deeper into scientific research and paradigms, which contribute to the usability of digital learning solutions in specific contexts.

BACKGROUND

Previous studies have shown that severe usability issues can be found in many of the available learning technologies and that those issues can have adverse effects on the learning experience, as well as, continued use of the technology (e.g. Ardito, De Marsico, Lanzilotti, Levialdi, Roselli, Rossano & Tersigni 2004). When considering technology for learning, there are two sides to usability that need to be considered: technical and pedagogical. A common way to evaluate usability cost efficiently is to have experts conduct a heuristic evaluation on the technology with or without additional user testing. Even though these checklist approaches have been criticised (e.g. Squires & Preece, 1999) they are still widely used and are an inexpensive way to detect at least some of the usability issues in the learning solution. However, heuristic evaluations usually only focus on either technical or pedagogical usability, seldom both (Ardito et al. 2004; Lanzilotti, Ardito, Costabile & De Angeli, 2006). Furthermore, attempts have been made to create pedagogical usability heuristics derived from technical usability principles (e.g. Nokelainen, 2006), but these frameworks fail to address the technology related concerns. Also, some frameworks have addressed this by creating an evaluation framework for assessing the complete usability of learning technology without creating any artificial separation between the two important aspects of learning technology usability (e.g. Hadjerrouit, 2010).

However, there is still a demand for a more holistic way of addressing usability and user experience aspects in learning technology during the early stages of the learning solution design process. This means that learning technology usability should be seen not as an objective factor within the ability to technically use the solutions for learning purposes, but rather, a fluid component intimately connected to user experience, contextual and application factors that operate in an ecosystem to enhance learning experience. To illustrate this, it is beneficial to consider the colours, images and even examples used within the application. While working technically, socially and aesthetically in one context, whether that be cultural or even learning context (e.g. age, school grade, school environment etc.), it may not be entirely suitable for other contexts. This suitability, and ultimately usability (perceived and actual usability) is determined by: literacy levels and literacy standards (formatting, spacing, font, alphabet, language); underlying connotations of colours, how images correspond with the lived realities of learners and whether or not they are appropriate - can the learner identify with the characters and images being represented?; and are the examples applicable or even acceptable to the learner?

Moreover, one of the main issues that is often neglected both in relation to learning technology as well as more traditional education and learning scholarship alike, are the immeasurable qualities of learning encounters. These include the experiences, memories and non-evaluated learning (learning occurring outside the syllabus) that may stay with the learner for the rest of their life. These learning experiences may affect future experiences whether in direct relationship to the subject in question (mathematics, science, language etc.), or to the technology itself (Dewey, 1938/1997). On this note, it is important to remember that not only should the interaction design of learning solutions take into account the fact that positive usability will influence the student's attitudes and capacity to learning the subject material through the application, and subsequent related learning experiences, but it will also influence the student's attitudes and emotions towards the mediating technology itself. That is, poor design and implementation of information technology often results in states such as technophobia (Brosnan, 2002; Marquardt & Kearsley, 1998). Technophobia has been discussed quite extensively from the perspective of e-learning, yet devising an effective paradigm to address the interrelationship between the numerous moving components has proven challenging (Juutinen, 2011).

PERCEIVABLE, OPERABLE, UNDERSTANDABLE, ACCESSIBLE, ROBUST

Many of the challenges observed in the literature review, the results of which are presented in the following section, in combination with empirical findings, can be summarized into five main elements: the perceivable, the operable, the understandable, the accessible and the robust. These elements correspond with the four principles of the Web Content Accessibility Guidelines (Caldwell, Reid, Vanderheiden, Chisholm, Slatin, & White, 2008), which state the importance of perceivability, operability, understandability and robustness in cognitive language and learning areas. Perceivability refers to the rate to which information in the design can be perceived (Caldwell et al., 2008), that is, information (text, images, and other sensory information) that is apparent and easily noticed. If specific elements or information is either too small, located in an unusual position (not consistent with usability standards) or even hidden in menus or behind links, it is not adequately perceivable (Krug, 2014; Nielsen, 1995). Operability is affected by both functions within the software design, as well as hardware and input devices such as keyboards, touchscreens, voice and gestural interfaces etc. Operability requirements vary according to the needs and capabilities of the users, and these are contingent upon both physical capabilities as well as cognitive capabilities (Caldwell et al., 2008). For instance, use of animations within a learning environment should be controlled and carefully deliberated, as these often pose challenges to accessibility.

Accessibility in this chapter incorporates the above mentioned WCAG model (Caldwell et al., 2008), with other accessibility issues such as multi-platform and device usability, online-offline possibilities, and overall consideration for how cultural, social and economic circumstances influence learners' abilities to access and use the software solutions. Moreover, understandability is included within this accessibility, as language in particular, and the way that it is applied through either natural language (e.g., English, Finnish etc.) as well as system and literary logic (e.g. reading flow and direction) affect the way learners access information. Robustness of the solutions stems from the multi-platform, multi-device accessibility considerations, to account for the varied and personalised way in which people use and combine devices and software - both from the teaching and learning perspectives - and whether or not there are possibilities to seamlessly combine these varied components (Cardwell et al., 2008). Furthermore, to refer once again to the perceivable element of the findings, perceived usability, as described by scholars such as Tractinsky (1997) and Norman (2005), incorporates aesthetics and the role of emotions, and how people think (imagine) they are able to use a system, as integral components in understanding the usability of design.

CANVASSING THE MODELS FOR LEARNING EXPERIENCE USABILITY VALUE

Regarding the empirical section, Jakob Nielsen's (1994a) ten usability heuristics were utilized to evaluate 24 learning solutions from five countries. Before adopting these heuristics awareness of their relationship within the framework of digital learning technologies (e.g., see Nokelainen's (2006) pedagogical usability) was already formed. However, it was necessary to concentrate on the technical aspects of the learning solutions, before endeavouring to understand the dynamics of the various learning situations and contexts on the pedagogical usability itself. On this note, previous work by Kenttälä, Kankaanranta, Rousi and Pänkäläinen (2015) highlights the differences in the distribution of observed usability problems based on Nielsen's heuristics. Moreover, a significant outcome of this study was that 73% of all observed usability issues could be categorized under five heuristics which were: 1) consistency and standards; 2) visibility of the system status; 3) match between system and the real world; 4) aesthetic and minimalist design; and 5) user control and freedom).

These findings can be explained by the diversity of digital learning solutions evaluated, and their intended application contexts varying from tool-based usage, to content-rich pedagogy, geography and mathematics. From the design perspective, another explanatory factor involves the fact that when presented with such diversity in any number of everyday situations (from school to work, domestic and leisure time environments), the key characteristics influencing people's acceptance of, behavior towards, engagement with, as well as overall usability and user experience is that digital solutions need to be: consistent in style and logic (Krug, 2014; Nielsen, 1994a); visible among the masses, and visible in terms of communicating operation logic (Norman, 2013); connected in content and language with the external environment (social, cultural, physical) (Nielsen, 1994b; Squires & Preece, 1999); aesthetically pleasing which combines both cognitive and hedonic elements (Diefenbach & Hassenzahl, 2011); and enable the user to feel in control (Hassenzahl, Diefenbach & Göritz, 2010).

In the previous study by Kenttälä et al. (2015), issues described by these heuristics were mainly given low severity ratings. The heaviest concentration of severe usability issues could be found under two heuristics (error prevention and helping users recognize, diagnose, and recover from errors) which both received lower overall amounts of usability issues (Kenttälä, et al., 2015). These observations also raised some issues regarding the interrelated nature between technical and pedagogical usability which will be further analysed to create a holistic view of learning solution usability. Moreover, an attempt will be made to close the artificial divide between technical and learning related (previously pedagogical usability) aspects of usability, by examining how the two sides of usability support and complement each other to form a new framework that aids designing and evaluating learning solution usability.

The LETUS framework was developed by analyzing 13 frameworks and complemented by knowledge gained from analyzing data gathered from international expert evaluations about design and use of learning solutions (see Mäkelä 2015). The international expert evaluations consisted of four parts: overall impression, education, culture and design, out of which this chapter focuses on design. For this purpose 113 evaluations from 7 countries (Chile, Finland, Hong Kong, Singapore, South Korea, Spain and United Arab Emirates) were coded by two researchers. The coded data was then checked for reliability and the explanatory power of the coding framework was developed accordingly. The individual work of each researcher was then combined and one unified coding framework (Table 1) was created.

This framework was then compared and analyzed side by with other frameworks and models presented in Table 2. The frameworks analyzed had different focuses, yet complemented one another in order to

Table 1. Coding framework for design portion of the international expert evaluations

Coding Framework
Feedback, social media and other features
Guidance
Differentiation for different user groups
Learning methods and practices
Connection with user's everyday reality
Multimedia
User experience and perceived usability
Navigation and structure
Access and infrastructure
Scalability
Suitability
Cultural relevance

Table 2. Additional frameworks analysed

The Arcs model of motivational design (Keller, 1987)	Pedagogical usability (Nokelainen, 2006)
Usability heuristics (Nielsen 1994a)	A conceptual framework for using and evaluating web-based learning resources in school education. (Hadjerrouit, 2010)
Usability Heuristics for E-Learning Design (Mehlenbacher, Bennett, Bird, Ivey, Lucas, Morton, & Whitman, 2005)	The Design Principles for Flow Experience in Educational Games (Kiili, Freitas, Arnabb & Lainema, 2012)
Gameflow Model (Sweetser & Wyeth, 2005)	Pedagogical playability heuristics (Tan, Goh, Ang & Huang, 2013)
Events of instruction (Gagné, Wager, Golas, Keller, & Russell, 2005)	Computer-Assisted Assessment (CAA) Heuristics (Sim & Read, 2015)
Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. (Mishra, & Koehler, 2006)	Coding framework for design portion of international Learning solution Expert Evaluations (Table 1)

form a more complete view of all the aspects that should be taken into consideration when designing or evaluating learning technology. The LETUS framework utilizes the basic structure of the Technological Pedagogical Content Knowledge model, or TPACK (Mishra, & Koehler, 2006), with further emphasis on context related features of the technology learning experience.

THE LEARNING EXPERIENCE TECHNOLOGY USABILITY FRAMEWORK

The core of the Learning Experience Technology Usability (LETUS) framework is formed by a coding framework (Table 1) created through the analysis of 113 expert evaluation reports from 7 countries, where expert evaluators evaluated the usability and design of nine learning solutions (see Mäkelä 2015). However, since the framework has been developed through one set of data and for a particular use, the explanatory power and overall coverage of the framework has been furthered by comparing and combining its features with knowledge gained from previous frameworks. The knowledge gained from the coding framework based on the Expert Evaluation data was furthered by researching relevant frameworks, usability and playability heuristics currently available. Basic criteria for choosing the frameworks and heuristics for this chapter entailed that they had been used or created for the analysis of learning technology and games.

The LETUS framework has four basic components: Learning, Content, Technology and Context (Figure 1). These components can be further divided into subcomponents that form a basis for evaluation and design of learning solutions (Table 3).

Each of the components present in the LETUS Design framework comprise elements which are seen as not only essential for the innate qualities of the components, but are also integrated with the mechanisms of the other components. The combined features from individual frameworks (Table 3) outline the associated elements of each component. Integral to the learning component are: 1) guidance and instructions, collaboration, feedback and assessment - elements pertaining to social instructor-learner/learner-learner interaction, information which directs the student towards learning pathways, as well as indications of how the learner is progressing; 2) previous knowledge, skill development, differentiation and skills for learning - applied and metacognitive elements for knowledge and its development; and 3) confidence, motivation and creativity - the in-learner cognitive-emotional responses to the learning technology design. Innate within the content component are: 1) authenticity and relevance, concepts and goals - the inner logic of the content and motivation for its elements; and 2) readability and multimedia - the way in which the content is designed and supported by technical characteristics. Technology innate

Figure 1. The components of LETUS framework

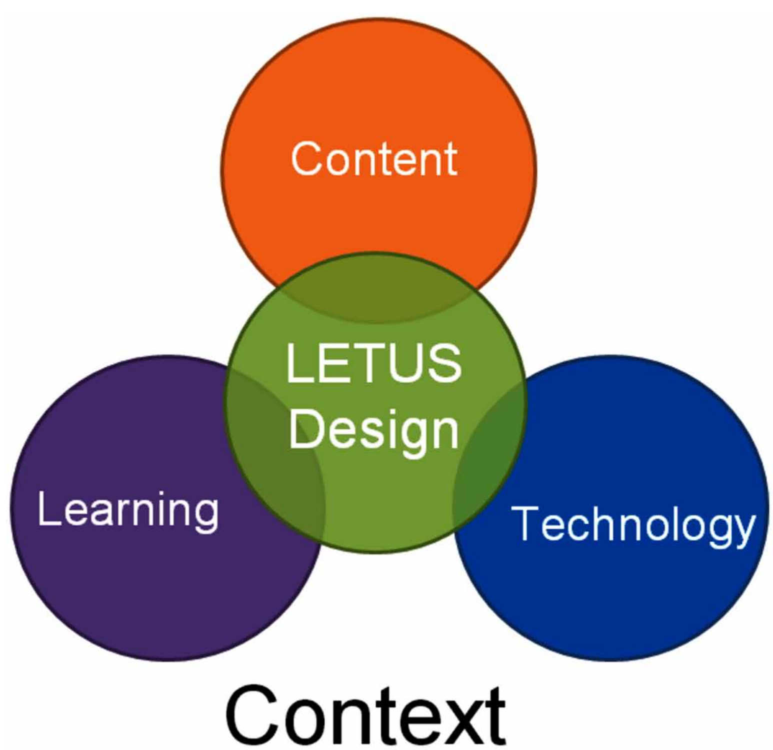

Table 3. Combined features from individual frameworks

Learning	Content	Technology	Context
Feedback	Goals	Flexibility	Satisfaction
Guidance and instructions	Authenticity and relevance	Control	Immersion and flow
Concentration and attention	Readability	Errors	Applicability
Collaboration	Concepts	Consistency	Added value
Assessment	Multimedia	Aesthetics and trust	Sociocultural relevance
Confidence		Navigation and intuitivity	
Motivation		Communication	
Skill development		Interaction	
Previous knowledge		Accessibility	
Differentiation		Scalability	
Skills for learning		Reliability and maintainability	
Creativity			

elements, or elements pertaining to the technical usability design, comprise: 1) flexibility, control, errors (error prevention or recovery), scalability, reliability and maintainability - the robustness of technical design and diversity (device, system and user) in use possibilities; 2) navigation and intuitivity, communication, interaction and accessibility - the language and interaction possibilities afforded by the design; and 3) aesthetics and trust - how users subjectively experience the composition of the solutions, and to what degree they rely on its credibility. Finally, context is constantly surrounding any technology or human-technology interaction. Moreover, context determines the validity and interpretation of the above mentioned elements. Thus, context influences the degree to which the learner and/or educator experiences: satisfaction, immersion and flow, applicability, sociocultural relevance, and quite significantly added value to the learning situation and desired outcomes.

FUTURE RESEARCH DIRECTIONS

Research in the field of educational technology usability needs to keep evolving to accommodate new technologies and designs. One trend that has been widely addressed over the past years has been the use of mobile technology in education (e.g. Soykan & Uzunboylu, 2015). Future developments particularly in AI and autonomous systems are drastically changing the ways in which learner-technology/ human-technology interactions are considered. Manual usability is fading into the background as the computer becomes ‘invisible’ (Streitz, Kameas & Mavrommati, 2007.) Key issues that affect artificial intelligence in education (AIED) are: intercultural and global dimensions, practical impact, privacy, interaction methods, collaboration at scale, effectiveness in multiple domains and role of AI in educational technology (Pinkwart, 2016). Similar issues were also observed in regards of educational technology in general in this chapter.

Further research is however needed to more profoundly include the learner perspective and learning theories and models in the design and evaluation frameworks. As a first step towards the Learning Technology Usability (LETUS) framework, this chapter is not a conclusive framework and the necessary learning aspects involved in technology aided learning need further analysis. Furthermore, some aspects relevant to learning with the aid of technology might need to be added to increase the explanatory power of the framework. Current focus in education is on learning 21st century skills (Binkley, Erstad, Herman, Raizen, Ripley, Miller-Ricci, & Rumble, 2012) and in order to be effective in preparing students to the 21st century skills, learning solutions should be designed to support learning of these skills. Incorporating these desired learning outcomes into design and evaluation criteria for learning solutions is a challenging task.

CONCLUSION

This chapter focused on usability of learning solutions and provided a new framework for evaluating and designing learning technology. The chapter articulates the need to revise current approaches to learning technology usability, through emphasising the importance of considering firstly the significance of learning as it is in educational situations (rather than taking a pedagogical, instructional design approach), and secondly consideration for learning as an experience, or series of experiences which cannot so easily be defined in terms of objectives and outcomes. Rather, the experience of technological design itself - user experience - and of the ways in which it supports learning processes should be considered the emphasis. Moreover, the role of context cannot be underplayed as this determines the ways in which both the technical design and learning material are experienced.

LETUS is the result and development of a rigorous literature review, combined with empirical study, into the factors that have been included in and scrutinised in decades worth of research into usability and learning technology design. It has combined the findings of these investigations with principles and directions explicated in agenda including the World Content Accessibility Guidelines and the presented modification of these which entail the perceivable, operable, understandable, accessible and robust. The emphasis of the LETUS model is on viewing learning via technological interaction as an experiential ecosystem which involves overlapping and dynamic exchange of components comprising the learning itself, content and technology within an all-encompassing context, which defines, directs and influences the subsequent learning experience. Here, rather than treating the two previously studied usability types involved in learning technology design - technical (Nielsen, 1994a) and pedagogical (Nokelainen, 2006) - as separate entities, LETUS seeks to synthesize elements pertaining to the learning, technological design, content-related issues and context. If any of these components are out of step with one another, or indeed the context as a whole, the learning experience derived from the learning technology interaction will be affected.

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KEY TERMS AND DEFINITIONS

Heuristic Evaluation: Usability inspection method assessing products compliance with commonly accepted usability principles.

Learning Experience: Feelings, memories and other factors that affect the way an individual learns or approaches learning.

Learning Solution: Software or other product that has been designed for educational or learning purposes.

Operability: Possibility and desire to use a product.

Pedagogical: Relating to teachers or education.

Perceivability: Being able to become aware of something through the use of one's senses (e.g. vision, touch, smell).

Usability: Learner's ability to use a product for its intended purpose efficiently without frustration.

Chapter 13
Flipped Classroom:
Advanced Issues and Applications

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ABSTRACT

This chapter indicates the advanced issues of flipped classroom and the important perspectives on flipped classroom in the digital age. Flipped classroom is a learning environment where students learn new content on their own by watching video lectures or other online sources and assigned problems are completed in class with teachers offering personalized guidance instead of lectures. Flipped classroom allows students to learn on their own time and at their own pace and allows students to have more time for collaborating with other students which can be a great learning experience for the students and as a way for them to build their teamwork abilities. The chapter argues that utilizing flipped classroom has the potential to improve educational performance and facilitate the modern learning environments.

INTRODUCTION

Flipping the classroom has transformed teachers' teaching practice. Teachers no longer stand in front of their students and talk at them for 30 to 60 minutes at a time. This radical change has allowed teachers to take on a different role with their students. Flipped or inverted learning is a type of blended learning that involves the use of educational technology to switch or flip what is traditionally done in the classroom with what is done as homework (Pulley, 2014). In a flipped classroom, the conventional roles of classroom and homework are reversed: students study on their own using digital teaching materials prior to class and apply their learning in classroom activities (Umezawa et al., 2016).

Through flipped classroom, students gain many benefits from the flipped classroom where they can watch lectures at home that pass important concepts along to the students (Bagby, 2014). Flipped classroom pedagogy is applicable for the course enrollments of various sizes (Trogden, 2015) and makes use of electronic resources to provide concept and theory outside of class time, in order to free the time spent in class for concept application and experiential learning (Coyle, Newman, & Connor, 2016). In class,

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the instructor allows students to peer review their work in groups while the instructor engages them to validate their work (Ireri & Omwenga, 2016).

Because all the direct instruction of flipped classroom is recorded and delivered via online videos, students with special needs can watch the videos as many times as they need to learn the educational materials (Youngkin, 2014). No more frantically trying to copy down notes with the hope that they will understand them later. Instead, students can pause their teacher, rewind their teacher, and make sure they actually learn the important concepts. Giving students the ability to pause helps them with time management. In addition, flipping allows teachers to organize technology to increase the effective interaction with students.

This chapter is based on a literature review of flipped classroom. The extensive literature of flipped classroom provides a contribution to practitioners and researchers by indicating the advanced issues and applications of flipped classroom in order to maximize the educational impact of flipped classroom in the digital age.

Background

The call for reform in education, based on the recognition of an increased role of technology, as well as the rapid advancement of technology types, requires major changes to the traditional methods of teaching (Newman, Deyoe, Connor, & Lamendola, 2015). Traditional classrooms designed for lecture inhibit student mobility and flexibility, which complicates the implementation of flipped classroom models (Carpenter, Sweet, Blythe, Winter, & Bunnell, 2015). New teaching pedagogies (e.g., flipped classroom) have embraced the use of collaborative learning where students engage in group-based activities during class time and they embark on the asynchronous video lectures after the classroom (Maina, Wagacha, & Oboko, 2016). The asynchronous approach frees up in-class time for student-centered synchronous learning activities (O'Flaherty & Phillips, 2015).

With the advent of new technologies and the move for faculty to implement these into their teaching practice, a new model for course design and delivery has developed called the flipped classroom model (Larcara, 2015). Flipped classroom model is an approach to instruction where direct instruction and lecture is viewed at home and class time is used for collaboration and project-based learning (Dickenson, 2015). Flipped classroom is grounded in a consideration and respect for individual and diverse learning needs (Ray & Powell, 2015) and reverses the roles of traditional lecture and assignment in order to maximize student learning (Faulkner & Green, 2015). Flipped classroom promotes students' creativity concerning fluency, flexibility, and novelty (Al-Zahrani, 2015).

THEORY AND APPLICATIONS OF FLIPPED CLASSROOM

This section explains the advanced issues of flipped classroom; the Kirkpatrick's four-level training evaluation model and flipped classroom; and the important perspectives on flipped classroom in the digital age.

Advanced Issues of Flipped Classroom

In the digital age, students have more opportunities for contact with digital electronic products, including personal computers, tablet computers, and smartphones (Tsai, Shen, & Lu, 2015). Teaching in a flipped classroom offers students a video of the course content so that they can study in advance (Tsai et al., 2015). Flipped classroom model differs from a traditional classroom in that course content is introduced to students not through lectures but through other ways outside of the classroom (Chellapan & van der Meer, 2016). The use of a flipped classroom approach encourages students and faculty to rethink how learners learn and teachers teach (Simpson & Richards, 2015).

Flipped classroom approach is recognized as an integrated teaching model acknowledging multiple teaching approaches, including in-class cooperative learning, mentored laboratory activities, and online teaching videos (Ogden & Shambaugh, 2016), and has a positive effect on the transfer of learning (Chao, Chen, & Chuang, 2015). Flipped classroom enhances students' motivation and improves their academic performance (Evseeva & Solozhenko, 2015). Amhag (2016) indicated that flipped classroom consists of two parts: teacher-recorded videos with individual instructions outside the classroom and interactive group learning activities face-to-face inside the mobile online webinars.

Flipped classroom concept has drawn attention by educators as a method of organizational and individual competencies (Barrons, 2015). Flipped classroom model allows for the increased classroom interaction that can include peer-to-peer activities (See & Conry, 2014). Regarding flipped classroom, lectures that used to occur in face-to-face settings can instead be accessed through online technologies at home, and face-to-face class time can be used for discussion, problem solving, and collaborative work (Wells & Holland, 2016). Students are responsible to read the materials and complete the tasks on their own time (Francis, 2014).

Important Perspectives on Flipped Classroom in the Digital Age

With the advent of the Internet in the digital age, social media becomes an important aspect of people's everyday life (Alharbi, 2015). The implementation of technological tools in classroom settings provides significant enhancements to the learning process (Tafazoli & Romero, 2017). For example, the flipped learning approaches can be effectively enhanced through using social media (Alharbi, 2015). The use of social media has created the highly effective communication platforms where any user, virtually anywhere in the world, can freely create the content and disseminate this information in real time to a global audience (Kasemsap, 2017a). In addition, social media allows organizations to improve communication and productivity by disseminating information among the different groups of employees in a more efficient manner (Kasemsap, 2017b).

Current digital tools and methods potentially change the way teachers interact in the classroom, and the way language learners acquire language (Loucky, 2017). The flipped classroom methodology is one of the latest innovations in the field of education, challenging the traditional notions of the classroom experience (Loucky & Ware, 2017). Applying flipped classroom to language learning through the support of technology-enhanced language learning (TELL) has the potential to engage students and drive their understanding of important concepts (Loucky & Ware, 2017). TELL is the utilization of the advanced devices as the technological innovation to display multimedia as the modern language learning methods in the digital age (Kasemsap, 2017c).

In the digital age, flipping the classroom creates an ideal merger of online and face-to-face instruction that is becoming known as a blended classroom. Teachers play a vital role in the lives of their students. They are mentors, friends, neighbors, and experts in the modern learning environments. Having face-to-face interaction with teachers through flipped classroom is an invaluable experience for students. To make a flipped classroom successful requires training teachers about innovative technology integration, thus providing ongoing professional development and developing supportive school and home environments with strong educational leadership (Dennen & Spector, 2016).

Concerning flipped classroom, class time is no longer spent teaching basic concepts, but rather focused on more value-added activities, such as problem solving, active learning, and collaborative exercises (e.g., case studies, web-based simulation games, and real-world applications) (Asef-Vaziri, 2015). Flipped classroom allows students to personalize their learning outside of class and affords them greater opportunities to apply and synthesize information during class (Zawilinski, Richard, & Henry, 2016). Another benefit of flipping the classroom is that the technique allows students to review instructional content at their own pace (Obradovich, Canuel, & Duffy, 2015).

Flipped classroom is practical since students who miss a lecture can review the content and stay up-to-date with the course (Albert & Beatty, 2014). To address a variety of learning preferences, the in-class activities should be sufficiently varied and should include lab work, experimentation, and peer discussions (Arnold-Garza, 2014). With flipped classroom approach, instructor must develop and include activities to ensure that students are prepared for the class (Mason, Shuman, & Cook, 2013). More advanced tools need to be employed in order to track students' out-of-class behavior and utilize it to adapt the content of the course (Chen, Chen, & Sun, 2014).

Flipped classroom has become increasingly popular in STEM (Science, Technology, Engineering, and Mathematics) higher education in recent years, largely due to the volume of supporting anecdotal evidence and positive student response (Ojennus, 2016). Students can prepare at their pace, level of understanding, and schedule for the lectures (Davies, Dean, & Ball, 2013). Instructors commit more in-class time to provide adaptive and instant feedback to individual or group of students (Fulton, 2012). In addition, instructor must clearly communicate the reasoning behind implementing the flipped classroom model to obtain student support (Garver & Roberts, 2013).

A major goal of K-12 education is to create a student-centered classroom where educators are teaching to increase critical thinking skills, promote problem-based learning, and differentiate instruction (Katz, Brown, & Kim, 2016). Using the flipped classroom through the web-based learning model has a practical impact on developing self-questioning and self-study skills among graduate students (Abdelaziz, 2013). The improved satisfaction in the flipped classroom can be predicted by the improvement in transactional distances between students, students and the instructor, and students and the instructional technology used in the class (Swart & Wuensch, 2016).

Flipped classroom process requires a reconceptualization of the learning process both for the instructor and students, and it requires a careful consideration of how to construct the class time to promote learning (Crisafulli, 2015). Many challenges regarding flipped classroom implementation include lack of technical support, IT infrastructure challenges, inadequate technical and non-technical training resources for instructors, the inability to evaluate student comprehension using traditional strategies, increased course preparation time, and lack of student preparation (Gardner, 2015).

FUTURE RESEARCH DIRECTIONS

The classification of the extensive literature in the domains of flipped classroom will provide the potential opportunities for future research. Flipped classroom is a pedagogical model in which the the typical lecture and homework elements of a course are reversed. Augmented reality is a type of interactive display environment that takes the capabilities of computer generated display, sound, text, and effects to enhance the user's real-world experience. Cognitive technologies simulate human reasoning and perceptual skills, thus giving modern business and education new capabilities and enabling organizations to break prevailing trade-offs among speed, cost, and quality. Mobile learning is the ability to obtain and provide the educational content on personal pocket devices, such as smartphones and mobile phones. An examination of linkages among flipped classroom, augmented reality, cognitive technologies, and mobile learning would seem to be viable for future research efforts.

Critical thinking is one of the most vital parts of the problem-solving and decision-making process, as it is the act of clearly thinking through options that will lead to a final choice (Kasemsap, 2017d). Problem-based learning (PBL) is a challenging program that makes the study of organization change intriguing for students because they are motivated to learn by a need to solve the real managerial problems (Kasemsap, 2017e). Like flipped classroom, where the traditional activities are removed from the classroom and completed by the students on their own time, PBL flips the instruction. Instead of teaching the material and then requiring that the student apply the concepts, the problem is presented first and students learn the educational material by solving it. Enhancing critical thinking and PBL through the application of flipped classroom should be further studied.

CONCLUSION

This chapter highlighted the advanced issues of flipped classroom and the important perspectives on flipped classroom in the digital age. The main goal of a flipped classroom is to enhance student learning and achievement by reversing the traditional model of a classroom, focusing class time on student understanding rather than on lecture. To accomplish this, teachers post short video lectures online for students to view at home prior to the next class session. Flipped classroom allows class time to be devoted to mastering the material through collaborative learning exercises, projects, and discussions. It is possible for students to have the increased input and control over their own learning regarding flipped classroom.

Both flipped teaching and flipped learning incorporate a full cycle of learning activities. Flipped classroom allows students to learn on their own time and at their own pace and allows students to have more time for collaborating with other students which can be a great learning experience for the students and as a way for them to build their teamwork abilities. Flipped classroom allows class time be used to master skills through collaborative projects and discussions. This encourages students to teach and learn concepts from each other with the guidance of their teachers. Utilizing flipped classroom has the potential to improve educational performance and facilitate the modern learning environments.

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KEY TERMS AND DEFINITIONS

Education: The systematic study of the methods and theories of teaching and learning.

Flipped Classroom: The pedagogical model in which the typical lecture and homework elements of a course are reversed.

Instruction: The information about how to do or use something, often written in a book.

Learning: The process or experience of gaining knowledge or skill.

Method: The procedure, technique, or way of doing something, especially in accordance with a definite plan.

Skill: The talent or ability that comes from training or practice.

Technology: The organization of knowledge for practical purposes.

Training: The process of being conditioned or taught to do something, or is the process of learning and being conditioned.

Chapter 14
Multimedia Active Reading:
A Framework for Understanding Learning With Tablet Textbooks

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ABSTRACT

In the age of online textbooks and digital reading devices, the nature of active reading has changed. During active reading, learners build and analyze the materials they read by applying specific strategies, such as annotating, summarizing, and developing study guides or other artifacts in an effort to comprehend, memorize, and synthesize information. However, research suggests that as textbooks migrate to the digital space, contemporary active reading may be more accurately conceptualized as, at least in part, dependent upon the medium or the platform on which it occurs. This chapter proposes a novel perspective for understanding active reading called Multimedia Active Reading, which is empirically grounded in prior research that uncovered ways in which learner behaviors in the tablet textbook environment map to common physical active reading strategies (i.e., annotation, reorganization, browsing, and cross-referencing) and introduced and evaluated novel active reading support designed for the tablet textbook environment.

INTRODUCTION

In the age of online textbooks and digital reading devices, the nature of active reading has changed. During active reading, learners build and analyze the materials they read by applying specific strategies, such as annotating, summarizing, and developing study guides or other artifacts in an effort to comprehend, memorize, and synthesize information. Active reading is, in fact, fundamental to meaningful learning. It serves a meta-cognitive function that allows content to leave strong memory traces and helps learners understand a text for a specific purpose, such as future recall in an educational setting or as part of a work task. However, research suggests that as textbooks migrate to the digital space, contemporary active reading may be more accurately conceptualized as, at least in part, dependent upon the medium or the platform on which it occurs.

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In other words, the active reading process and the device being used (i.e., desktop computer, tablet device, etc.) are inextricably linked. This represents a fundamental departure from earlier notions of active reading, because earlier characterizations were primarily focused on printed documents and books. For example, in traditional print environments, learners generally engage in the physical strategies of active reading (i.e., annotating, reorganizing, cross-referencing, and browsing) with pen and paper in the book or on a separate document. However, computers, tablets, and mobile devices include built-in active reading tools and therefore invite new active reading strategies as a result of these affordances. Thus, as we consider how to characterize active reading in the digital age, it may also be helpful to explore novel perspectives on active reading in relation to specific affordances of individual devices. Of course, characterizations of active reading for tablets or other digital devices aren't wholly different than those that were envisioned for the paper experience. However, digital affordances – i.e., the integration of multimedia content, touch screen interactivity, and nonlinear presentations, to name a few – clearly have the power to alter the active reading experience in significant ways.

In that spirit, this chapter proposes a novel perspective for understanding active reading called *Multimedia Active Reading*. This framework includes characteristics that focus on the emergent nature of active reading with interactive, multimedia tablet textbooks. This framework is founded on two key principles. First, it acknowledges the ways in which prior characterizations of active reading inform and contribute to our understanding of active reading on contemporary digital platforms. Second, *Multimedia Active Reading* is empirically grounded in prior research (blind cite), which uncovered ways in which learner behaviors in the tablet textbook environment map to common physical active reading strategies (i.e., annotation, reorganization, browsing, and cross-referencing) and introduced and evaluated novel active reading support designed for the tablet textbook environment (blind cite).

BACKGROUND

During the past four decades, a vast body of literature has emerged that seeks to characterize active reading specifically based on the cognitive and physical processes learners enact to better understand educational content. Active reading originated with, "How to Read a Book: The Classic Guide to Intelligent Reading" (M.J. Adler & Van Doren, 1972 & 2011). The authors define active reading as a set of activities that should guide educational reading. Since then, many studies have indicated that students employ a wide range of active reading strategies, particularly when their reading goals include studying for exams or to retain information for a long time. Of course, specific strategies may differ from student to student, and individual students may be more or less successful in their active reading pursuits. However, scholars agree that good active reading skills are critical for students to become successful learners (Scheid, 1993; Zile-Tamsen & Marie, 1996).

Early definitions of active reading focused on reading text in print. However, the strategies and behaviors that comprise active reading as a conceptual approach to learning are applicable to the consumption of other types of media as well. The rising popularity of tablet use among students (e.g., iPads and similar Andorid devices) is moving textbooks to the mobile arena. For eample, large publishing companies like McGraw-Hill and Pearson, tech companies like Apple's iTunesU, and startups like Inkling Habitat have all entered the interactive, multimedia tablet game. Thus, active reading, watching, and listening, as well as engaging with interactive content are interwoven with active reading, particularly as learners attempt to annotate and study content delivered in multiple media formats. But what, if any, novel traits of active reading emerge when leaners engage with a particular reading assignment? How can learners' annotation goals be equally supported in regard to both text-based and multimedia content? To answer these questions, novel systems that better support educational active reading of tablet textbooks must be grounded in relevant theories of active reading and learning.

"How to Read a Book: The Art of Getting a Liberal Education" was first authored in 1940 by Mortimer Adler, an American philosopher, educator, and popular author. In it, Adler laid the foundation for a guide to intelligent reading that was particularly focused on the college-bound student. However it wasn't until 1972 when Adler co-authored a heavily revised edition ("How to Read a Book: The Classic Guide to Intelligent Reading") with academic Charles Van Doren that the concept of active reading emerged as a framework for critical reading. This early framework includes *structural*, *interpretative*, and *critical reading*, and any or all of the following purposes for reading a text: to understand a document's structure or purpose; to understand an author's meaning, arguments, and terminology; and to critically assess the merit and accuracy of a text.

A few years later, A.K. Pugh elaborated on the work of Adler and Van Doren with is book, "Silent Reading: An Introduction to Its Study and Teaching" (1978). Pugh's "responsive reading" goes a step further than earlier definitions of active reading, asserting that there are several key characteristics of responsive reading that are both cognitive and physical and that both categories are intricately intertwined with a learner's purpose for reading. Furthermore, these cognitive functions can be supported through specific physical strategies, such as note taking, annotating, browsing, and cross-referencing. This work has influenced the conceptualization of a number of teaching and learning strategies. Finally, Adler et al. added "work-related reading" to the discussion of active reading in 1998, which briefly addressed the then-emerging digital environment. They noted that in the digital age, learners often read and annotate several documents or digital displays concurrently. They also pointed out that reading more often happens along with writing–annotation, outlining, etc.–then without. Table 1 summarizes these three foundational models of active reading.

Researchers who have studied differences between active reading in paper and digital environments explain that the smooth integration of annotation with reading is one of the most essential challenges for any digital tool aimed at supporting active reading (Tashman & Edwards, 2011). Several studies have also noted that in the digital environment, learners struggle to gain easy, intuitive access to annotations (Li et al., 2014), interleave reading and writing (O'Hara, Taylor, Newman & Sellen, 2002), and effec-

Table 1. The traditional active reading framework has evolved over four decades

Model	Key Characteristics
Active Reading Adler & Van Doren, 1972	**Structural reading:** Understand the structure and purpose of a text **Interpretative reading:** Understand author's arguments, special phrases, terms **Critical reading:** Judge the merit and accuracy of a text
Responsive Reading Pugh, 1978	**Linearly progressing** through the text without interruption **Reading to search** for a specific piece of information **Reading to acquire** information without a set goal **Reading to get an overview** about the general structure of the material **Note taking,** annotation, and cross-referencing
Work-Related Reading A. Adler, Gujar, Harrison, O'Hara & Sellen, 1998	Reading that happens more frequently with writing than without and is performed across several documents or displays concurrently

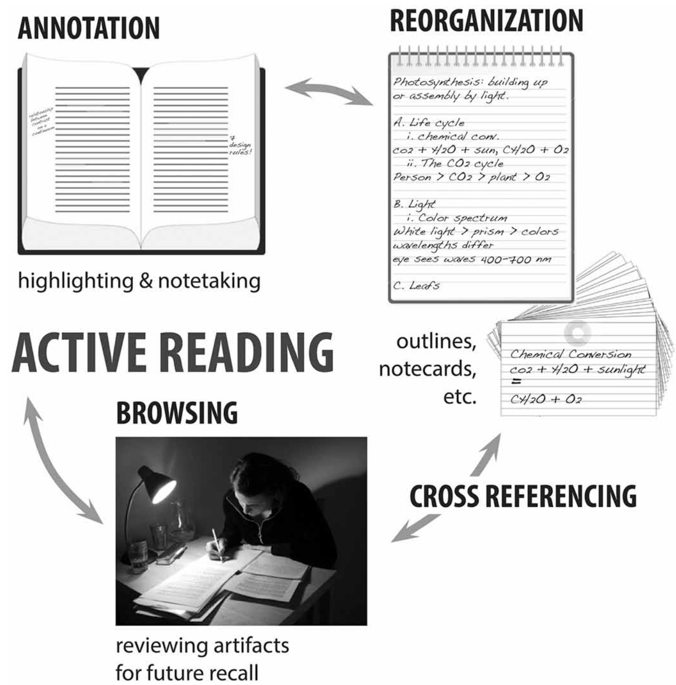
tively build cognitive maps of content (Thayer et al., 2011). Studies have also indicated students may have difficulty migrating from print textbooks to interactive digital textbooks. For example, researchers have suggested that certain academic reading tasks are challenging with digital textbooks. Thayer et al. (2011) found that many student-oriented goals, such as studying for exams and reading to learn specific topics or information are not adequately supported by digital devices. They assert this is the case because "built-in annotation tools are too cumbersome to use regularly" (p. 2921). Likewise, Tashman and Edwards (2011) note that in tablet textbooks "even annotation–traditionally seen as a strong point for paper–can be constraining, complicating the creation of large annotations, or marginalia that refer to disparate or large portions of text, or to multiple texts" (p. 1). These themes are pervasive among studies that have similarly explored student attitudes toward using eReaders and tablets for textbook consumption. Doering, Pereira and Kuechler (2012) found that college students are "moderately traditional" in their attitudes toward using tablets and eReaders for textbooks because they believe tools intended to aid studying are in need of further improvement before they will be fully accepted and widely used. These findings suggest that further research and development is necessary to conceptualize and build tools that are specifically appropriate for the environments in which they were used.

The novel and relatively new affordances provided by interactive touch screen tablets–especially those that have surfaced since Apple's 2010 release of the iPad–has spurred development of new devices and features designed to support active reading. However, although many of these projects present compelling design ideas, development has largely focused on replicating the properties of paper texts in the digital environment. Likewise, design has mostly been inspired by designers' insights into what new functionality readers need (Tashman & Edwards, 2011). This may result in novel ideas and technologies, but it remains unclear whether new systems have truly addressed the functions that learners want and the difficulties they face in their actual active reading tasks.

Finally, traditional descriptions of active reading aren't always sufficient for expressing what learners are actually trying to accomplish in the interactive digital environment. For example, when multimedia content is seamlessly integrated with narrative text in the context of a tablet textbook, learners must *read* text, *watch* video, and *listen* to audio. Although a great deal of research has addressed audiovisual annotation alone, none has adequately identified key requirements for systems to effectively support active reading in an integrated multimedia environment like the tablet textbook. Early definitions of active, responsive, and work-related reading are certainly applicable to the interactive, multimedia tablet environment. However, we must advance our understanding of these structures so they can both inform future research directions and continue to grow and evolve from a strengthened understanding of what it means to read, study, and learn in the digital age.

It is worth noting that prior literature has identified four distinct types of physical active reading activities (illustrated in Figure 1): annotating (e.g., highlighting or taking notes), reorganizing (e.g., outlining or making study aids), cross-referencing (e.g., flipping back and forth between sections of a text or different texts), and browsing (e.g., reviewing a collection of annotations or revisiting portions of a larger work) (Aubert, Champin, Prié & Richard, 2008). These activities and the related cognitive activities learners engage in while reading often represent a fluid and integrated process.

Figure 1. Active reading generally involves four actions: annotation (e.g., highlighting, note taking), reorganization (e.g., outlining, summarizing), cross-referencing (e.g., working back and forth among documents, annotations, etc.), and browsing (e.g., studying artifacts developed during the other phases)



MULTIMEDIA ACTIVE READING

The active reading behaviors and strategies learners exhibit in the interactive, digital space are markedly different than in the traditional print environment. Of course, digital devices – e.g., desktop computers, eReaders, tablets, mobile phones, etc. – invite different modes of interactivity. For example, touch-screen devices involve different interaction patterns than desktop computers. Likewise, learners engage with narrative text differently than they do with audiovisuals. Thus, the particular affordances and content models offered by a specific platform may directly affect the active reading experience.

Specifically, tablet textbooks introduce three novel facets of content and engagement that fundamentally change the active reading experience. First, complex multimedia, such as audio, video, and interactive information graphics, are integrated with expository text, offering a number of very different presentation and consumption methods for educational content. Second, a learner's interaction with the tablet textbook changes dramatically, as multimedia content, touch-screen interactivity, and digital annotation mechanics represent a considerable departure from paper page turning and hand-written annotations. Third, the tablet textbook becomes an intelligent agent that automatically reorganizes and concatenates a leaner's annotations. Thus, as we consider how to characterize active reading in the digital age, it is necessary to build new active reading models that are conceptualized with a specific type of device in mind.

SOLUTIONS AND RECOMMENDATIONS

Multimedia Active Reading is offered as an extension to our understanding of active reading and specifically focuses on the key characteristics of reading interactive, multimedia tablet textbooks. *Multimedia Active Reading* includes three new conceptual approaches to understanding digital active reading: *Interactive Reading, Integrated Reading, and Structurally Augmented Reading*. These novel characterizations of active reading are explained in the sections that follow and envisioned with key learner behaviors and the natural affordances of the touch screen tablet in mind.

Interactive Reading: Balancing Mechanical Interaction, Annotation Tasks, and Comprehension

In the tablet textbook environment, learners interact with the mechanical affordances of the device while annotating and studying content. However, a notable duality exists, in that interactivity can either be distracting or helpful. One hand, mechanical interaction can keep learners engaged, focused, and interested in the study activity. On the other hand, it can also introduce a tension between the necessary focus on comprehending content and the required physical activities associated with interactive features, such as tapping and swiping. Thus, *Interactive Reading* is characterized by the need for learners to equally balance mechanical interaction with a device and an uninterrupted focus on reading comprehension.

Evidence that learners often are distracted by the mechanics of interactive content was pervasive prior research meant to understand learner behaviors during the tablet textbook experience (blind cite). Such distractions first surfaced in the preliminary exploratory study through observations and learner feedback. Participants noted that video annotation was particularly complicated due to the fact that in order to carefully study instructional video, learners had to frequently pause, rewind, fast-forward, and/or replay portions of longer videos to effectively make notes over important information therein. Prolonged or repeated interaction was perceived merely as mechanical overhead that in no way supported active reading, but rather, became potentially distracting and cumbersome. In short, all that time spent tapping, swiping, pausing, rewinding, and re-watching often pulls learners away from focusing on the information. At the same time, participants were generally positive about the increased interactivity that tablet textbooks provide, saying interactivity was "engaging" and encouraged learners to "stay focused on content" and "make better notes that [they] normally would with paper and pencil." These results suggest a paradox for active reading in the tablet environment. On one hand, some interactive annotation and navigation features may be engaging, helpful, and even fun. On the other hand, if these features are designed in a way that requires too much superfluous mechanical interaction, they are likely to be frustrating, distracting, and even a detriment to meaningful learning.

Thus, tablet textbooks must provide built-in, interactive annotation and study tools that adhere to three main principles:

1. Annotation tools should be aligned to and appropriate for the interactive instrument/device.
2. Mechanical interaction that is merely functional overhead should be minimized.
3. Interactivity should facilitate engagement and hold attention.

While there are an uncountable number of design solutions to achieve these goals, systems that capitalize on touch screen interaction, as well as minimize unnecessary interaction allow learners to take a greater number of notes, over a variety of media formats, with fewer button taps, swipes or other types of interaction, keeping them more focused on active reading and less distracted by system mechanics.

Integrated Reading: Synthesizing and Effectively Cross-Referencing and/or Browsing Information Delivered in Multiple Media Formats

When multimedia content is integrated with narrative text in tablet textbooks, learners need to synthesize information delivered across all media formats. To support active reading across a diverse range of media content, learners must leverage tools that enable them to study video, audio, images, etc. as comprehensively as they do traditional narrative text. The seamless integration of audiovisuals in tablet textbooks requires a much more nuanced analysis than would be possible if the text-based and audiovisual content are considered separate, unrelated entities. Therefore, *Integrated Reading* involves a learner's need to conceptually and cognitively make connections between an individual annotation and the media source from which it was derived to stimulate memory and recall. *Integrated Reading* is also functionally tied to both cross-referencing and browsing, as learners attempt to engage in multimedia synthesis during both of these active reading tasks.

First, an internal cross-referencing occurs during active reading with tablet textbooks that involves more than simply working back and forth between the body of the text and one's annotations. This was observed during an exploratory study, as learners often marked their notes to indicate the type of media format the annotation was associated with (i.e., video or graphic), and then articulated the necessity for this behavior in order to "remember more of the information later" (blind cite). Furthermore, several learners made sketches on paper while watching videos and animations in an attempt to capture the visual frames in their notes. Again, this behavior is evidence of the need for learners to conceptually level and synthesize information from multimedia content. Second, this need to mentally map annotations to their sources was also present during browsing activities when learners are reviewing and studying annotations. In the exploratory study, participants often indicated that it was difficult to make sense of the concatenated list of annotations because they were not meaningfully organized.

To combat this issue tablet textbooks must be designed to support learners in their efforts to easily browse and cross-reference annotations to related media sources and adhere to two main principles:

1. Complexity introduced by multimedia presentations should be leveraged to stimulate memory.
2. Conceptual cues and categorical organization of annotations should be used to stimulate memory and facilitate orientation and/or recall.

By way of example, tablet textbook might achieve both goals by implementing visual cues, such as color coding and icons, to help identify the media format from which an annotation originated. This way, when learners view all of their annotations in one concatenated list, these visual cues are prominent ways of indicating from where each note was derived. Furthermore, as learners make annotations, the system might automatically tag, classify, and organize them according to media type. This way, the learner can later filter and browse annotations categorically, which may stimulate better mental organization, memory, and recall. In a study that tested these ideas (blind cite), several participants indicated that filtering by media type helped them "stay mentally organized" and "remember information from the videos" better than browsing one long list of annotations.

Structurally Augmented Reading: Capitalizing on the Potential for Automatic Reorganization to Support Easy Browsing, While Preserving the Value of Personalization

During active reading, learners must organize their annotations and notes in personally meaningful ways; and most tablet textbooks provide some level of automatic reorganization that is materialized in concatenated collection of annotations. Thus, an effective tool must support meaningful browsing of annotations by anticipating organizational schemas that learners find intuitive. Furthermore, tablet textbooks should provide a structured view of annotations that can be used to do more open-ended, personalized note making on paper. In other words, meaningful organizational structures can serve as a pre-scaffolding for paper notes made after initial annotations have been collected in one place. Thus, *Structurally Augmented Reading* is characterized as a learner's ability to take advantage of automated reorganization tools to augment their usual study habits.

It also worth noting that although automatic reorganization has the potential to introduce new levels of efficiency, systems that automate tasks also have the potential to eliminate significant personal agency. For example, the very physical nature of many active reading tasks–e.g., "writing information in my own words"; making outlines, lists, flash cards, and other artifacts; and highlighting or otherwise marking a text–is often inextricably linked with memory and recall. In other words, manually building a personalized representation of one's annotation is, in its own right, a form of active reading.

To address these concerns, tablet textbook designs must consider two main principles:

1. Reorganization tools should be designed to anticipate structural schemas and organizational cues that are intuitive and useful to learners.
2. Learners should be encouraged to also work outside of the system to build personally meaningful study aids in concert with those built into the tablet textbook system.

Thus, tablet textbooks should provide learners with a fair amount of choice regarding how they browse their notes, while still conforming to the mechanics of the tablet textbook environment. For example, filtering capabilities that allow learners to browse notes by topic, media type or annotation type, to name a few, may facilitate more personal agency than offering only one format for viewing annotations. Furthermore, in a study that tested these ideas, participants indicated a desire to use *both* tablet textbook annotation tools *and* pencil and paper notes to build personally meaningful study guides. This indicates that the presence of automated features may provide learners with more time to devote to active reading strategies both in and outside of the textbook environment. Table 2 revisits prior characterizations of active reading with the addition of Multimedia Active Reading on Tablet Textbooks.

Significance of Contribution

Multimedia Active Reading focuses specifically on the key characteristics of active reading with textbooks on interactive, multimedia, touch screen tablet devices. This model is both an extension of prior efforts to characterize active reading, as well as a framework for better understanding the most significant challenges, tensions, and shortcomings learners face when annotating and studying educational material in the tablet textbook environment. Thus, the significance of this contribution is twofold:

Table 2. Multimedia active reading on tablet textbooks includes three main types of reading–Interactive Reading, Integrated Reading, and Structurally Augmented Reading–that represent the key characteristics of active reading in the tablet textbook environment

Active Reading Adler & Van Doren, 1972	Responsive Reading Pugh, 1978	Work-Related Reading Adler et al., 1998	Multimedia Active Reading on Tablet Textbooks
Structural Reading Reading to understand the structure and purpose of a text **Interpretative Reading** Reading to understand author's arguments, special phrases, terms **Critical Reading** Reading to judge the merit and accuracy of a text	**Linearly progressing** through the text without interruption (i.e., receptive reading) **Reading to search** for a specific piece of information **Reading to acquire** information without a set goal **Reading to get an overview** about the general structure of the material **Note taking,** annotation, and cross-referencing	Reading that happens more frequently **with writing** than without Reading that is **performed across several documents or displays** concurrently	**Interactive Reading** Reading that requires careful balance between mechanical interaction with a device and an uninterrupted focus on comprehension **Integrated Reading** Reading that involves a learner's need to cognitively connect annotations to media sources to stimulate recall **Structurally Augmented Reading** Reading that takes advantage of reorganization tools to maximize efficiency and/or augment traditional study habits

First, *Multimedia Active Reading* provides active reading scholars with a framework for better understanding what it means to study in the tablet textbook environment that is both grounded in active reading theory and based on learner behaviors, preferences, and performances in natural study sessions. The use of iPad, Android, and other tablet devices continues to become more prevalent in educational settings, and tablet textbook development is increasing. Thus, the *Multimedia Active Reading* model helps us better understand how the affordances of tablet devices may lead to unique user experiences and learning scenarios. Furthermore, this extension to the active reading framework asserts that contemporary notions of active reading must consider how individual technologies affect the active reading process.

Second, this new model characterizes how specific interaction patterns and design affordances for tablet textbooks affect active reading. In this regard, *Multimedia Active Reading* can also serve as a set guidelines for tablet textbook authors, designers, developers, and publishers who wish to provide learners with unique, engaging, and effective learning experiences.

FUTURE RESEARCH DIRECTIONS

Certainly, there are an uncountable number of design solutions that could potentially improve active reading support in tablet textbook environments. Thus, one very broad direction for future research would be to continue to efforts to identify novel active reading behaviors and related design solutions for tablet textbooks. Furthermore, although the research that predicated this chapter focused primarily on tablet textbooks, an individual textbook is rarely designed for reading on a single device. Thus, a truly comprehensive active reading system would adapt active reading features for an individual textbook across several different devices, from tablets, to desktop computers, and the like. In light of this, future work might explore how the *Multimedia Active Reading* framework might be adapted for texts that provide integrated multimedia content across a variety of platforms. Such research may also uncover new behaviors and challenges for learners engaged in multimedia active reading on other digital devices.

CONCLUSION

This chapter articulates an extension to the active reading framework that better captures the activities and behaviors of learners in the tablet textbook environment. This is important because in 2016 and beyond, active reading cannot be effectively conceptualized as an activity that is independent of technology and separate from the platform on which it occurs. In other words, the active reading process and the device being used (i.e., traditional textbook, desktop computer, tablet device, etc.) are inextricably linked. Thus, as we consider how to characterize active reading in the digital age, it is also necessary to build new active reading models that are conceptualized with a specific type of device in mind.

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KEY TERMS AND DEFINITIONS

Active Reading: The cognitive and physical strategies a reader uses to understand, annotate and critically engage with a printed or digital document.

Integrated Reading: Synthesizing and effectively cross-referencing and/or browsing information delivered in multiple media formats.

Interactive Reading: Balancing mechanical interaction, annotation tasks, and comprehension.

Multimedia Active Reading: A set of characteristics that focuses on the emergent nature of active reading with interactive, multimedia tablet textbooks.

Multimedia Content: Audiovisuals, interactive graphics, animations, photo galleries and other types of interactive media.

Structurally Augmented Reading: Capitalizing on the potential for automatic reorganization to support easy browsing, while preserving the value of personalization.

Tablet Textbook: A digital textbook specifically designed for tablet devices–such as the Apple iPad or Samsung Galaxy–that blends the structure of a traditional book with additional multimedia content, such as *audio, video, animations, interactive graphics*, and the like.

Chapter 15
Instructional Strategies for Game-Based Learning

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ABSTRACT

Although it could be assumed that playing games lifts intrinsic motivation and that this must have an effect on the cognitive processes of the player, it is still not known how to develop an educational game with the same positive effects. Thus, the challenge for GBL is rather significant in determining how to design and develop good educational games and how to integrate them into the teaching and learning process so that students' motivation and learning are qualitatively improved. This chapter's main objectives are to describe some of the current GBL models proposed by the literature used to analyze, design, and integrate games in education and, on the other, to propose and describe a methodology developed by the author to create educational games. The assumption is that this type of information could aid instructional designers and educators—and even commercial game designers—interested in developing good GBL experiences.

INTRODUCTION

As in the past, there are many challenges facing education today. However, due to the current complex global state of affairs, all countries—industrialized, developing, or underdeveloped—face the central challenge of forming citizens who require novel sets of abilities to achieve more fulfilling lives. To this end, many innovations have been emerging in education, most of them integrating some use of information and communication technologies, such as MOOCs (massive open online courses), MUVES (multi-user virtual environments), virtual worlds, augmented and virtual reality, electronic games, and original on-line learning experiences like those offered by the Khan Academy or Codeacademy. Although there are diverse views regarding the quality of learning that these technologies have achieved, most share a fresh learning perspective: they properly presuppose an active learner. It could be argued that this assumption falls within the constructivist stance because social constructivism also assumes that knowledge is constructed during active social and situated experiences. Among these innovative instructional technologies,

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one that has captured the interest of many educational practitioners and researchers around the world is game-based learning (GBL), which is the integration of educational games into the teaching and learning process. Wu, Hsiao, Wu, Lin, and Huang (2012) define GBL succinctly as “learning through the game” (p. 269). This generalized interest in the use of games by the educational community is mainly due to the strong motivational affordances that games possess to hold players’ engagement in accomplishing tasks for long periods of time (Tobias, Fletcher, & Wind, 2013). When a person is deeply involved in playing a video game for several hours, it can be assumed that that person is intrinsically motivated because he or she is mostly “doing an activity for the inherent satisfaction of the activity itself” (Ryan & Deci, 2000, p. 71). This is the kind of motivation that educators and learning designers wish for in their students because it has a positive effect on learning by promoting action in students. However, although it could be assumed that playing games lifts intrinsic motivation and that this must have an effect on the cognitive processes of the player, it is still not known how to develop an educational game with the same positive effects. It could be said that this last proposition is in part evidenced by the existence of many educational games (sometimes referred as edutainment) that do not motivate students and that are in fact, as commonly mentioned by other authors in games literature, just a chocolate-covered piece of broccoli (Farber, 2014). Thus, the challenge for GBL is rather significant in determining how to design and develop good educational games and how to integrate them into the teaching and learning process so that students’ motivation and learning are qualitatively improved.

The commercial gaming industry has been flourishing intensely for several decades, together with its methods for game design; however, when these methods are used to create educational games, authors van Staalduinen and de Freitas (2011) admit that they are not usually well integrated into pedagogical theory. In fact, Arnab et al. (2015) call this lack of integration of game and educational design as “One of the biggest issues with educational games to date” (p. 392). The issue here is that both are necessary conditions to have a good educational game: To be successful, the educational game must be capable of achieving the stated learning objectives (which often include the development of complex cognitive and behavioral abilities) as well as maintaining players’ engagement and motivation. This lack of integration is also evidenced by the educational games studies that do not explicitly state which pedagogical model they used to base their design decisions. For example, Kebritchi and Hirumi (2008) reviewed 55 educational games and found that only 24 reported in which pedagogical theory they were basing their design. Wu et al. (2012) conducted a meta-analysis study to explore how educational games were using learning theory in their analyses and found that 567 studies did not do it as opposed to 91 that did.

Thus, both frameworks—pedagogical and game design—are equally important (Rooney, 2012) because this divorce, as van Staalduinen and de Freitas (2011) put it, has important implications for the development of educational games that positively influence students’ quality of learning. However, although educational research is currently discussing how to better achieve this integration between game design and educational theory by proposing solid learning principles (e.g., Gee, 2013), both instructional designers and teachers still have many questions regarding how to create sound educational games and how to integrate them into everyday teaching contexts and practices. Many of the proposed models to develop educational games do not prescribe more specific, efficient, and low-cost development methodologies (Arnab & Clarke, 2015; Bellotti, Berta, De Gloria, D’Ursi, & Fiore, 2012). Therefore, this chapter parts from the premise that there is a need for more practical instructional strategies that could be applied to design and develop educational games.

Considering this need for innovative instructional strategies that integrate game design and pedagogy to foster better GBL practices, this chapter's main objectives are, on the one hand, to describe some of the current GBL models proposed by the literature used to analyze, design, and integrate games in education and, on the other, to propose and describe a methodology developed by the author to create educational games. The assumption is that this type of information could aid instructional designers and educators—and even commercial game designers—interested in developing good GBL experiences. This chapter's intention is to adhere and contribute to Jane McGonigal's "movement to harness the power of games for good" (McGonigal, 2011, Introduction, Section 2, para. 17), stated as part of her undertaking to make life better for people through the use of games.

GAME-BASED LEARNING MODELS

The research on GBL has evolved from inquiring as to whether games could have a positive effect on learning to identifying those conditions under which the quality of learning can be promoted or hindered by games (Clark, Tanner-Smith, & Killingsworth, 2014; Schrier, 2014; Van Eck, 2006). The more these conditions become clear, the more teachers will see games as useful learning resources that they could incorporate into their teaching styles and general practices. To achieve this, it is relevant to analyze some of the GBL models described in the literature.

Arnab et al. (2015) proposed one such model in which they underline the need for a framework that better structures the possible relations between learning components and game components. Accepting that this relationship is at times rather conflicting, they proposed a model based on the belief that "high-level pedagogical intents can be translated and implemented through low-level game mechanics" (p. 393). Their model, called Learning Mechanics and Game Mechanics (LM-GM), defines the key concept of Serious Game Mechanics (SGM; they use the term *serious game* instead of *educational game*) as a means to facilitate those designing decisions that aim to translate a certain learning objective into adequate elements of gameplay. Thus, an SGM links learning mechanics to game mechanics and could become a reoccurring pattern in different educational games. In this proposal, learning mechanics is understood as those learning strategies and practices suggested by learning and pedagogical theories; game mechanics is "something that connects players' actions with the purpose of the game and its main challenges" (Sicart, 2008, Introduction, para. 2). This model's holistic approach is proposed by its authors as a means to evaluate existing educational games, to explore how can they be integrated into learning settings, and to design new games. Although this model still needs more validation, it offers a clear explanation of the issue between learning and game design, and it can become a very useful and practical tool for designers and educators working in the field of GBL.

Another model created to support the analysis, design, and use of serious games is the Activity Theory-Based Model of Serious Games (ATMSG) developed by Carvalho et al. (2015). This model's main objective is to use activity theory as the base to examine how an educational game is structured. The authors compared their model to the LM-GM framework and stated that, although also valuable, the LM-GM model does not offer a sufficiently detailed analysis of the components of an educational game. In fact, this model offers a more exhaustive process to analyze an educational game's components by linking them with the game's stated learning objective. The ATMSG model also has a broader perspective because, by using activity theory as its underpinning, it conceptualizes a game as part of a complex system of activities performed by learners, teachers, and game designers, each one with different motives, depending on their learning or entertaining interests. An important contribution of this model is how it differentiates those teaching activities that happen intrinsically within the game from those extrinsic activities conducted by the teacher outside the game to complement learning. This last perspective is relevant because it includes in its investigative analysis not only the game itself but also its context of use. According to the authors, the ATMSG model has been examined and proved very useful as an analysis instrument to study existing educational games, but it still needs to be researched as a design tool to develop new games.

A very useful framework to better understand how games are selected and used in education is the four-dimensional framework developed by de Freitas and Oliver (2006). They emphasized the importance of considering the learning contexts and processes when selecting and using games; thus, their framework includes students, teachers, available resources, and representation modes. These four related dimensions are formed by considering (1) where learning takes place, such as in classrooms and other learning settings, including equipment and support; (2) the characteristics of learners, including their profiles and competencies; (3) the mode of representation of the game, such as how interactive it is, its level of fidelity (replicate reality), or being immersed within the game versus learning processes outside the game; and (4) the pedagogical aspects of the learning experience, such as theories, models, and learning approaches.

As an extension of the four-dimensional framework, van Staalduinen and de Freitas (2011) proposed a GBL framework to offer educational practitioners a more practical tool to design and analyze educational games. They proposed that this model emphasizes that, to truly integrate game design and instructional theory, there is a need to understand existing game design practices and a new learning perspective, one where learning is understood more as an immersive experience. Following from Kolb's experiential learning cycle (Kolb, 1984), they defined an effective learning experience as one where content and its application are clearly related. This gives the framework a constructivist perspective and thus establishes that knowledge is constructed during authentic learning experiences (similar to real-life situations), where learners play and engage in complex decision making and social interactions. The framework divides the design process in terms of learning, instruction, and assessment activities, integrating them with the four dimensions discussed in the de Freitas and Oliver (2006) model; that is, context, learner specifics, representation, and pedagogy. Van Staalduinen and de Freitas recommend that game designers first specify the content to be learned (the learning objectives and the game's goals) and then propose learning cycles in terms of learners' actions and the types of feedback given to those actions so that learners' engagement and learning can be promoted. Finally, designers should attend the assessment of the learning outcomes achieved during the actual playing of the game. The assessment should be conducted considering the game's scores and also through an after-game session where the teacher and students discuss the whole experience.

THE LUDU METHODOLOGY

After reviewing several frameworks and models, some described in the previous section of this chapter, the author created a methodology to develop educational games that intends to facilitate the integration of the use of games into teaching and learning practices. This methodology is now being validated by applying it to the creation of inexpensive educational board games working with different groups of high school teachers in the state of Puebla, Mexico.

The methodology is called LuDu (*to play* in Esperanto), and it seeks to serve as a practical and easy-to-follow resource for designers of educational games and for teachers using them in their everyday educational practices. The methodology proposes a set of instructional strategies assuming that the use of games in education increases the learners' quality of learning and that many educational contexts around the world do not have ample human and economic resources to develop complex digital games. Therefore, it is now being tested by having high school teachers apply it to design and develop inexpensive, but well pedagogically based, educational board games. In this way, a teacher, or a group of teachers, design, develop, apply, and evaluate the educational product.

LuDu was developed from constructivist pedagogy, mostly using its sociocultural perspective, which conceptualizes learning more in terms of its social, cultural, and historical aspects. In particular, the methodology strives to crystalize many notions taken from the situated learning paradigm, which assumes that the context affects human cognitive processes (Brown, Collins, & Duguid, 1989). This situated perspective sees learning as a complex system of social interactions with others, tools, and context (Wilson & Meyers, 2000) to solve authentic problems—authentic in the sense that they are similar to those solved by a certain community of professional practitioners, such as mathematicians or nurses. The activities done while engaging in this authentic problem-solving learning experience foster high-level cognitive processes in the learner and also allow for a process of enculturation to happen; that is, learners not only learn the content but also the culture around mathematicians, lawyers, or geographers.

The general structure of the LuDu methodology and its dynamics are divided into design and learning activities, respectively performed by the designer/teacher and the learner/player (see Figure 1). The first column in the methodology's structure gathers a group of instructional strategies divided into preproduction, production, and postproduction, which the designer/teacher could apply to create a complete educational game. The second column explains what learners/players would be doing during and after playing.

Following the LuDu methodology's strategies and dynamics, a teacher could design, build, and evaluate a complete GBL experience as discussed next.

Description of the instructional strategies proposed by the LuDu methodology.

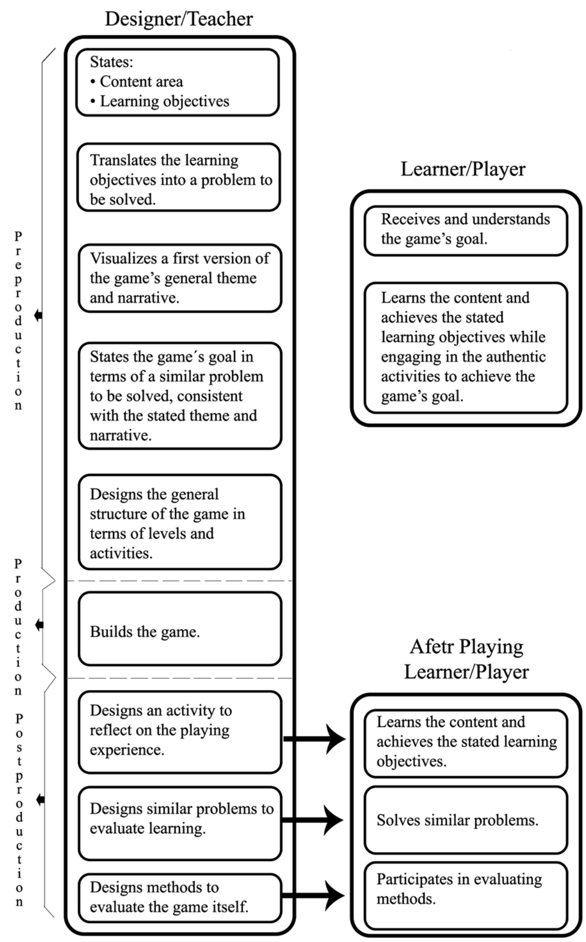
- With the first design activity, the designer/teacher states the learning objectives that she would like to achieve with her educational game. It is expected that these objectives are taken verbatim from her lesson plan. For example, let's assume that a geography teacher wants to create a board game using LuDu, and she starts by stating one or more learning objectives, for example: "Students will be able to describe the migration patterns of monarch butterflies by explaining seasonal and climate changes in Canada, the United States, and Mexico."
- Then she must translate this objective into a problem to be solved, for example: "Explain why although the number of monarch butterflies migrating from Canada to Mexico plunged in 2014, it has been improving during the last two years."
- Considering the learning objective and the problem, she now visualizes a general theme and a possible narrative for her game. For example, she imagines a board with the three countries and the students as professional geographers who have been asked by the United Nations to travel, following the 3,400-mile monarch butterflies' migration routes, along Canada, the United States, and Mexico, to understand and solve the problem of the declining numbers of butterflies during 2014.

- Then, considering the game components identified so far, she states her game's goal as follows: "During this game, you will be able to race and compete with other teams along the three countries of Canada, the United States, and Mexico to assist the United Nations in solving the monarch butterfly enigma."
- She now starts to sketch possible boards, and she draws a map with the three countries. In drawing the butterflies' routes, she identifies a starting point in Canada where players would begin to play; how they would throw the dice to move along the routes; how each route would have special points where students can read more about the monarch butterflies, about the problem, and about regional climates and common events, such as the use of herbicides in the United States and the excess of logging in Mexico, both of which affect the butterflies' migration habits; how players should answer questions; and how their answers would allow them to move forward or backward.
- Using paper, scissors, glue, and her computer and printer, she creates a simple board game.
- Finally, she designs an after-the-game learning experience where she will reflect together with her students on what they have learned about the monarch butterflies and the viability of their different solutions to the stated problem. For example, she can implement the focus group technique, where she asks students certain questions to foster their reflections about the content and the problem solved.
- She also designs a test where she will ask students to solve similar problems. Evaluating students' learning by asking them to solve similar problems is important because what they learned while playing is how to apply a certain content to solve a problem; it is very likely that they did not memorize the content verbatim. She can design a set of four new problems to be solved that would require the same content as the one learned during the game. For example: "Design an ideal route for the monarch butterfly that would increase its chances to travel safely along its migration journey from Canada to Mexico."
- She also designs an evaluation instrument to assess the game itself. For example, she can design a rubric and ask students to complete it. The rubric could include several dimensions, such as level of motivation while playing, understanding of the game's rules, relevancy of the problem, and the like.

With these strategies, the LuDu methodology believes that the integration of an educational game is facilitated because:

- Having the teacher also be the designer and developer of the game will give her more motivation and proficiency to incorporate it into her everyday teaching practices.
- By starting with a real learning objective from her lesson plan, the teacher is an expert in the content and knows the type of learning that her students need to pass the course.
- By aiming for her students to solve a problem, instead of just accomplishing a learning objective, learners are motivated while engaging in significant learning and ludic activities.
- The inclusion of game design elements and concepts becomes an integrated part of the process. Thus, instruction and game design are merged in an imperceptible way.

Figure 1. The general structure and dynamics of the LuDu methodology



CONCLUSION

This chapter described the frequent disconnect between game design and instructional design and how it adversely affects the development of GBL experiences. In order to delve into the subject, this chapter described several models proposed in the literature by known researchers as a way to solve this disconnect. Finally, the LuDu methodology, created by the author, is described in detail as a way to contribute to the solution of the stated issue, although with a different perspective; that is, LuDu intends to serve as a practical methodology for teachers who, although well versed in a certain content, are interested in using games as part of their everyday teaching activities but who do not have either experience in creating educational games or enough time and adequate economical and technical resources.

There is no doubt that the creation of these models and frameworks to develop GBL is an important task in the current educational research; however, researchers must be careful not to assume that the process of using and creating an educational game could become a very precise type of algorithm. In general, teaching strategies stated more as recipes do not correspond very well with the complexities of human learning.

The validation of the LuDu methodology is still in its first phases. Having tested it with different groups of high school teachers already, some results are starting to emerge. For example, teachers feel rather bored when following a step-by-step process during the preproduction stage but are very motivated when building their own board games. In addition, although they like the idea of using games in their teaching, they expressed concerns regarding the time employed to create them. These results have important implications for the possible ways to train teachers so that they adopt the methodology to best meet their needs. There is still much research work to do regarding the LuDu methodology; for instance, it still needs to be evaluated by applying it to the development of digital educational games, which offer different affordances and thus require different design considerations.

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KEY TERMS AND DEFINITIONS

Constructivist Pedagogy: A set of principles based in the constructivist theory of how humans construct knowledge. It is based on the idea that knowledge is constructed during experience, such as real-world problem solving, and by reflecting on those experiences.

Edutainment: Games produced mainly to be entertaining but that also look to achieve certain learning objectives at the same time.

Game-Based Learning: The integration of educational games into the teaching and learning process.

Game Design: A strategic process to create a game for entertainment or educational purposes.

Instructional Design: A strategic process to create instruction that is stated in terms of methods that seek to facilitate the learning of knowledge, skills, and attitudes.

Instructional Strategy: A method used to design instruction that seeks to facilitate the learning of certain content.

Serious Game: A game that has as its main objective that players learn certain content. It also strives to be entertaining but not as its main objective.

Chapter 16
The Fundamentals of Game-Based Learning

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ABSTRACT

This chapter explains the overview of Game-Based Learning (GBL) and the significance of GBL in global education. The aim of GBL is to teach something while the students are playing. As the cost-effective and highly engaging learning method, GBL has the potential to motivate students and offer custom learning experiences while promoting long-term memory and providing practical experiences. GBL facilitates student engagement, motivation, and immediate feedback, toward bringing educational success into the modern learning environments. Regarding GBL, goal-directed practice coupled with targeted feedback enhances the quality of students' learning. GBL provides the learning opportunities that engage students in the interactive instruction and helps prepare them to participate in the technological society of the 21st century.

INTRODUCTION

From primary and secondary educational levels to higher education and lifelong learning, the use of games for educational purposes has become a focus of increasing interest for instructional designers, teachers, and researchers (Romero & Usart, 2013). The ability of educational leaders to exploit knowledge assets is essential in order to gain the capability of lifelong learning and knowledge management in higher education institutions (Kasemsap, 2016a). Learning through games is a promising field for the future of education (Ebner & Spot, 2016). The use of electronic games for educational purposes tends to relate to practicality and feasibility (Tan, Johnston-Wilder, & Neill, 2011). The difference in country-specific curricula, pedagogy, and practice highlights the technological requirement for a flexible approach of embedding digital games into primary classrooms in a way that is sensitive to context (Allsop & Jessel, 2015).

Educational computer games can motivate students to develop the basic competencies and encourage challenging themselves to be better and learn the additional knowledge related to the important

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tasks (Kasemsap, 2017a) and can provide the great potential as an active form of knowledge transfer (Minovic, Štavljanin, Milovanovic, & Starcevic, 2012). The interactive power of digital games makes them a compelling tool for teaching and learning (Liu & Li, 2015). GBL can contribute to increasing students' cognitive skills, academic performance, and motivation in learning (Huh, 2008). The diffusion of GBL can be facilitated only if both learners' and teachers' needs and goals are taken into account (Ketamo, Kiili, Arnab, & Dunwell, 2013).

This chapter focuses on the literature review through a thorough literature consolidation of GBL. The extensive literature of GBL provides a contribution to practitioners and researchers by explaining the theory and applications of GBL in order to maximize the educational impact of GBL in global education.

BACKGROUND

Digital technologies have been growing in diversity and the possibilities they offer have increased, providing new opportunities for the transmission of knowledge (Leitão, Rodrigues, & Marcos, 2014). The term game-based learning (GBL) includes all of the following items: serious games, instructional games, instructional video games, instructional computer games, structuring learning experiences in a gaming environment, and education games when used in an educational environment (Vu, Fredrickson, Hoehner, & Ziebarth-Bovill, 2016). While an increasing number of students are using educational games to learn in the informal environments, their acceptance in the classroom as an instructional activity has been mixed (Kenny & McDaniel, 2011).

The right balance between educational requirements and motivational factors should be achieved in order to ensure an enjoyable and effective GBL experience (Toro-Troconis & Partridge, 2010). Technology and games have yielded positive results concerning motivation, persistence, curiosity, attention, and attitude toward learning (Shin, Sutherland, Norris, & Soloway, 2012). Instructional games are created when training is added to a gaming environment or when gaming aspects are incorporated into training (O'Connor & Menaker, 2008). Educational games can provide students with a motivating and stimulating environment while providing them with immediate feedback to promote learning (Bodnar, Anastasio, Enszer, & Burkey, 2016).

THEORY AND APPLICATIONS OF GAME-BASED LEARNING

This section provides the overview of GBL and the significance of GBL in global education.

Overview of Game-Based Learning

The interest in GBL has rapidly grown over the past decade (Martinez-Garza & Clark, 2013). A new interest in the use of video games for learning has emerged, and a number of claims are made with respect to the effectiveness of games in education (Vandercruysse, Vandewaetere, & Clarebout, 2012). Traditional lectures are more effective in increasing student knowledge, whereas educational games are more effective for student enjoyment (Charlier & de Fraine, 2013). Educators face three main challenges when integrating games, including curriculum integration, technical requirements, and teacher training (Kebritchi, Hirumi, Kappers, & Henry, 2009).

Özkan-Czerkawski (2012) defined GBL as a branch of serious games that refers to the learning outcomes that are achieved through games. Serious games open up many new opportunities for complex skill learning in higher education (Westera, Nadolski, Hummel, & Wopereis, 2008). GBL is the actual game used in the classroom to enhance both learning and teaching (Wiggins, 2016). Gamification involves the application of game-design thinking and play elements to non-game activities, such as routine homework and classroom lessons (Abrams & Walsh, 2014). The utilization of gamification can turn an existing curriculum into the GBL environment (Kingsley & Grabner-Hagen, 2015).

Gaming is a very natural way of self-directed learning during a phase in life, which is the stage of cognitive development (Kelle, Sigurðarson, Westera, & Specht, 2011). The key advantage of educational games is their immersive and motivational potential (Kickmeier-Rust & Albert, 2010). Effective content design is crucial to the success of GBL (Hong, Cheng, Hwang, Lee, & Chang, 2009). GBL enables both teachers and students to get a new perspective on learning, as well as enhance knowledge transfer, thus offering both hands-on practice and chances for increasing the 21st century skills (Ott, Popescu, Stanescu, & de Freitas, 2013).

Significance of Game-Based Learning in Global Education

GBL can enhance the flow experience in learning and in pure games (Lai, Chu, Liu, Yang, & Chen, 2013). The proliferation of mobile devices (e.g., smartphones and tablets) can support higher education institutions (HEIs) toward adopting GBL practices (Kasimati, Mysirlaki, Bouta, & Paraskeva, 2015). Using mobile games in education can enhance the active learning with fun in an effective manner (Huizenga, Admiraal, Akkerman, & Dam, 2009). Students and teachers in the game-based course provided more reasons for student motivation along with more desirable, more helpful, and less hindering aspects compared to students and teachers in the non-game-based course (Hess & Gunter, 2013).

Educational games are utilized to teach content in a variety of courses from elementary to graduate education (Martinson & Chu, 2009). Games can help students learn to solve problems, analyze data, test hypotheses, and engage in educational discussions (Gros, 2010). The inclusion of games in the formal curriculum helps students experience how GBL can contribute to teaching and learning, improves self-confidence on technological skills, and encourages the students to utilize GBL in their educational activities (Charlier & de Fraine, 2012).

GBL includes the elements of competition, engagement, and immediate reward (Chu, 2009). GBL promotes an immersive and stimulating pattern of learning that facilitates learner engagement and motivation (Pappa et al., 2011). User engagement strategies from the viewpoints of GBL and virtual worlds are recognized for affording the immersive learning experiences for autonomous learners (Huang, Li, & Lin, 2013). Educational game designers should make the purposeful design efforts to create the learner-adaptive engagement (Ke & Abras, 2013) and should carefully consider how to embed instruction in the game narrative (van der Spek, van Oostendorp, & Ch. Meyer, 2013).

Concerning educational gaming advocates, the engaging nature of games encourages the enhanced attention to the learning outcomes among players (Sherry, 2013). The combination of fun and engagement in digital games with the potential of learning useful skills has made digital game a promising opportunity as the educational tool in the interactive learning environments (Toprac, 2011). Teachers' inability to use games is compounded by the lack of teacher education programs that focus on developing teacher competence in adopting GBL, particularly at the preservice level (Foster, Shah, & Duvall, 2015).

FUTURE RESEARCH DIRECTIONS

The classification of the extensive literature in the domains of GBL will provide the potential opportunities for future research. E-learning allows students to choose the learning content and tools appropriate to their differing interests, needs, and skill levels (Kasemsap, 2016b). Web-based learning (WBL) supports the open learning concept by providing students with the ability to connect to the educational resources when it is convenient for them, and allowing students to explore the educational resources in an effective order that suits their educational needs (Kasemsap, 2016c). Organizational learning is the organization-wide continuous process that enhances its collective ability to accept, make sense of, and respond to the internal and external changes (Kasemsap, 2017b). An examination of linkages among GBL, e-learning, WBL, and organizational learning in the modern learning environments would seem to be viable for future research efforts.

Management education is the process of teaching or learning, especially in a school or college, regarding management perspectives (Kasemsap, 2017c). It is essential to emphasize the academic way of educating preservice teachers, future teachers, and novice teachers toward obtaining the theoretical and practical knowledge before entering the teaching profession (Kasemsap, 2017d). Teacher professional development (TPD) provides time, resources, and educational personnel to effectively support teachers to improve their knowledge and skills about teaching and learning (Kasemsap, 2017e). Critical thinking involves reviewing the results of the application of decisions made and implementing change where possible (Kasemsap, 2017f). Promoting management education, teacher education, TPD, and critical thinking through the utilization of GBL should be further studied.

CONCLUSION

This chapter highlighted the overview of GBL and the significance of GBL in global education. The aim of GBL is to teach something while the students are playing. As the cost-effective and highly engaging learning method, GBL has the potential to motivate students and offer custom learning experiences while promoting long-term memory and providing practical experiences. GBL uses competitive exercises, either pitting the students against each other or getting them to challenge themselves in order to motivate them to learn better. In order to create an effectively educational game, the instructor needs to ensure that GBL will be suitable to students' educational requirements.

GBL motivates students to learn, immerses them in the learning materials, and encourages them to learn from their mistakes. GBL enhances the classroom learning environment by increasing opportunities to develop a decision-making process and to enhance both problem-solving and critical thinking skills toward various aspects of life. Regarding GBL, goal-directed practice coupled with targeted feedback enhances the quality of students' learning. GBL provides the learning opportunities that engage students in the interactive instruction and helps prepare them to participate in the technological society of the 21st century. Promoting GBL has the potential to enhance educational performance and reach strategic goals in global education.

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KEY TERMS AND DEFINITIONS

Education: The knowledge or skill obtained or developed by a learning process.

Game-Based Learning (GBL): The use of video games to support teaching and learning.

Gamification: The practice of making activities more like games in order to make them more interesting or enjoyable.

Knowledge: Familiarity, awareness, or understanding gained through experience or study.

Learning: Knowledge acquired by systematic study in any field of educational application.

Skill: Proficiency, facility, or dexterity that is acquired or developed through training or experience.

Technology: The utilization of scientific knowledge to solve the practical problems, especially in industry and commerce.

Training: The process or experience of being trained.

Chapter 17
Impact of Kinect Exergame on Mental Computation Speed and Achievement

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ABSTRACT

The aim of this study was to investigate the effects of kinesthetic educational game on students' mental computation speed and achievement. The participants were 63 students. The working group was divided into two separate groups as experimental and control groups. The pre-test developed by the researchers was applied to measure prior knowledge of the students in the beginning of the experimental process. In the following eight weeks, computer-based and kinesthetic educational games were applied to the experimental and control group. During playing the games, number of correct answers and completion time were recorded and the post-test was applied. According to results, the mathematical performance and mental computation speed of the experimental group is higher than the performance and speed of the control group. When the findings about the game completion time of experimental group evaluated, the time of the first game is longer than the time of the last game. And also, the scores of the last game is higher than the scores of the first game.

INTRODUCTION

Today's children have grown up with the opportunities of the internet and digital technology. They have new technological tools such as podcasts, cell phones, iPods, skype and iPads. We begin to understand that processing information, learning, socializing and playing games of this generation meeting technology at an early age are different from our generation. The student generation called "Digital Natives" or "The N Generation" finds technological tools such as developing video games and the internet engaging (Prensky, 2001). In the last decade, computer and video games have been popular especially among

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children and young people. According to surveys performed with young people in various countries, it is revealed that children expend most of their time in media (Blumberg, Blades, & Oates, 2013). Chen (2007) reveals that the annual income of video game industry containing game playing population with 10-34 years old people is as high as 15 billion in the United States. In the study conducted by Rideout, Foehr, and Roberts (2010), they state that average time of playing video game is about 1.15 hours among the American young people between 8 and 18 years old and the time period used for playing game has been rising recently; 24 min. in 1999, 49 min. 2004 and 73 min. in 2009. Vandercammen and Vandenbrande (2011) reported that the time per day spent for game by Belgian youngsters is about 1.20 hour while the time is 1.61 for Dutch youngsters. Gentile et al., 2011stated that 83% of adolescents and children play game at least time to time in Singapore in 2011. In addition, it was revealed that online games were played by more than half of junior high school Taiwanese students (Tarng & Tsai, 2010). On the other hand, a rapid increase in the number of digital player profile is observed in Turkey.

Game-Based Learning

For hundred years, people around the world have enjoyed all kinds of games from the simplest one to the most difficult game and they are successful in terms of being appealing, entertaining and attractive for our attention. A game can be described as 'a mental or physical contest or activity with rules which people play for entertainment (Merriam-Webster, 2015). As simply defined, games are specified as mental or physical activities with their own rules which function for success of player. Popularity of games among people attracted the attention of researchers and government offices and the usability of games for educational and instructional purposes became a subject of research. This led to the development of serious games (Davis & Whittinghill, 2011). Serious games can be defined as 'a game played for the purposes of instruction, training, education and other practical issues rather than complete entertainment objectives' (Susi, Johannesson & Backland, 2007). The first educational use of digital games was seen in 1971 when the game *The Oregon Trail* was created by three Carleton College students and the game was then put on the market in the state and general public by the Minnesota Educational Computer Consortium (MECC). Other classis games including *Lemonade Stand* (1973, 1979), *Snooper Troops* (1982), *Where in the World is Carmen Sandiego* (1985), *Math Blaster* (1986), and *Jumpstart* (1994) displayed the alternative choices for learning instead of laboratory activities and traditional classroom lectures (Cheng, 2014).

Many studies are conducted about how the efficiency of educational computer games will be when they are used as a learning tool. The results of the studies reveal that using games in learning increases learners' motivation, engagement, interest, higher order thinking skills, achievement and learning (Ketelhut, et al., 2006; Prensky & Thiagarajan, 2007). Playing a game does not only charm us but also needs skills such as time management, critical thinking, solving a problem and other educational activities due to the rules placed in games (Gee, 2008; Prensky, 2007). Gee (2003) suggests that students already have these abilities and thus they require being located in a game platform. Even if students have these skills, they do not demonstrate them in a traditional classroom learning environment at schools. The students having no interest in classroom and no willing to learn can play the games that are cognitively challenging and exhausting for hours outside school (Gee, 2003; Prensky, 2007).

Well then, although students can be eagerly absorbed with high level cognitive processing during game playing, why can't they do this in classroom environment? Marc Prensky (2007) explains this situation in detail like that games fascinate us because they are different, interactive, entertaining, obtain open objectives, help learning via feedbacks and results, make us watch their charming stories and combine contest, struggle and difficulty. Besides, it is expected that affective and cognitive impacts are stimulated by games via gathering internal motivation sources such as control, wonder, imagination and struggle as a need of its own nature (Malone, 1980; Malone & Lepper, 1987). During playing game, knowledge is actively experienced by players rather than passive acquisition (Squire, 2005; Barab, et al., 2012). From this point, integration of learning content into game improves learning by interaction, significant experiments and learning principles inherent in games (Prensky, 2007; Gee, 2008).

In the study conducted with secondary school students (N = 876) by Marino et al., (2012), they reveal that learning science course from computer game is preferred by all students instead of laboratory based applications, internet based platforms or schoolbooks. Wouters and co-workers (2013) highlighted that serious games have high efficiency in terms of learning and retention. Therefore, researches are conducted on the educational potential of game-based learning as a tool which can develop expected educational capability of the individuals due to its feature of being able to provide various educational skills potential inherent in it. Especially game-based learning platforms are able to integrate skills and learning content in a single game structure for enhancing affective and cognitive skills established by the gameplay of the game mentioning pedagogical objectives.

Exergames

Exergaming is formed from the mixture of 'Exercise' and 'Gaming' words which implies a new generation game playing structure where game players use their motor movements instead of being immobile and in a sitting position like in conventional button click gaming structure (Best, 2013). Despite their existence since 1980s, the anticipated commercial profit could not be achieved possibly due to low interface property and high prices. Thereafter, the advancement in sensor and wireless technologies led to decline in the prices of exergames and they became available even in people's homes. The Wii with a wireless remote in accelerometers and optical sensors for measurement of arm rotation and motion was introduced in 2006 by Nintendo. This tool allowed people to move their arms forward, wave and spin during gaming in home environment. In 2010, a peripheral called Kinect connected to Xbox 360 with a cable was introduced by Microsoft and it allowed external control. Kinect works with optic sensors that follow player's motions three-dimensionally. This provides transfer of player's motions such as running, jumping and squatting into a virtual environment. According to the results of a national U.S. survey performed in 2010, it seems that exergames are played by about 40% of high school students (U.S. grades 9-12) at least 1 day per week (Fulton, Song, Carroll, & Lee, 2012). Adolescents and children are regularly being part of Exergaming in the world. Therefore, the effects of Exergaming on adolescents and children are extensively being investigated by educators. The greater part of the studies about this topic have focused on the facts that energy consumption of youth and regular physical activity are increased with Exergaming and physical fitness is positively affected by it (e.g., Baranowski et al., 2012; Daley, 2009). Screening the literature reveals that although the number of researches have risen, the researches about the effects of Exergaming on the cognitive functions of youth especially within the domain of administrative function are limited (e.g., Best, 2012; Staiano, Abraham, & Calvert, 2012).

What type of experiences supporting the cognitive development of adolescents and children is a substantial topic of study for psychological researchers? The studies commonly reveal that weaker cognitive function and low academic achievement were observed in the youth having less physical activity than their thinner peers (Li, Dai, Jackson, & Zhang, (2008); Taras & Potts-Datema, 2005). The empirical results demonstrate that cognitive function of children is enhanced by the aerobic exercises implemented at medium density especially within the domain of executive functioning (Best, 2010). In addition, youth having better physical fitness display superior executive functioning when compared to youth with less fitness (e.g., Hillman, Buck, Themanson, Pontifex, & Castelli, 2009) Empirical studies reveal that the interactive playing action video games containing high level cognition, motor skills and perception when compared with traditional button click games played in an immobile position ambidextrously enhance visuo-spatial processes with cognitive flexibility, executive functioning and attentional control (Green & Bavelier, 2003; Greenfield, DeWinstanley, Kilpatrick, & Kaye, 1994; Li, Polat, Makous, & Bavelier, 2009). Due to natural feature of exergaming to combine action video gaming and physical activity in game, there is a potential of it to enhance the cognitive functions of youth especially within the domain of executive functioning (Staiano & Calvert, 2011). In the studies conducted about this objective, it seems that executive functioning of youth is positively affected by Exergaming game when it is played regularly (Anderson-Hanley, Tureck, & Schneiderman, 2011; Best, 2012; Rueda et al., 2004; Decety, et al., 2004). In their study, Miller and Robertson (2010) closely examined the impacts of a commercial off-the-shelf computer game on children aspects of self-perceptions and their mental computation skills. Children (71 participants in three primary six classes, aged between 10 and 11) were asked to take a 100-item test (the 'Number Challenge') for the measurement of their mental computation. According to both speed and accuracy of calculations, the game console group had significant pre/post gains.

In this study, the effect of exergame that based on physical activity on mental computation speed and achievement were investigated.

METHOD

Methodology

Complete experimental design was used in the study. In the experimental model consisting of experimental and control groups, the groups were determined to be equivalent through pre-test and then they were randomly assigned to the groups. After application process, the post-test was applied. Mathematical performances and mental computation speed of the groups before and after application were compared (See Table 1).

Study Group

The study group consists of 63 senior students from a primary school in Istanbul. The mean age of the students is 11 and the group is composed of 37 female and 28 male students. The study group was divided into two groups suitable to the method.

Table 1. Experimental process

Groups	Pre-Test	Experimental Process	Post-Test
G1	O1	X	O2
G2	O1	Y	O2

G1: Experimental group G2: Control group O1: Pre-test X: Experimental Process Y: Traditional Process O2 Post-test

Data Collection Tools

As data collection tool, 'Mathematical Performance Test' developed by the researchers was used as the pre-test and post-test to measure knowledge of the students.

Mathematical Performance Test

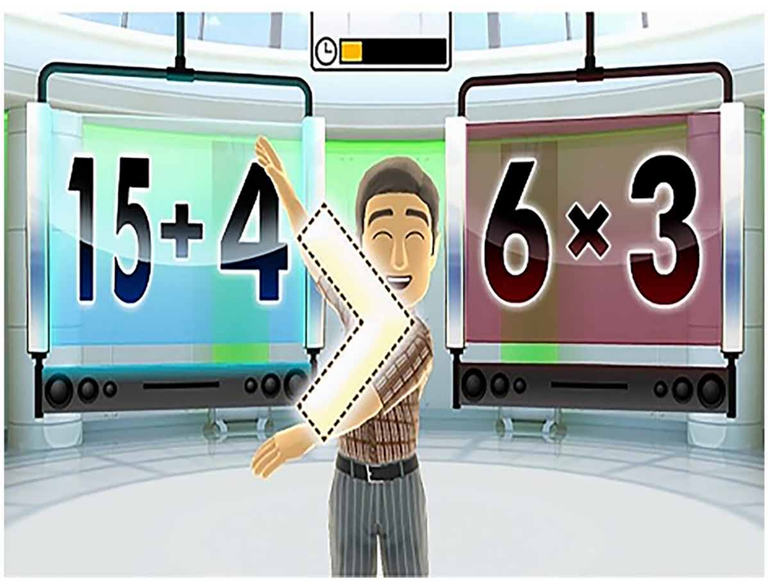
In this study, a test which included 24 multiple-choice questions and was developed by the researchers was prepared to measure the mathematical performances of the students. The questions prepared in line with gains about related subject were examined to determine the scope of validity by two experts in the field and expert opinion has been taken about the accuracy of the questions and their appropriateness for the students.

EDUCATIONAL GAMES

Computer-Based Educational Game

It is a game that correct answer can be given through more-less than (< >) comparison of two simple mental arithmetic processes. Mental arithmetic processes including addition and subtraction of single-digit numbers were present in the game. In the game with total 20 questions, the student can give correct answer via choosing correct mathematical symbol (< >) in 3 seconds given for each questions (See Figure 2).

Figure 1. The screenshot of computer-based educational game



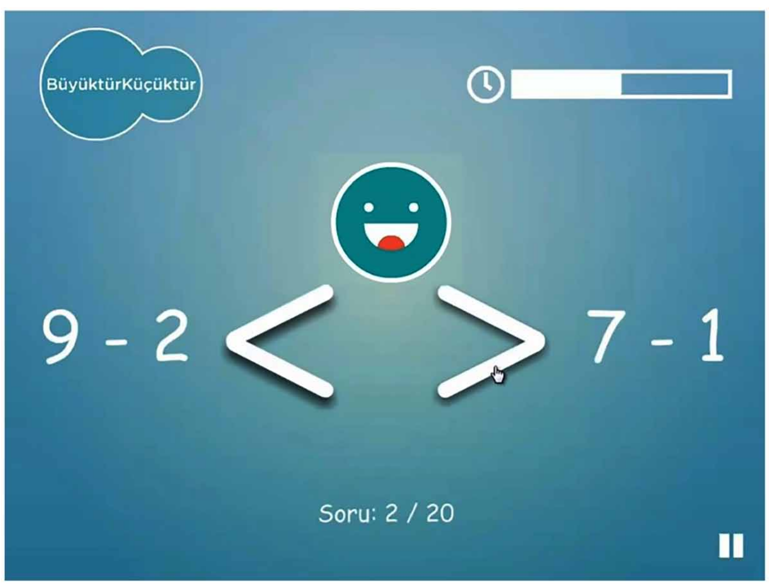
Kinesthetic Educational Game

Kinesthetic educational game is a game which correct answer can be given through more-less than (< >) comparison of two simple mental arithmetic processes. It is required to perform symbol movement corporeally to choose correct answer. Raising two arms with similar movements for more-less than symbols provides to choose answer (Figure 3). In the game, mental arithmetic processes including addition and subtraction of single-digit numbers were present. In the game including total 20 questions, the student can give correct answer via choosing correct mathematical symbol (< >) in 3 seconds given for each questions.

Experimental Process

The pre-test developed by the researchers was applied to measure prior knowledge of the students in the beginning of the experimental process. At the end of the pretest, the number of correct answers and test completion time were determined. In the following weeks, computer-based and kinesthetic educational games were applied to the experimental and control group. In these applications lasting for 8 weeks, each of the students played the game a total of 24 times, including 3 times a week. During playing the games, number of correct answers and completion time were recorded. After 8-week-application process, the post-test which was the same with the pretest was applied to the experimental and control groups and number of correct answers and completion time were determined.

Figure 2. The screenshot of the environment where Kinesthetic Educational Game is played



Data Analysis

Equivalence of the students in the experimental and control groups according to their groups was primarily evaluated in the research. t test was applied for paired and independent groups to understand whether there was a statistically significant difference between the post- test scores of both groups.

FINDINGS

Findings About Mathematical Performance Scores of the Experimental and Control Group Students in the Pre-Test

When the findings about the mathematical performance are evaluated, there is no statistically significant difference between mathematical performance scores of both groups in the pre-test ($p>0.05$, See Table 2).

Findings About the Mental Computation Speed of the Experimental and Control Group Students in the Pre-Test

When the findings are examined, there is no statistically significant difference between the mental computation speed of both groups in the pre-test ($p>0.05$, See Table 3).

Findings About Mathematical Performances of the Experimental and Control Group Students in the Post-Test

When the findings about the mathematical performance are evaluated, there is a statistically significant difference between the averages of the post-test scores of both groups according to the Independent sample t-test results ($p<0.05$, $t=3.44$, See Table 4). According to the results, the mathematical perfor-

Table 2. Independent sample t-test results of the mathematical performance scores of the experimental and control group students in the pre-test

	N	M	sd	df	t	p
Experimental	27	22.11	1.88	63	1.408	0.164
Control	38	21.21	2.91			

Table 3. Independent sample t-test results of the mental computation speed of the experimental and control group students in the pre-test

	N	M	sd	df	t	p
Experimental	27	173.81	74.98	63	-0.152	0.880
Control	38	176.63	72.94			

Table 4. Independent sample t-test results of the post-test scores of the experimental and control group students

	N	M	sd	df	t	p
Experimental	27	23.11	0.69	63	3.44	0.001
Control	38	21.63	2.14			

mance of the experimental group ($M_{experimental}$=23.11) is higher than the performance of the control group ($M_{control}$= 21.63).

Findings About the Speed of Mental Computation Speed of the Experimental and Control Group Students in the Post-Test

When the findings are analyzed, a statistically significant difference is present between the post-test scores of both groups according to the Independent sample t-test results ($p<0.05$, t=-0.219, See Table 5). According to these results, the mental computation speed of the experimental group ($M_{experiment}$ =100.89) is higher than the speed of the control group ($M_{control}$= 119.76).

Findings About the Scores of the Experimental Group in the First and Last Games

When the findings about the fifth research question are examined, there is a statistically significant difference between the experimental and control groups in terms of average scores of the games students played at first and last week according to Paired sample t-test results ($p<0.05$, t=-0.219, See Table 6). The results indicate that the scores of the last game (M_{first}=13.70) is higher than the scores of the first game (M_{last}= 19.40).

Table 5. Independent sample t-test results of the mental computation speed of the experimental and control group students

	N	M	sd	df	t	p
Experimental	27	100.89	33.94	63	-0.219	0.032
Control	38	119.76	34.33			

Table 6. Paired sample t-test results of game scores of the experimental group students in the first and last week

	N	M	sd	df	t	p
First Week	27	13.70	2.94	26	-10.97	0.032
Last Week	27	19.40	0.93			

Findings About Game Completion Time of the Experimental Group in the First and Last Games

When the findings about the game completion time evaluated, there is a statistically significant difference between the both groups in terms of completion time of the games students played at first and last week according to Paired sample t-test results ($p<0.05$, $t=-0.219$, See Table 7). These results indicate that the time of the first game ($M_{first}=13.70$) is longer than the time of the last game ($M_{last} = 19.40$).

DISCUSSION

In this study, according to results, the mathematical performance and mental computation speed of the experimental group is higher than the performance and speed of the control group. When the findings about the game completion time of experimental group evaluated, the time of the first game is longer than the time of the last game. And also, the scores of the last game is higher than the scores of the first game. There has been a sustained level of activity that can support playing, challenge, entertainment and learning in the educational games (Prensky, 2001; Corti 2006; Michael & Chen, 2006). A number of studies (Marino and Beecher, 2010; Fisch et al., 2011; Dennison & Dennison, 1994) have demonstrated the positive impact of educational games on students' academic performance. A review of the literature emphasizes that video games have a short-term positive effect on not only basic cognitive capabilities (processing speed, visual perception skills) but also higher-order thinking strategies (Nouchi et al., 2013; Mead, 2013). In this study as well, it is observed that students both increase their performance and mental computation speed by enjoying themselves. Besides, they have been seen to be encouraged to learn more thanks to both their struggles with each other according to the scores they get at the end of the game and the motivation gained with success and entertainment. Challenge and motivation are emphasized to contribute to learning process through game to a great extent and encourage learners (Chen, Law, 2016; Cagiltay, Ozcelik, Ozcelik, 2015; Corti, 2006).

Video games procure substantial opportunities in students' displaying their capability of mental computation particularly in learning Maths (Olive, 2000). In a well-designed game, students fulfill acts only in their dreams in the applications on paper while performing acts physically. The implementation of mental computation using visual or physical objects creates the opportunity of forming a new way of processing for students in regulating these mental computations (Simon & Tzur, 2004). Experimental studies demonstrate that playing educational video games markedly increases the mathematics performance of students compared with conventional paper and pencil applications (Ke and Grabowski, 2007).

Individuals whose number sense has improved bring different solutions by pondering flexibly without relying on written account, and this enables them to make numerical calculations they face in daily life

Table 7. Paired sample t-test results of game completion time of the experimental group in the first and last week

	N	M	sd	df	t	p
First Week	27	2.07	0.41	26	8.98	0.000
Last Week	27	1.17	0.33			

easily. The researchers conducted in recent years have unearthed that students are not able to use their strategy of number sense sufficiently (Harç, 2010; Kayhan Altay & Umay, 2011; Şengül & Gülbağcı, 2012). However, abstract mental computations are seen to be activated both physically and visually within the game and contribute to learning in these processes (Simon & Tzur, 2004). In this study, the progress observed in post-test compared with pre-test demonstrates that kinesthetic games increase mathematics processing speed, and physical activities have contribution.

The studies carried out suggest that youth take part in the activities they take pleasure most and they indulge in playing exergames (Bailey & McInnis, 2011; Graves et al., 2010). In their studies, Miller and Robertson (2010) investigated the effects of a commercial off-the-shelf computer game on the mental computation skills and self-perception aspects of children. In the results adopted as a consequence of 10 week research, they reached the conclusion that there is a significant difference both in terms of answering correctly and computation speed between pre/post-test results of game console group (experiment) and the mixed control group (Miller & Robertson, 2010). Vogel et al. (2006) examined 32 experimental studies and came to the conclusion that the use of educational games in classrooms help students with their cognitive gain and display a considerably higher performance than conventional teaching. The increase of mental computation speed can be more easily achieved with educational games. The strategies emerging while performing mental computation are, as different from written calculation, focused on number not order (Van de Walle et al., 2010). In this study, it is envisaged that a student can perform mental computation within the game and improve his/her capability of decision making through making big small comparison of the issuing result. In addition to this, it can be said that more success is achieved in the games supported by physical acts. Students are observed to be motivated and enjoy more in the game process where they join with physical activities. These influences were proved to have outstanding contributions on learning with a lot of students (Chen & Law, 2016; Corti, 2006).

According to Staiano and Calvert (2011) playing exergames makes contribution to physical, social and cognitive enhancement. A recently conducted research suggests that passing to exergame applications at school may increase academic performance, and decrease absence in the class, becoming late to class and negative interclass behaviors (Lieberman et al., 2011). Again, in the result of a study, it is emphasized that engaging with physical activities has the potential of positively influencing cognitive functioning, memory and academic performance (Donnelly & Lambourne, 2011; Castelli, et al., 2007).

Examining the literature, it is put emphasis on the fact that games can be very strong instruments of learning that students will always find interesting (Marino, et al., 2013). Exergames may create attractive platform of activity at schools. Looking at the applications across the world, exergames are seen to have been integrated into physical education courses at some schools. A sample of this kind of applications is the exergame course syllabus in the state of Western Virginia (Schiesel S., 2007). For Staiano and Calvert (2011), in the USA, such exergames as DDR (Dance Dance Revolution) are integrated to not only physical education classes but also to break times, lunch breaks and post-school programs. DDR which is one of the exergames that USA considers as the last weapon in the struggle against childhood obesity is used at hundreds of schools at least 10 states as a regular part of physical education syllabus. The results of our study also demonstrate that exergames have positive impacts on students' mental computation speed and academic performance. From this point of view, exergames that kinesthetically count students in the game and make favorable contribution to their academic performance should be used efficiently at schools in compliance with syllabus.

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KEY TERMS AND DEFINITIONS

Educational Games: An educational game is a game designed to teach humans about a specific subject and to teach them a skill.

Exergaming: 1.) Exergaming is the positive and engaging fitness 'experience' gained by combining exercise and gaming. 2.) Exergaming is a term used for video games that are also a form of exercise.

Game-Based Learning: Game-based learning is a type of game play that has defined learning outcomes.

Kinesthetic Learning: Kinesthetic learning is a learning style in which learning takes place by the students carrying out physical activities, rather than listening to a lecture or watching demonstrations.

Video Game: Video games are electronic, interactive games known for their vibrant colors, sound effects, and complex graphics.

Chapter 18
Instructional Design for Simulations in Special Education Virtual Learning Spaces

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ABSTRACT

Virtual learning environments provide new teachers with experiences to apply knowledge of learner differences to semi-authentic learning situations involving students with special needs, teachers, and parents. Instructional design provides a systematic process to document instructional designs in an undergraduate special education course, which has students apply universal design for learning principles. A variation of instructional design designed for teacher education, the teacher decision cycle, documents the teaching decisions behind the use of TLE TeachLivE to provide simulated experiences in virtual learning settings, as well as supporting activity structures. Implementation guidelines are provided.

INTRODUCTION

The instructional systems and technology field taps learning and instructional theories with technology tools to address complex educational challenges. This chapter uses instructional design (ID), a systems approach to integrating theoretical foundations and systems thinking, to document how virtual simulations in special education programs give students near-authentic experiences in special education settings. ID provides a systematic foundation for the analysis, implementation, and evaluation of teaching decisions. More pragmatically, this chapter assists educators in implementing simulation in virtual learning spaces based on student and program needs as the basis for teaching decisions. Furthermore, an ID process prompts educators to evaluate the implementation and provide feedback on future adjustments.

What writers and researchers have documented in recent years is that to learn best today's students, the so-called digital natives, need to be engaged and that they are already mentally and physically equipped

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to accomplish the work (Prensky, 2001; Kelly et al, 2009; Tapscott, 2001). The overriding pedagogical approach to support these learners involves both solo and collaborative work, but performed in new virtual settings (Pearlman, 2010). For example, Lemke's (2010) cites three ways to support student engagement, including visualization, democratization of knowledge, and participatory learning. All three means are core foundations to the use of virtual learning environments, particularly for the learning of how to implement Universal Design for Learning principles by special and regular educatators.

This chapter proposes two benefits to readers. First, the chapter will summarize technology tool use in two types of virtual learning spaces; namely structured simulations using a popular simulation software and student peer simulations using video. Second, the chapter helps educators to systematically think through the use of these tools using instructional design. While there are many ID models, the systematic approach used here is a teacher decision cycle (Shambaugh & Magliaro, 2006), which prompts teaching decisions through the use of five questions:

1. Who are the students?
2. What are the learning outcomes (and program goals)?
3. How are those outcomes assessed?
4. What are the teaching options?
5. How does technology help instructors to re-think learning outcomes, assessment, and teaching?

The responses to these questions serve to document the thinking behind and the rationale for the use of the two simulation activities. This chapter encourages educators to use a systematic teaching decision process to provide a grounded approach for their teaching decisions (e.g., alignment of learning activities and learning outcomes). At the same time, a structured cycle of analysis, implementation, and evaluation activities contributes evidence for the meeting academic program goals; specifically, how an academic course meets program goals.

BACKGROUND

Educators are continually faced with the challenge of educating people to live in a world they themselves will not live in. Gardner (2007) provides a direction to educators by proposing five minds to cultivate in today's students. Three of these minds are cognitive, including disciplinary, synthesizing, and creating, minds that are the focus of STEM disciplines. The other two minds are the developmental accomplishments of respectful and ethical minds. Both Gardner and Pink (2006) remind us of the need to help young people master the "softer side" of cognition, that of design, story, symphony, and play. Building upon the learning of core content and foundational skills, the explicit recognition and articulation of knowledge and skills are specified in recent learning outcome efforts, such as The Partnership for 21st Century Skills (2003). If these five minds provide us with a big picture direction to education and there are frameworks for specific knowledge and skills development, then what learning environments support this scope of human development in the 21st century?

SIMILATIONS IN VIRTUAL SPACES

One approach to helping students experience the world is through simulation, an attempt to provide sufficiently authentic learning settings in which students actively and socially participate as opposed to the solo acquiring of knowledge without application. Miller (2014) defines simulation as "computer-based media that replicate aspects of a process, object, or scenario from the real world" (p. 157). Educational benefits to simulations include student motivation, repeated use by users, a safe alternative to the actual experience, animation of key concepts, limiting complexity, immediate feedback, and integrated use within other learning activities. A challenge to the use of simulations is designing learning activity in which the participants genuinely engage in topics or problems of relevance and interest, but also to create knowledge that contributes to the group or social context (Hakkarainen et al, 2004).

As a result, special education programs in colleges and universities are responsible for assuring pre-service special education teachers are prepared for the many hats they will most likely wear. Bell and Morris (2009) suggested the main component of effective learning experiences in higher education is authentic interaction. The authors' study supported a practice-based approach to preparing tutors to work with students through the use of simulated and authentic practice. Virtual Learning Environments (VLE's) potentially provide pre-service teachers with the opportunity to learn, experience, and reflect through simulated instruction.

Emerging technologies enable training programs to mirror situations similar to what pre-service teachers may encounter in the real world (Blankenship & Kim, 2012). This chapter summarizes two examples of simulations in virtual learning spaces. Virtual reality applications provide new opportunities for simulated learning experiences in education. Studies show that participants in online immersive environments like Second Life demonstrate both intensive engagement and emotional involvement in these interactive experiences (Boellstorff, 2008). Educators have begun to take advantage of these two features of virtual worlds to provide simulated learning experiences that increase engagement and provide a social context in which learners can acquire and practice skills (Steinkuehler, 2008).

Virtual Learning Environments (VLEs) enable teachers to present students with new experiences by offering unique capabilities such as creation of simulated flight or movement. According to Evtah (2009), educators can guide growth and influence educational change through participation in virtual realities. The author-suggested simulation of real-world experiences has a motivating effect on students and enhances the meaningfulness of instruction. Instruction becomes an activity of which students participate and contribute, rather than simply receive. Simulations can be utilized for providing a variety of meaningful learning experiences for pre-service teachers, simulations should not replace traditional student teaching experiences (Sawchuk, 2011). Well-planned scenarios may feel like true field experiences, but they are designed to enrich field experiences and are not intended to replace them.

One example of a VLE is through the use of TLE (TeachLiveE) TeachLivE™, which is a full immersion virtual reality environment which is intended to train beginning teachers for the classroom workforce (Andreasen & Haciomeroglu, 2009; Dieker et al, 2014). The TLE TeachLivE™ Lab is designed as an enrichment tool for engaging pre-service teachers in a variety of simulated scenarios. In Straub and fellow researchers (2015) found that four, 10-minute simulation sessions on a specific teaching skill can change teacher behavior within the simulation but also with real students in actual classrooms. In the

TLE TeachLive™ Lab, pre-service teachers interact with live avatars playing the roles of actual students in a middle school or high school classroom. Additionally, an adult avatar can take the role of any adult (e.g., parent, co-teacher, principal). The goal of the Lab is to allow pre-service teachers the opportunity to re-visit the virtual classroom in an attempt to hone or reteach concepts or skills without having caused harm to actual students (Andreasen & Haciomeroglu, 2009; Straub et al, 2015).

An instructional design process, the teacher decision cycle, will be used to summarize teaching decisions in the use of structured and peer simulations using TLE TeachLivE™. The intent is to help readers understand the basis for these decisions, particularly the learning outcomes these technology tools were designed to address as well as the realities of the context for their implementation.

DOCUMENTING TEACHING DECISIONS USING INSTRUCTIONAL DESIGN

Instructional Design as a Structured Process

Instructional design models address important issues of learning, content, and context during the development of instruction. The prescriptive premise behind instructional design is that if an instructional design is followed, the learning outcomes identified in the design will occur. As one evaluates the extent to which learners achieve learning outcomes, changes in the instructional design may be warranted. Documenting these changes provides designers and users of the model with feedback on its efficiency and effectiveness.

Early generations of ID models attempted to depict one approach to address all instructional problems (see Tennyson, 1995, for a generational history). Some of these linear, step-by-step cycles and flow charts helped to understand the ID process and were suitable for teaching instructional design (Dick, Carey, & Carey, 2014; Morrison, Ross, Kalman & Kemp, 2012), while others provided procedural guidance to instructional development (Gagné, Briggs, & Wager, 1992). Some models were aimed at teachers, particularly providing procedures to develop instructional materials (Gerlach & Ely, 1980; Smaldino, Lowther, Mims, & Russell, 2014). More recent approaches have attempted to model the complexity of instructional development with the unique performance improvement needs (Handshaw, 2014) and incremental design and development (Allen & Sites, 2012).

The so-called ADDIE model (e.g., Dick, Carey & Carey, 2014), consisting of analysis, design, development, implementation, and evaluation phases of activity, represents the ID model that one has been exposed to in academic or training settings. Within ADDIE, analysis as a formal design component prompts designers to think about the context of the problem. Context resists analysis because it is complex and difficult to abstract, summarize, and database. A limitation to the development of learning environments which incorporate technology-based tools failing to address the social context of learning, such as the culture of the classroom and the school, and the beliefs and decisions made by teachers in those classrooms. How does one account for context in design? Bielaczye (2006) suggests a Social Infrastructure Network, which examines cultural beliefs, practices, socio-techno-spatial relations, and external interactions. Within the ID field, the problematic nature of context has been discussed. Tessmer and Richey (1997) suggest a process of contextual analysis, while Jonassen and Hernandez-Serrano (2002) suggest stories as a formal case-based means to formalize context. Thus, thinking about the implications of one's design decisions is an important activity (Rowland, Parra, & Basnet, 1994).

Shambaugh and Magliaro (2001) added to the ADDIE model two phases of preliminary activity before that of analysis; namely, Learning Beliefs and ID Models. One's foundational beliefs about learning, students, and the educational process are connected to learning principles based on learning theory. Because ID models are criticized for being too complex, too rigid, and time consuming, developing one's own ID process forces a newcomer to represent both phases of analysis, design, and evaluation activity but also to think through how these phases are connected in ways that make sense to the novice designer. Tapping their development research on the design of student ID models, Magliaro and Shambaugh (2006) categorized different type of student models based on the perspectives and work activity of the students. These categories included teacher-centered, participant-centered, context-centered, and student-centered. From this work Shambaugh and Magliaro (2006) developed an instructor-focused approach known as the teacher decision cycle to frame ID activity as a set of questions that made sense to educators, ranging from public school teachers to health profession educators.

Description of Teacher Decision Cycle

The teacher decision cycle (Shambaugh & Magliaro (2006) is used to summarize teaching decisions in the use of structured and peer simulations. The first question, "Who are the students?" typically is one focus for needs assessment or analysis activity in instructional design. This first question prompts an instructor to re-examine assumptions held about the range of learning characteristics and histories of individual students. A part two to this first question addresses the context for the students and subsequent decisions on learning outcomes and asks "What are the academic program's goals in terms of curriculum and learner performance? Thus, the first question serves to provide evidence that a course or other learning experience directly supports program outcomes. In public school settings, this context question addresses the realities that teachers find themselves in depending on the local school, county/district, or state initiatives and histories.

A second question addressing learning outcomes asks "What will students learn?" Inherent in this question is re-examining the range of learning outcomes and looking for outcomes that extend beyond cognitive learning such as social learning and critical thinking, a typical feature of any intellectual activity. A third question addresses assessment and asks "How will you know if students learned?" The responses to questions two and three provide indication of the degree to which learning outcomes aligns with an assessment plan. Question four then asks the teaching question or "How will you assist students to learn?" The response to question four examines teaching options, such as formal teaching models, context-based teaching strategies (e.g., Project-Based Learning for inquiry outcomes), and general purpose strategies, such as review, practice, and re-teaching. Question five explicitly examines the possibilities for media and technology use. This question frames technology as a teaching decision, and the choice to use technology should be primarily guided by its potential to help students learn. This final question provides a means to reconsider the prior decisions for learner characteristics, learning outcomes, assessment, and teaching.

Teaching Decisions Behind TLE TeachLivE™

The teacher decision cycle set of five questions serves to document the teaching decisions behind the use of TLE TeachLivE and supporting activities to provide simulated experiences in virtual learning settings.

Who Are the Students?

The students taking the course and completing the TeachLivE interactions are in their second year of a five year teacher education program using a professional development school model, where students are placed in school settings across three years for approximately 1000 hours. Students are placed in a PDS with a teacher education coordinator administrating their placement. In addition to courses, students are evaluated by their host teacher according to a rubric designed for that semester. Students earn an undergraduate degree in either multidisciplinary studies or their content area plus a master's degree after their fifth year. The students are primarily traditional female students who are seeking a special education endorsement to their grade level or content area specialty.

What Are the Learning Outcomes?

The official catalog entry for the course includes the following: Specialized computer hardware and software, adaptive and assistive devices, instructional and productivity software, and principles and practices of Universal Design for Learning (Gordon, Meyer & Rose, 2016) for students with special needs. The specific learning outcomes include the following:

1. Explain key elements of assistive technology and applicable laws and policies.
2. Conduct assessment to determine alternative access options and appropriate environmental controls.
3. Use assistive technology to support learning by students with special needs in communication, literacy, written expression, mathematics, and other academic areas.
4. Describe the construct of Universal Design for Learning (UDL).
5. Discuss the principles and practices associated with UDL.
6. Apply UDL to design learning activities for students with and without special needs.
7. Discuss collaboration with families and other professionals and professional and ethical practice to ensure appropriate and successful applications of assistive technology.

The learning outcomes address primarily the state's professional teaching standards, including technology standards (based on the International Society for Technology in Education), and the state's speaking and listening skills. In addition, the learning outcomes address the state's assessments for teacher education, including principles of teaching and learning, education of exceptional students, special education, teaching students with visual impairments, and gifted education. Finally, the learning outcomes also address Council for Exceptional Children (CEC) standards for preparation of special education personnel for the Specialized Professional Association (SPA) review by the Council for the Accreditation of Educator Preparation (CAEP).

The course provides instruction and hands on experiences with computer hardware and software, adaptive and assistive devices, instructional and productivity software. Further, teacher candidates are taught and expected to demonstrate their understanding of the principles and practices of Universal Design for Learning (UDL) for students with special needs. Throughout the course, students are given opportunities to assimilate course content into instructional practices including assessment, conferencing, and co-planning with general education teaching partners.

How Are Those Outcomes Assessed?

There are two major types of assessment in the course, performance and disposition. For performance assessment, students complete assignments that will be assessed by the instructor using a rubric. This rubric will be used to assign course grades and meet the criteria for admission to the practicum experience of the teacher education program. The Council for the Accreditation of Education Professionals (CAEP) requires that all teacher education programs assess all candidates for appropriate professional dispositions that reflect the program's philosophy for the area of specialization. Dispositions are attitudes, values and beliefs that impact student learning and development as well as educator professional development and they are demonstrated through verbal and nonverbal behaviors in interaction with others in courses and clinical experiences. A disposition assessment has the instructor and students completing the teacher education program's Disposition Assessment Instrument. This rating is not used in assigning course grades, but is reviewed by program faculty to assess progress in the program.

The course's performance assessments include the following:

- **Universal Design for Learning Toolkit:** Each student individually and as part of a collaborative group assigned by the instructor develops a classroom resource/toolkit that reflects UDL principles (Gordon, Meyers & Rose, 2016) addressing multiple means of engagement, representation, and action/expression. Three toolkits are produced. The first two address Mathematics and Language Arts and include ten resources/supports per topic and two teacher made materials clearly demonstrating the adaptation for each learning domain. A narrative of the usefulness of each item in the toolkit is submitted individually based on grade level or area of study. A third toolkit is individually-developed based on a learning domain of the student's choice.
- **Diffusion Simulation Activity:** An online simulation assignment in which the students are attempting to persuade teachers to buy into Assistive technologies, Instructional Technologies, and Universal Design for Learning.
- **Literacy Supports:** Students produce three reading products (e.g., digital storybook, graphic novel, adapted storybook) assessed by rubrics.
- **Chapter Activity:** Each student completes one of three activities in each assigned chapter of the text (Edyburn, 2013).
- **Flipped Instruction Quizzes:** Each student completes a quiz consisting information presented during the flipped instruction.

What Are the Teaching Options?

A number of activity structures are used in the course to support the application of UDL by pre-service teachers, including flipped classroom, a physical lab, and the TeachLivE™ virtual lab. To support all seven learning outcomes a variation of a flipped classroom approach is used in which ten content presentations are developed by students in which student groups are assigned a content area to develop a presentation. The presentation is submitted for posting at least one week prior to the assigned class for that presentation. The whole class participates in the ten content presentations, which also include in-class activities as individuals or in groups.

To support learning outcomes 2-3, three assignments are completed in the Center for Assistive Technology Education (CATE) Lab. Each student visits the CATE lab and demonstrates competencies on specified pieces of software, hardware, or computer access. Students demonstrate their ability to program various augmentative communication devices as assigned as well as provide rationale for use of voice output devices, computer accessibility, and/or other adaptive equipment.

To support learning outcomes 4-7, each student participates in the TeachLivE™ virtual classrooms during class meetings. Activity plans are submitted prior to each student's assigned date. Other students complete feedback and self-reflection for each session. Details of the TeachLivE™ are described below.

How Does Technology Help Instructors Re-Think Learning Outcomes, Assessment, and Teaching?

The assistive technology tools addressed in the course give pre-service teachers experiences with improving the educational experiences of students with special needs. Virtual environments introduce new teachers to a simulated educational setting which can only be discussed in a traditional course or through the use of media. Instructors are no longer bound to instruction within the four walls of a classroom. Technology-enhanced instruction using a virtual learning environment such as the TeachLivE™ allows for students to experience near-authentic educational settings. Specifically, students interact with avatars appearing as either an adult in a teacher's lounge area or up to a five person middle or high school student classroom. The pre-service teacher can conference with the adult avatar as a parent of a student with a disability or as a general education teacher, elevating the traditional role play to a more realistic learning opportunity.

Often pre-service teachers do not have the experiences to accurately portray the challenges facing parents of children with disabilities or the capacity to respond contextually as a seasoned general education teacher. Therefore, the experiences in the TLE TeachLivE™ setting are much richer and truer than instructional practices in class with their student peers. Further, having the ability to interact and teach in a five student classroom allows for practice responding to true challenges facing students with disabilities involving both instructional or social needs. Technology provides interactions with an avatar resembling the persona as well as giving accurate portrayal of student characteristics, speech, and behaviors. TLE TeachLivE™ sessions are recorded for self and group reflection. Students can then develop goals and refine their teaching practices based on their performance. Additionally, peers benefit from viewing other recorded sessions to add to their repertoire of effective, or perhaps not effective, conferencing or instructional practices.

RECOMMENDATIONS FOR USING TLE TEACHLIVE™

Before Teaching TLE TeachLivE™

This special education course uses three activity structures for instruction: (1) the flipped classroom approach where students develop the presentations for whole-class participation, (2) a physical lab where students learn how to use assistive technologies, and (3) a virtual lab for simulated participation with special needs students, their teachers and parents. The lab settings require up-front preparation to ensure student access to assistive technology tools that work and a virtual lab supported by adequate technology infrastructure computing, networking, and a physical space to house the equipment. Ideally, a dedicated space is needed for both labs to ensure ongoing maintenance and student and faculty access. Both labs need faculty and/or staff to manage the physical assets of both labs and coordination of lab use across academic semesters. Not all students enter the course with the same experiences with persons with disabilities, families, or field experiences. Of importance is evaluating student's experiences and expertise through in-class discussions and one-on-one interviews in order that future in-class activities as well as in both labs will highlight and challenge students on an individual level. Knowing the delineation of skill levels assists in creating scenarios for in-class or in the labs to enhance and facilitate growth for every student. To the extent to which each activity can be individualized will allow for the greatest potential of learning.

During Teaching: Implementing TLE TeachLivE™

The ability to evaluate student growth in this course using a TLE environment requires attention to pre-service teacher differences, particularly their depth of exposure to students with special needs and immersion in school settings. In large classroom settings, it is often difficult to watch each aspect of role play activities and provide real time feedback with multiple sessions occurring simultaneously. Feedback is often generic and does not always allow for the affective aspects of both roles. The TLE environment provides near-authentic activities for each student to interact with and feedback is directed at specific performance, which pre-service students value and need. Their classroom is more representative of their in-school teaching.

The students remain active participants throughout the course by representing their growth through a variety of instructional activities. Students participated in role plays, case studies, a skills demonstration in an assistive technology lab, and peer review of their instruction. It is important for pre-service teachers to have the opportunity to enhance their teaching ability; however, of equal importance is supporting their ability to interact in a collaborative setting with general education teachers as well as to respond in real time with students with disabilities. As instructors, conveying didactic information is often the norm and is a needed ingredient in teacher preparation programs. Yet, there is a dynamic exchange with actual teachers that will occur when pre-service teachers enter classrooms during field experiences. The course and overall program are designed to prepare these pre-service teachers for the reality of real-time conversations and decision making with regular education teachers and parents.

Many times, the ability of all participants is uneven in terms of presenting a challenge to the instructor to relate individual student performance to the needs of others in the classroom. Each of the students face very specific issues in their school placement and they need instructor guidance to see the value of learning from their peers who are teaching in different grade levels and content areas. To some extent, role play performance will be limited in students who lack real life experiences with special needs students and school realities. Thus, their first conference is a key teaching and assessment activity to help struggling students make sense of the simulated role play and their limited knowledge and experiences. Recording in-class role plays is valuable to the instructor as a means to highlight specific decisions and to relate a particular role play across course participants. Although students participate in the TLE environment individually within the lab, their small group peers (i.e., three members from class) complete real time evaluations and comment on skills the student demonstrated with high precision as well as areas in which the student could improve on their performance. Immediately after their session, students complete a self- evaluation of their performance, the realness of the virtual environment, and two targeted goals for their next lab.

Post Teaching: Evaluating the Use of TLE TeachLivE™

Measuring student outcomes can be a challenge when the skills are in constant flux as the students learn more about their understanding and interconnections of special education knowledge, content area learning, and knowledge of student differences, specifically student disabilities. Student learning outcomes can encompass much more in a simulated environment as students report the experiences in TLE TeachLivE™ are more real than discussed or through media alone. In the course these pre-service teachers apply their knowledge and pedagogical decision-making experience to designing learning experiences with special needs students in actual public school classrooms. This course provided students with multiple means of expression allowing students to fully demonstrate their integration of course content and emerging teaching abilities using UDL guidelines.

Students will review the video of their teaching and complete a *Praise and Polish* activity in which they examine their own teaching in terms of aspects s/he feel were completed at a high level as well as ways in which to improve, or polish the aspects they deemed were at a low or medium level of performance. Students will then reflect on why each chose the strategy, language, or interaction s/he did. This specific type of reflection allows for greater introspection by the students on the guiding principles or theories regulating their teaching practices. It is this reflection that assists students in overlaying their teaching philosophy with their actual behavior. Often times, students realize that their behaviors are more aligned with a different pedagogy, allowing for further growth and insight into future teaching. The students become observers of their own teaching; therefore, when we have a post conference discussion in small groups, the students clearly articulate their decision-making process, lending greater depth and breadth of content and strategies to the sessions.

The feedback from the virtual environment is trifold (i.e., self, peer, instructor). Having this variety of perspectives provides a broader lens for the student to examine their instructional or conferencing skills. From the TLE activities, students select which of three scenarios they would like more practice, allowing for in-class activities to be driven on a need identified by students based on multi-model performances. Students will then participate in a small group interaction of their choosing to replicate the scenario s/he feels needs the most improvement. These in-class scenarios are recorded and students complete a compare/contrast on their in-class session with their TLE session. Their final activity is to revisit their teaching philosophy and identify their teaching behaviors aligning with educational theory. Students develop a strong sense of their teaching style, beliefs and strategies for instruction and interaction.

FUTURE TRENDS

This chapter informs the question as to what is the optimum professional learning environments for pre-service and in-service teachers? The use of virtual environments suggests the possibility that such environments can be incorporated within the school, bringing the environment to the school setting. Research is needed to evaluate the duration, frequency, and number of simulated sessions to support specific teacher learning outcomes (Straub et al, 2015). Results from such studies would inform administrators on resource needs as well as the formulation of best practices for the use of simulations in teacher education.

CONCLUSION

The use of a virtual learning environment helps pre-service teachers experience near-authentic interactions with special needs students, regular education teachers, and parents. The TLE TeachLivE™ system provides individualized role play opportunities to unpack the teaching decisions necessary in their public school placements. The objective of this chapter has been to support the volume's goal of linking a specific context that of higher education special education, with the technology of simulated simulations and role play and the use of a system approach, instructional design, to develop the teaching intervention. The chapter has provided (1) design strategies of using simulation and role plays, (2) the teaching decisions behind the use of a virtual earning environment for special education teacher education, and (3) a working example of how digital technology improves educational and professional development experiences of those working in special education settings.

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KEY TERMS AND DEFINITIONS

ADDIE: A long-standing model of instructional design that incorporates the phases of analysis, design, development, implementation, and evaluation.

Assistive Technology: Technological and physical means to improve the use of learning tools.

Flipped Classroom: Media materials are produced and used at a distance by students while a physical, F2F setting is used instead for student activities and feedback.

Instructional Design: A systematic process for responding to instructional problems, needs, and opportunities.

Instructional Design Models: Representations of how instructional design is conducted or how the analysis, design, development, implementation, and evaluation of an instructional design is conceptualized.

Simulations: Computer-based experience which replicates key features of real activity.

Teacher Decision Cycle: Framing instructional design as a set of questions; namely, who are the students, what are the learning outcomes (and program curriculum goals), how will the learning outcomes be assessed, what are the teaching options, and how does technology help designers re-think the previsious questions.

Universal Design for Learning (UDL): Approach and principles designed to enhance the learning of all individuals.

Virtual Learning Environments (VLEs): Students receive new experiences by offering unique capabilities such as creation of simulated flight or movement.

Virtual Reality: A computer-based means to providing near-authentic experiences.

Chapter 19
How Virtual Work Informs Virtual Learning

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ABSTRACT

This chapter explores the connections between behaviors in virtual work and virtual learning environments. Benefits and challenges of virtual communities are reviewed. Following a review of organizational and educational literature, the authors identified six core competencies that emerged with shared emphasis as keys to virtual environment success. The authors appeal to educational leaders to assess and develop student, faculty, and administrator skills in developing trust, building relationships, empowerment, coaching and mentoring, inclusion and communication management.

INTRODUCTION

Technology enhancements have expanded how we approach work and education. At times, leaders in work and education environments have scrambled to keep pace with technology. As technology enhancements have enabled us to collaborate more freely for virtual work environments, it has also shifted how we consume education. Birth of the internet and the world wide web at the turn of the century led to changes in technology that beget changes in organizational behavior. As adoption of virtual work and virtual learning communities became more widespread, leadership practices in both environments shifted. With the advent of virtual work and virtual learning communities, traditional leadership approaches such as servant leadership (e.g. behaviors that help others accomplish shared objectives by facilitating individual development, empowerment, and collective work that is consistent with the health and long-term welfare of followers) (Yukl, 2013, p. 348-349); transactional leadership (e.g. leadership

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behavior that motivates followers by appealing to their exchanges that support self-interest) (Yulk, 2013); transformational leadership (e.g. leadership that appeals to the moral values of followers in an attempt to raise their consciousness about ethical issues and to mobilize their energy and resources to reform institutions") (Yukl, 2013, p. 231); and shared leadership (e.g. "a mutual influence process, characterized by collaborative decision-making and shared responsibility, whereby team members lead each other toward the achievement of goals") (Hoch & Kozlowski, 2014, p. 393) gave way to new leadership ideas.

Researchers and practitioners began considering the true meaning of leading in virtual environments. Early iterations of virtual work and virtual learning communities led researchers to question whether organizational and educational leaders ignored the behavioral changes required to successfully navigate technology-mediated interactions (Gurr, 2004). Early attempts to understand this phenomenon looked for behavioral symmetry between virtual work and virtual learning communities (Parchoma, 2005). The purpose of this paper is to re-examine the connection between exhibited behaviors in virtual work and virtual learning communities with consideration for how expanded technology use and application has made *virtual* a basic approach to work (Chen, Wu, & Yang, 2008) and learning. With this as a guiding principle, the authors explore how virtual learning behaviors are informed by virtual work behaviors and appeal to educational and organizational leaders to develop expanded leadership competencies and virtual leadership practices to better meet the educational and performance needs of virtual environments.

BACKGROUND

Virtual Benefits

Virtual work leads to multiple organizational benefits. Advancements in communication technology make it possible for global companies to bring together people from around the world to connect and collaborate on virtual teams. Dispersed, virtual teams use electronically-mediated communication to collaborate on shared organizational goals (Hertel, Geister, & Konradt, 2005; Morgan, Paucar-Caceres, & Wright, 2014). Virtual work leads to multiple positive economic and environmental byproducts including decreased travel and facility use (Duarte & Snyder, 1999), increased efficiency and productivity (Eom, 2009), flexibility and convenience, access for participants otherwise excluded due to disabilities (Nydegger & Nydegger, 2010), removal of geographical limitations (Hunsaker & Hunsaker, 2008), access to international talent and expertise, as well as asynchronous collaboration (Barnwell, Nedrick, Rudolf, Seasay, & Wellen, 2014). Although in a modified context, these benefits also apply to virtual learning experiences. Learners experience similar efficiencies and conveniences. Access to virtual learning opportunities such as online courses and degree programs enables learners remove traditional impediments such as time and distance.

Virtual Challenges

Virtual learning and work communities present similar challenges. Participants rely heavily on technology to mediate interaction (Olsen, Appunn, McCallister, Walters, & Grinnell, 2014; Parchoma, 2005). Participation can be hindered by novice user experience or software and hardware challenges (Leidner, Kayworth, & Mora-Tavarez, 2001/2002). Ambiguity often results from lack of in-person, face-to-face interaction which can create pedagogical challenges (Parchoma, 2005) and less rich communication experiences (Morgan et al., 2014). Physical separation can lead to feelings of isolation (Barnwell et al., 2014). Language and culture differences can lead to misunderstandings or miscommunication (Bjorn & Ngwenyama, 2009). Global participation can make scheduling synchronous tasks seem impossible (Nydegger & Nydegger, 2010).

Virtual Needs

Just as research has shown traditional leadership approaches can individually address some virtual work needs, educators recognize traditional educational practices can lead to success in virtual learning environments, even if traditional approaches result in less enjoyable learning experiences (Riha & Robels-Pina, 2009). Research suggests virtual learning expectations and behaviors require change on the parts of faculty and students. Traditional pedagogical and andragogical approaches were instructor-dependent. Virtual learning communities require more student independence which can be a difficult paradigm shift for virtual learners (Cercone, 2008). Some research even suggests this traditional, individual-centered approach is destructive and has a negative impact on the virtual learning experience (Hornik & Tupchiy, 2006). Faculty identified virtual learning communities as needing profound cognitive and affective engagement (Conceicao, 2006). Even education administrators have been encouraged to develop more customer-centric approaches that help schools leverage computer mediated learning and virtual learning environments to maximize student learning outcomes (MacFarlane, 2011).

SOLUTIONS AND RECOMMENDATIONS

Understanding Virtual Learning Through the Lens of Virtual Work

Relevant literature has shown leadership as key to success in virtual communities. Many organizational explorations of virtual communities have focused on the context of global work teams (e.g. Eom, 2009; Morgan, Paucar-Caceres & Wright, 2014; Symons & Stenzel, 2007). In these investigations multiple leadership styles have been recommended as key to virtual success including servant leadership (Molnar, 2010), a combination of transactional and transformational styles (Ruggieri, 2009) and shared (Hoch & Kozlowski, 2014). Yet contemporary recommendations maintain virtual environments require more novel techniques (Antes & Schuelke, 2011) and acknowledge the mounting pressure on faculty (Muenjohn, Pimpa, Montague, & Qin, 2016) and instructional designers (Ashbaugh, 2013) to meet evolving student preferences of virtual learning environments. These recommendations mirror earlier calls from education scholars to examine the leadership needs of human interaction when mediated by technology platforms (Gronn, 2003; Gurr, 2004; Lakomski, 2002). The complex nature of virtual learning communities requires characteristics and abilities that emerge from empirical findings and theoretical propositions found in education and leadership research.

Since the collective body of work on leadership in virtual communities shows that no single approach can satisfy all the needs of virtual participants, it is important for educational and organizational leaders to develop specific competencies for leading virtually. A review of educational and organizational literature revealed shared emphasis on six competencies to undergird leadership success in virtual communities – trust, relationship building, empowerment, coaching & mentoring, and communication management.

Table 1 compares these six competencies across the previously mentioned classic leadership approaches (servant, transactional, transformational and shared leadership).

Trust

Concerns regarding trust in virtual communities surface as a concern in educational and organizational research. In virtual learning and work communities, trust is a central idea that may be both an input and output with far reaching impact on communication and cohesion (Hunsaker & Hunsaker, 2008). In virtual learning communities, researchers found trust mediated the relationship between leader effectiveness and desired community outcomes, positively influenced performance and satisfaction (Chen, Wu, & Yang, 2008), and emerged as a core strategy for virtual success (Garcia, 2015). Organizational researchers found leader ability to build trust in virtual work environments was positively related to successful functioning (Al-Ani, Horspool, & Bligh, 2011), managing mistrust was instrumental to building trust (Dube & Robey, 2009) and low trust levels contributed to low productivity (Peters & Karren, 2009). In many instances the findings in educational and organizational literatures are in concert. However, there are some outliers. For example, in virtual work environments with prominent accountability measures, trust was less of a predictor of success or performance (Goh & Wasko, 2012)

Relationship Building

Relationship building is important in virtual learning and work communities as a counter measure for conflict. Dube and Robey (2008) identified it as a critical element in two of the five virtual team paradoxes. Educational researchers found relationship building in virtual learning communities was critical to faculty and student feelings of connectedness (Sherman, Crum, Beaty, & Myran, 2010) and heightened appreciation for the perspectives of others (Raffo, 2012) Organizational research has shown relationship building strategies in virtual communities include a mix of transformational behaviors such as inspiring others, appealing to values and encouraging out of the box thinking (Eom, 2009; Yukl, 2013) and transactional behaviors such as using contingent rewards, monitoring participant interaction (Wickramasinghe & Nandula, 2015), providing structure and setting deadlines (Eom, 2009).

Empowerment

Empowerment in virtual communities is contingent upon participant relationship with the leader. Since virtual learning communities require a great degree of self-direction, this is an important concept. Researchers caution faculty and instructional designers against the assumption that all virtual learners are comfortable with self-direction (Cercone, 2008). Faculty who lead virtual learning communities must consistently practice empowerment strategies that help students build self-efficacy (Lisk, Kaplancali, & Riggio, 2012) and self-confidence (Goh & Wasko, 2012). In fact, empowerment recently emerged as a factor connected to trust and communication in Garcia's (2015) model of e-leadership strategies for virtual education. Empowerment is an organizational strategy associated with servant leadership (Berger, 2014) and shared leadership.

Table 1. Comparison of virtual learning and work competencies with traditional leadership approaches

Competencies for Leading Virtually	Education Readings	Organizational Readings	Servant Leadership	Transactional Leadership	Transform. Leadership	Shared Leadership
Develop trust	Ban et al. (2011) Chen et al. (2008) Garcia (2015)	Barnwell et al. (2014) Eom (2009) Hunsaker & Hunsaker (2008) Nydegger & Nydegger (2010) Wickramisinghe & Nandula (2015)	X		X	
Conflict management	Chang & Lee (2013)	Barnwell et al. (2014) Eom (2009) Hunsaker & Hunsaker (2008) Nydegger & Nydegger (2010) Wickramisinghe & Nandula (2015)	X		X	
Relationship building	Chen et al. (2008) Raffo (2012) Sherman et al. (2010) Wagner et al. (2002) Weng & Tang (2012)	Barnwell at al. (2014) Leidner et al. (2002)	X		X	X
Empower others	Conceicao (2006) Garcia (2015) Raffo (2012)	Barnwell et al. (2014) Eom (2009) Goh & Wasko (2012) Hunsaker & Hunsaker (2008) Leidner et al. (2002)	X		X	X
Coaching & mentoring	Ladyshewsky & Tapling (2014) MacFarlane (2011)	Brooks (2009) Kerfoot (2010) Hunsaker & Hunsaker (2008) Leidner et al. (2002)	X		X	X
Inclusion	Conceicao & Altman (2011) Raffo (2012)	Ban et al. (2011) Hunsaker & Hunsaker (2008) Nydegger & Nydegger (2010) Standifer et al. (2010) Wickramisinghe & Nandula (2015)	X			
Communication management	Hornik & Tupchiy (2006) Riha & Robels-Piina (2009)	Barnwell et al. (2014) Eom (2009) Leidner et al. (2002)	X	X	X	

Coaching and Mentoring

In virtual communities, coaching and mentoring is more prominent than supervision (Kerfoot, 2010). Researchers recommend students, faculty, and administrators develop skills in this area (MacFarlane, 2011) as it is required for top-down as well as peer-to-peer virtual learning relationships. It has been explored as a strategy for instruction (Ladyshewsky & Taplin, 2014) and leadership development (Brookes, 2009). It is a trait associated with servant leadership, transformational leadership (McColl-Kennedy & Anderson, 2002), and shared leadership (Wang, Waldmand, & Zhang, 2014).

Inclusion

Appreciation for multiple perspectives and backgrounds is critical in virtual learning and work communities. Leaders competent in inclusion practices are able to develop trust, build relationships, and empower participants. Researchers have explored virtual learning communities (Raffo, 2012) and work communities (Conceicao & Altman, 2011; Standifer, Thiault, & Pin, 2010) for evidence of inclusive leadership practices. One inclusion factor that may be taken for granted is gender. However, research has shown differences in expectations (Arbaugh, 2000) and participation (Ladyshewsky, Geoghegan, Jones, & Oliver, 2008) between men and women in virtual learning communities. Gender consideration is part of a larger inclusion strategy needed to successfully lead in virtual communities.

Communication Management

Virtual learning and work communities require enhanced virtual communication skills. Educational leaders must be sensitive to the nuances of individualistic and collective communication approaches. Research has shown differences in approach can impact sense of community, use of virtual communication tools, and learner satisfaction (Hornik & Tupchiy, 2006). Although establishing communication guidelines is primarily associated with transactional leadership behavior, learning to manage virtual communication flow is essential for educational and organizational leaders to mitigate against conflict, develop trust, and demonstrate appreciate for inclusion (Wickramasinghe & Nandula, 2015).

FUTURE RESEARCH DIRECTIONS

Future research regarding the connection between virtual learning and virtual work communities should consider multiple items. Future researchers can explore granular contexts such as academic disciplines or school type to understand how specific academic contexts may impact virtual leadership behaviors. Since trust was an overwhelming issue for virtual learners, future researchers may also want to explore if this concern is more pronounce in online modalities versus face to face. Lastly, leadership researchers may want to investigate how the interchangeable characterization of e-leadership and virtual leadership behaviors impacts virtual learning. If each is isolated to a particular set of behaviors, there may be reason to understand the differences in e-leadership versus virtual leadership on the virtual learning experience.

CONCLUSION

Table 1 highlights that neither of the traditional leadership approaches can fully meet the needs of virtual learners or workers. This is particularly salient for educators as it reinforces the collective understanding that one approach to learning does not satisfy the needs of all learning communities (Cercone, 2008). Researchers have used a myriad of ideas to conceptualize the continuum of behaviors associated with leading in virtual learning and work communities. Investigations of virtual learning and work communities have used the terms virtual leadership and e-leadership interchangeably. Some described this phenomenon as social influence mediated by advance technology to affect change in attitudes, feelings, thinking, and behavior (Garcia, 2015). Others described it as creating conditions so others can best self-direct efforts toward goal achievement (Parchoma, 2005). Others provided specific designations for each describing virtual leadership as the individuals who manage virtual communities and e-leadership as the general nature of leadership in virtual environments (Schmidt, 2014). These collective depictions suggest Gurr's (2004) notion of conceptual confusion may still exist throughout virtual learning and work communities. The rapid pace at which technology changes how we engage in virtual environments may make it difficult to fully capture the meaning of this phenomenon without ambiguity.

Despite this rapid pace of change, the six competencies presented here consistently emerge as critical success factors for educators, learners, leaders, and followers. Schools must incorporate assessment of these virtual leadership competencies in the selection of faculty for online courses and provide ongoing faculty development opportunities for current faculty to grow in these areas. Online degree programs should consider these competencies in the selection of new students as well as provide ongoing opportunities for students for develop these skills as they progress. These competencies must be strategically included as institutions consider expanding their online footprint. Keeping abreast of virtual leadership needs mandates students, faculty, and administrators develop organizational and personal continuous learning plans to ensure technology changes do not outpace behavioral expectations.

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KEY TERMS AND DEFINITIONS

Computer Mediated Learning: Learning that occurs when an individual interactively engages with learning materials via computer-based tools and applications.

E-Leadership: Collection of leadership behaviors associated with virtual environments; often used interchangeably with virtual leadership.

Virtual Community: Environment for which participation is primarily mediated by technology applications or tools; interaction may be focused on social, work, or educational engagement.

Virtual Leadership: Collection of leadership behaviors associated with virtual environments; often used interchangeably with e-leadership.

Virtual Learning Environment: Internet or web-based platform used for instruction and learning.

Chapter 20
Modular E-Learning Course Design

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ABSTRACT

Generally it is difficult for an instructor to prepare and disseminate electronic course contents via Web. Therefore it is necessary to study and develop methodology and tools for supporting instructors, experts and even students to manage and access their online course contents easily, conveniently, flexibly and reliably. In order to do some jobs, module technology was introduced to e-learning to provide modularity in conducting educational development of courses and e-learning. Modules can best perform tasks independently on behalf of what was designed in a modular architecture. In modular design modules can be optimized independently of other modules, so that failure of one module does not cause other modules to stop and in general makes it easier to understand, design and manage web-based course system.

INTRODUCTION

Available knowledge, data and information are evolving huge in the Internet. It is difficult to organize, update, maintain, search and publish course content easily and optimally. Educational activities in Internet have increased with the fast growth. However, there are many lacks in e-learning procedures. Thus it is sometimes slow and difficult the use of web based learning. Hence, it would be beneficial if there are some more easy ways to adapt, design and use web for learning (Gunal,Tan & Hua, 2009).

There are a number of different authoring tools developed for assisting course content preparations in e-learning systems and multimedia distributed learning environment. When course contents are ready, the next steps for instructors are content management and course instruction. For this purpose, many different tools have been developed for supporting learning. Most of the instructors have to manually manage course contents, such as controlling and publishing content, adding homework answers periodically, putting announcements on time, and checking availability of hyperlinks inside the contents very frequently. All these management works are trivial but mistakes may often happen when done manually and with less knowledge. To avoid above problems and be simple and get rid of students' complains due

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to the possible mistakes, a lot of instructors just put the contents on the web servers, and almost without any change them during course periods. In this case, the course contents look like an ordinary textbook only appearing in electronic format in e-learning environment. These are dead materials and can not be optimally used to reach the maximum teaching/learning effectiveness. Course contents should be alive, dynamic and can even be growing.

Modular course design enables instructors in any field to develop well-organized online courses that are to be used. These courses are also easy for students to use, give them a sense of accomplishment as they perform the requirements of each module, and enable them to build on prior knowledge to build new skills.

A modular Web-based application can be a separate application in their own right, which interact with the main application and other modules to perform some set of tasks. A modular approach to web page design can save time in developing and maintaining a course web site. A template page can be created and the different components of the page plugged in where appropriate. No tools other than a text editor are required. This will involve "including" files within one another. Since this necessitates server-side processing some kind of server will be required. But these jobs should be done by technical people more than course instructors (Cargnelutti, 2008).

Modular approach is an advantageous for web-based education. A modular Web based course architecture consists of a core framework combined with the required modules to build a custom-tailored course. The resulting system should offer required functionality that the user needs. If a course requires a specialized functionality that is currently not offered by any module, an additional module should be developed by programmer but to be used by instructor of the course. The new module should be compatible with well-defined communication rules and behavioural patterns (Jenny et al.,2006).

Designing course and course content for online delivery requires consideration of curricular obligations, available development tools and materials, but it also requires careful analysis of teaching and learning techniques. A modular design of web-based education courses can facilitate teaching, course delivery, course design, student and instructor response and grading, and the well-structured growth of students. Lecture modules provide tutorials, scripts, interfaces, flexibility and richness for web-based classes. The course modules also should offer the instructor the ability to enhance, interrupt, change order of materials to be covered, or deliver chronological and sequential of instruction. This chapter will examine the concept of an agent-based modular system in web-based e-learning course.

E-LEARNING AND MODULAR DESIGN

E-learning has attracted a lot of attention from researchers and practitioners. Various types of e-learning platforms and tools include web services have been introduced in different education institutions and private training centres. Authors and learners are the main players and administrators and trainers as well. Authors or instructional designers can create e-learning content by using an authoring systems as well as traditional tools. The main part of e-learning system typically consists of a *learning management system (LMS)* and *learning content management system (LCMS)*. An LMS provides managing learners and their profiles, tracking their progress, easing collaboration, or scheduling events. An LCMS manages learning content which is typically stored in a database and eases content reusability, provides workflow support during content development, or delivers content by predefined interfaces and presentation layers (Pankratius, Sandel& Stucky, 2005).

E-learning systems typically cope with heterogeneous group of learners. These aspects and specialities influenced the way how e-learning content is typically handled, and led to the development of *learning objects (LOs)*, which basically represent reusable units of study, exercise, or practice and can be used in a course. LOs can be authored independently of the delivery medium by using an authoring system, stored inside an LCMS, and be distributed to run-time components over the Web, which implement and provides the interface for the learners. Since LOs are intended for use in many different e-learning systems, the concept of LOs represents one possible solution to the interoperability problem (Pankratius, Sandel& Stucky, 2005).

In e-Learning environment each user has an access right in a simple way across networks, to the communication tools and services, which are necessary to him in his activity and performance. In e-learning environment technologies for extracting knowledge should be designed in the limits of individuals' cognitive behaviour. The resources are distributed among people and environment and it's difficult to find out at a certain time who has the right information, advice or solution. Learning objects with their specific and powerful characteristics make knowledge management systems a valuable decision for education support Bakardjieva & Gercheva, 2011).

MODULAR COURSE DESIGN

Modular course design enables instructors in any field to develop well-organized online courses that are easy to manage. This flexibility in web based courses provides interchangeability, transferability and portable sharing of some digital learning objects as well modules and course materials (Hai-Jew, 2009).

Modularity is an important web based course design principle in a modular framework. Its goal is to design systems so that modules can be optimized independently of other modules, failure of one module does not cause other modules to fail, and in general to make it easier to understand, design and manage complex interdependent systems (Bliss,2008). In modular design modules should be self contained, one can replace or add any module without affecting the rest of the system without technical help. Some frameworks that allow to re-organize the directory structure, but when they were not created with a modular architecture in mind, they fail to provide most of the advantages that the architecture has to offer (Cargnelutti, 2008).

There are a lot of reasons for modular design. The first one is that one module can evolve or be replaced without affecting the other modules in application. If the design interfaces are clean, and do not effect other modules, then a developer or programmer can redesign a module without having to deeply understand the neighboring modules. The good thing with a independent module is that a well designed module as part of one system can be re-used in other systems too. It is the independence of the technology interoperability based on standards which is important. This doesn't, of course, have to directly align with the boundaries of learning materials, but obviously it makes sense to have the different technologies in different learning materials so that they can be reviewed, edited, and implemented by different people who develop. The web architecture of web based course should not be seen as a finished product, not as the final application, it is an ongoing procedure. Instructors should design for new course modules as well as developer develop applications to be built on top of existing architecture if it is required (Berners-Lee,2008).

A modular web based course architecture consists of a core framework combined with a set of task-specific modules. Modularity allows for the customization of client software those are browsers and by integrating only the required functionality into the final client. This offers three main advantages:

- The obtainable size of the client software minimizes download time,
- The user interface contains indispensable elements that makes it easy to learn and control,
- Modularity allows for construction of applications in real time (Jenny et al.,2006).

Modular course design enables flexibility in providing interchangeability, transferability and portability of digital learning objects as well modules and course materials (Hai-Jew, 2009). The modules can be optimized independently of other modules, failure of one module does not cause other modules to fail. In modular design, one can replace or add any module without affecting the rest of the system without technical help (Bliss, 2008). In modular design, one module can be re-used in other systems. Thus modules can be reviewed, edited, and implemented by different people (Berners-Lee,2008). Kelly (2009) summarizes advantages of modular design as follows:

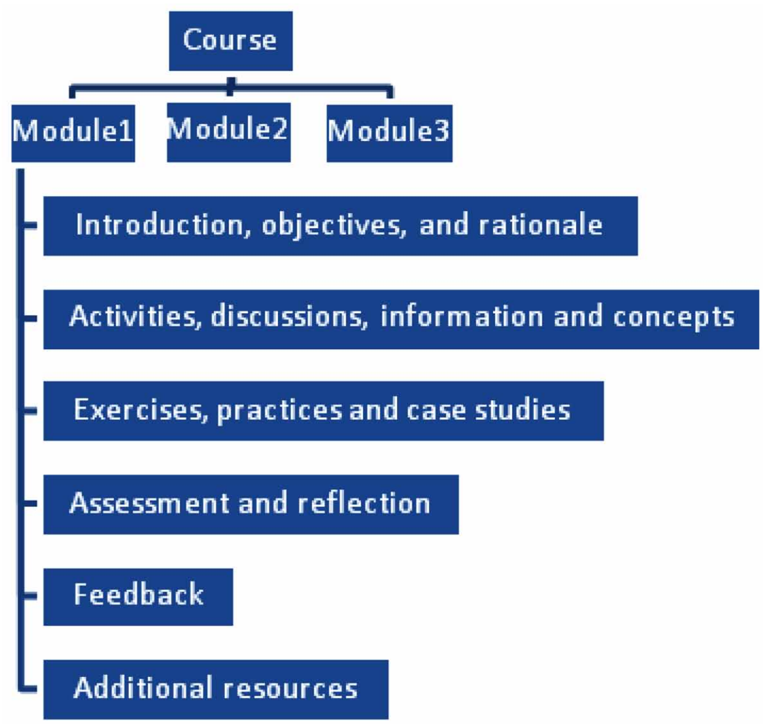
- **Expedited Course Creation:** Often, the task of creating a web based course is difficult for instructors. Components that go into a single module at a time simplifies the process, enabling instructors to design each learning component more thoughtfully. After creating a module it is not strange to create subsequent modules. In addition, by working on one module, instructors can more easily see how each activity relates to the course syllabus and desired learning outcomes.
- **Simplified Course Updates:** Modular design enables instructors to update specific parts of the course without having to overhaul the entire course. In addition to updating portability of modules is important. Modules can be easily removed for use in other courses or course management systems.
- **Consistency for Users:** Using the same types of components in each course module, students can adapt themselves and patterns in the course site (Kelly, 2009).

Instructional Strategies in a Module

The concept in a module is to bring together related contents that can be defined as a unit, chapter, topic, or segment of instruction. It is a standard "self-contained" chunk of instruction. A module refers to the chunking of the content conceptually and practically. Thus the course is a combination of one or more than one modules. In module design related contents are clustered into a module. Subject-based modules may be formed around a type or class of an object. Also a module may be organized around a particular activity or problem-based learning task (Hai-Jew,2009).

The basic structure of a module has learning objectives and learning outcomes. All the contents and resources within the module should support the objectives and outcomes (Hai-Jew,2009). Learning objectives are specific statements, actions, performance criteria, and conditions of what students will be able to do upon completing the module. A module should contain granular digital learning objects, multimedia contents, activities, assignments, discussions, practices, virtual experiences and simulations, and assessments (Boise State University, 2013). Modules may include some or all of the following elements as in Figure1.

Figure 1. Module structure



Interactivity

Interactivity contain using text, voice and visuals. Live broadcast of visual aids may offer rich body language and facial expressions to enhance the audio and visual communications. Immersive 3D spaces offer venues for individuals to communicate via digital materials.

Activities

Learning activities in web based education have become richer such as digital games. There are experiential simulations, digitized practices and full sensory discovery learning spaces. In each module there should be interactive activity for the entire class or for groups, which encourages critical thinking and practical application of the material covered in the learning module. In web-based courses links can be given to the rich resources on the Internet and publisher websites to enhance learning and stimulate students' curiosity to dig deeper into the subject matter (Henne, 2007).

Assessments

Assessments should offer the satisfactory completion of the module. Assessments may involve simple perusal of modular contents for very low value assessment. Medium and high-value assessments may involve more specific evaluation of finer points of the learning within a module (Hai-Jew,2009). Each module should include an activity before taking part in the learning activities within the module. The results can be compared to assessment results at the end of the module to measure learning outcomes. The end-of-module assessment should be in the same format as the pre-assessment to measure student progress (Henne, 2007).

Technological Functionalities

A module should offer a structure through which its information is delivered. A website may deliver the contents of a very flat, non-evaluative model. A web based learning system should offer functionality in terms of sequencing, learner tracking, rich multimedia delivery, learner work archival, and interactivity archival (Hai-Jew,2009).

Content Development

Modular content refers to a collection of learning resources developed as a single learning object. Each learning object functions like a building block – independent and self-contained but capable of being paired with other building blocks. When an online course is built using a collection of learning objects, it is considered to be built using modular course design. There are four steps in the creation of modular content.

- **Setting the Objective:** The objective for modular content specifies how it should be used. Without an objective learning resources can't be successfully developed for the learning object.
- **Determining the Best Way to Address the Objective:** One way to determine the best approach is to decide what skill is required to demonstrate competency of the objective. Students should be able to recall information fairly easily requiring a very low level cognitive skill – memory recall. Given the low skill needed, using text may be the best approach for addressing that objective.
- **Creating Content That Meets Scholarly Publishing Standards:** Scholarly text-based materials, are mostly edited, proofed and designed in an appropriate layout. When use of audio-based materials, they feature excellent sound quality. In the case of audio-visual presentations, they feature excellent sound quality and appropriate visuals to reflect what is being said. Materials that do not meet scholarly publishing standards may reduce the ability to be successfully pair for a learning object with other learning objects.
- **Remaining Focused on the Objective:** When a learning object to be successfully used with other learning objects, it cannot inadvertently address objectives for other learning objects. The two learning objects may define instruction differently and create a confusing learning experience for students. For reusability and coexistence each learning object must only address the specific objective it was intended to address. It should be always thought that create additional objectives and learning objects to address content not covered by your current learning objective (Crowder,2011),

CONCLUSION

In a typical website, a design is implemented so that it meets a set of requirements at the time of development. Often, after a website is delivered, the users (instructors, students, etc.) want to add functionality, or different users will require custom functionality based on specific needs. In order to accommodate these situations without a complete re-write, a framework that allows for future additions of modules without breaking the existing code base with an available module needs to be implemented. Design a flexible and scalable system architecture with modules is a way to publish and maintain a web-based e-learning course easily and effectively.

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KEY TERMS AND DEFINITIONS

Instructional Strategy: An instructional strategy is a method you would use in your teaching (in the classroom, online, or in some other medium) to help activate students' curiosity about a class topic, to engage the students in learning, to probe critical thinking skills, to keep them on task, to engender sustained and useful classroom interaction, and, in general, to enable and enhance their learning of course content.

Modular Design: Modular design, or "modularity in design", is a design approach that subdivides a system into smaller parts called modules or skids, that can be independently created and then used in different systems. A modular system can be characterized by functional partitioning into discrete scalable, reusable modules, rigorous use of well-defined modular interfaces, and making use of industry standards for interfaces.

Module: Prefabricated, self contained, standard unit that can be combined with other different but compatible modules to assemble a wide range of varied end-products such as buildings, computers, equipment, furniture, plants, shelving, software, and structures.

Learning Object: A digital self-contained and reusable entity, with a clear educational purpose, with at least three internal and editable components: content, learning activities and elements of context. The learning objects must have an external structure of information to facilitate their identification, storage and retrieval: the metadata.

Chapter 21
Personal Learning Environments

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ABSTRACT

A personal learning environment (PLE) is a construct designed to facilitate the process of learning and knowledge management. As a multidimensional system, a personal learning environment enables users to control the content and process of learning through the selection of resources, applications, and activities that best serve the learning needs. Personal learning environments exist as transformative learning spaces that differentiate to the users' ongoing personal interests and needs. Personal learning environments will continue to transform the educational landscape as technology continues to impact our culture. New modalities of learning will be needed to meet the needs of individuals who wish to pursue education in a manner that best serves their needs. Self-directed learning will require flexible landscapes that can coexist with traditional educational platforms; personal learning environments, if implemented effectively, can meet the emerging challenges in the future of education.

INTRODUCTION

A personal learning environment (PLE) is a construct designed to facilitate the process of learning and knowledge management. Unlike learning management systems (LMS) and virtual learning environments (VLE), personal learning environments provide users with greater levels of individualized control to create concrete or abstract platforms for learning. As multidimensional systems, personal learning environments enable users to control the content and process of learning through the selection of resources, applications, and activities that best serve the learning needs. As an intellectual metaphor, a personal learning environment can be construed as a cognitive mind map developed by the learner to acquire and organize information internally. The user selects processes information to construct a self-directed pathway for knowledge acquisition. Finally, as a pedagogical approach, a personal learning environment establishes a "learner-centric" practice that enables students to engage in activities that respond to their personal learning styles. Individuals develop their own goals and pace for learning; they select the strategies that help them master the material. Since PLEs are dynamic, they have a variety of architectures that are

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often modified throughout the learning process. Personal learning environments exist as transformative learning spaces that differentiate to the users' ongoing personal interests and needs.

Definition and Taxonomy

Since personal learning environments are not persistent, they are difficult to define. Furthermore, since some personal learning environments may involve internal self-reflection and mindfulness, they can be too abstract to explain. Richard Culatta (2016) points out that the phrase "personalized learning is often used interchangeably with the terms of adaptive learning, individualized learning, differentiated learning, and competency-based learning" and the "lack of precision around the language we use" is problematic when attempt to explain this concept. If we cannot adequately define the kind of learning that creates the environment, it is impractical to assert a generalized explanation or universal taxonomy to characterize this modality. Martindale and Dowdy (2010) affirm this conclusion, but in their assessment, agree that the "one common trait in all the early definitions of a personal learning environment is that the personal learning environment gives the learner control over his or her learning process" (179).

To expand the meaning of personal learning environments, several researchers have formulated their interpretations based upon what personal learning environments can accomplish for learners. Lubensky (2007) suggests that a "personal learning environment is a facility for individuals to access, aggregate, configure and manipulate digital artifacts of their ongoing learning experiences." Chatti (2007) notes that personal learning environments "[offer a] means to connect with other personal spaces for effective knowledge sharing and collaborative knowledge creation". Vazquez and Nistal (2013) believe that personal learning environments are created by learners to distribute and share their learning outcomes. The Imaile Project (2016) describes personal learning environments as "systems that help learners take control of and manage their own learning [which] includes support for learners to set their own learning goals, manage their learning, both content and process, and communicate to others in the process of learning". Most PLE advocates agree that personal learning environments foster the sustainability of active-learning online learning communities, collaborative research, and group-directed learning. However, as personal learning environment architectures continue to evolve with the development of emerging technologies, describing what these platforms can do also continues to change. For this reason, some individuals look to the primary function of personal learning environments to formulate the definition.

When learners initially establish an objective for their PLE, they immediately construct its meaning. The manner in which they describe their PLE is solely based upon its specific function. For some individuals, the PLE serves as a one-stop space to store all their learning tools which can be used at a later time to find and generate the content they need; hence, their personal learning environment exists as a toolbox or learning kit. Others create personal learning environments as a mechanism that links their online learning communities to cultivate teaching and research interactions; the focus is to connect to social media services that serve as content generators through peer to peer interaction. The relationships with people facilitate the content the learner uses to gain knowledge. It serves as a "people portal." Others use these environments as places to archive previously or ongoing collections of documents, files, and notes that can be retrieved at a later point in time for the creation of new knowledge products. Their personal learning environment resembles an electronic portfolio or online notebook. These individuals may use tools to store their information, but the focus is on storage. Many of these types of personal learning environments are seen in research organizations and workplace settings. In workplace settings, some individuals create personal learning environment to organize their productivity and professional development initiatives. Some people simply use personal learning environments to learn at their own pace. Many academics create PLES for keeping abreast of the latest information related to their teaching and research and independent scholars use personal learning environments as repositories for lifelong learning. They use their PLE for a specific task, such as writing a dissertation or working on a specialized work project. They need the PLE for a brief period of time to accomplish a learning task. In multidimensional Personal learning environments, people can create models that include some or all of these functions.

Since it is challenging to define personal learning environments that have multiple functions, the instructional design is often used to classify the typology. In an attempt to begin development of a classification scheme, Scott Leslie (2008) put together a comprehensive list of PLE models and posted them on Edu-tech's wiki (http://edtechpost.wikispaces.com/PLE+Diagrams). The list is arranged by the PLE's design orientation. In an attempt to classify and organize these models, some researchers believe that categorization of personal learning environments can be done by examining the design orientation priorities. In some personal learning environments, tools and applications are more important than networks and interactions with other learners.

By examining the modalities of personal learning environments, some researchers believe it is easier to classify them. Mark van Harmelen (2006) created a basic taxonomy which highlights some of the important dimensions found in tool driven learning spaces. In his taxonomy, van Harmelen identified a series of dimensions that personal learning environments reveal: pedagogy, personalization, control; connectivity and compatibility. He explains how personal learning environments are different from existing learning management structures, but also notes the opposing pedagogies in the creation of personal learning environments. For example, he discusses the functional characteristics of PLEs and reveals the importance of compatibility in terms of the tools and resources. He shows opposing models that exist with system formats (open versus closed; single versus multi-network). Since Van Harmelen's taxonomy focuses on tool orientations, he does not address how external resources created through learning activities beyond the personal learning environment integrate into the system. His taxonomy also limits itself to single user systems, which do not account for community-driven PLE systems, such as social media groups. Like, van Hamerlen, Niall Sclater (2008) also classifies personal learning environments by their tools, but his focus is more on the functionality of the tools within the environment. He argues that there are three unique distinct directions when it comes to PLE design and implementation:

The first group argues that client software can be developed to mediate between the learner and the many resources of the Internet. A second group is attempting to achieve this by providing sophisticated web servers and enabling participation of learners by their web browsers without additional software. And finally, some people argue that PLES are here already and that many online learners already make effective and customized use of a range of online facilities (3).

Theorists who see personal learning networks as blended systems (making use of both tools and "people" networks) have attempted to categorize personal learning environments by their dominant orientation. System models are seen as those whose primary orientation focuses on the networks that are linked to generate the information the learner needs. These systems are open and allow the users to modify the formats and applications within the environment. Unlike system driven personal learning environments, social personal learning environments focus on people. These personal learning environments are built upon the networks of human interaction that allow for the distribution of information exchange (people teaching one another; people talking to each other; people sharing generating information for each other). These designs are more community-driven because they focus on resources that engage and actively support the communication of the community. For example, learners may follow individuals on Twitter who conduct research in a certain fields of study. The focus is not so much on the use of Twitter (the tool) to accomplish this task, but rather on connecting to the people who can assist the learner with his or her inquiry. Social media networks are people driven. Social media networks do not necessarily place emphasis on the tools that are used, but rather on the people that belong and connect with each other in those networks. In some instances, learners use one system in their personal learning environment. In others, some researchers link multiple platforms for different needs. Others simply create smaller subsystems within the greater framework. These subsystems are referred to as personal learning networks (PLN). Often, some people interchange the two terms, but the PLN actually exists as a part of the whole. Multiple PLNs can be found in a personal learning environment and can even exist external to that environment.

Other personal learning environments have a hybrid orientation which relies on both the system and people network to create the design. These structures offer a mixed-model approach to personal learning environments based on the type of tools the user can access and the type of information that is gained from the participation in communities of people. Many of these types of personal learning environments can be found in workplace settings that often require more mobile systems of information exchange and partnerships. Global research organizations and industry developers may develop specialized personal learning environments for their members to communicate and ensure ongoing dissemination of information and resources. Although the tools may be important to conduct specific tasks for the learning objectives, the people that are participating in the community networks are equally important. In hybrid models, the personal learning environment would not be efficient if either element was removed.

THE GENESIS OF PERSONAL LEARNING ENVIRONMENTS

Although much of the research seems to focus on Web 2.0 technology as the driving force behind the rise of personal learning environments, it is important to understand that long before the development of participant technologies, other influences led to the conceptualization of personal learning environments. In one sense libraries served as the first learning environments that enable users to retrieve the resources they needed to facilitate learning. Although some critics may scoff at this idea, the basic mission of a library is to provide resources for personal learning which admittedly, is the basic tenet of a personal learning environment. Patrons with information need seek resources through interaction with print sources, library staff, and services available in the library system. Connections and learning communities are fostered through shared reading experiences in book circles, sponsored educational programs targeted to specific demographic groups, and resource lists identifying new materials for review.

Even today, modern libraries have modified their activities to promote information fluency with the rise of emerging personalized learning. The Association of College and Research Libraries (ACRL) recently published the *Framework for Information Literacy for Higher Education* "which offers a renewed vision of information literacy as an overarching set of abilities in which students are consumers and creators of information who can participate successfully in collaborative spaces" (ACRL). In fact, the ALA's definition of information literacy, directly addresses the objectives of what personal learning environments are designed to accomplish: "Information literacy is the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning." Furthermore, the expansion of virtual libraries and digital repositories of archival information, have created even greater online access to resources, materials, and services. The rise of electronic research databases, intuitive information retrieval systems, and information storage applications such as user generated digital commons are creating additional tools for research, organizing, and dissemination of information that are all services used in personal learning environments.

Another significant foundation in the evolution of personal learning environments was the creation of LISTSERV. Created by Eric Thomas for BITNET, listservs enabled group messaging to transmit as email to individuals subscribed to a server managed mailing list. Listserv group owners could manage content and participants within a closed environment. Individuals who were members of the community could interact with the resources made available to the group. *Majordomo* later expanded the use of this medium to form more open subject area networks. The development of these tools is important because they paved the way of creating online community networks. Soon after, more robust chatrooms and other collaborative web spaces were created to enable users to share more complex media. Collaborative technologies such as blogs and wikis offered even more levels for control of content creation and editing with other learners. There is little doubt that these early online communities gave rise to the multidimensional social media networks that are integrated in modern personal learning network environments.

Although libraries and networking systems can be seen as concrete foundations for the development of personalized learning environments, equally important is the theoretical" frameworks that prompted explorations into alternative modalities for learning. Allen Tough's research identified the importance of self-directed learning and demonstrated how adult learners engaged in developing "learning paths" that culminated into learning projects. In his research, he found that adult learners regularly conducted purposeful and self-directed activities external to the classroom environment to gain knowledge for a desired outcome. Ivan Illich's book, *Deschooling Society* (1971) presented the idea of an "educational web" to network student learning. Illich presented the view of "learning webs" as an alternative to current education practices. A "Network of Learning" was further described by Christopher Alexander et. al (1977) in the book: *A Pattern Language: Towns, Buildings, Construction* in which the authors suggested that learning could be constructed by communities external to the classroom environment. Alexander et. al. suggested that the process of learning should be "decentralized" and that other aspects of a student's community could become "the backbone of the learning process" (Alexander). David Kolb's (1986) *Experiential Learning Model* (ELM) further showed how experience coupled with reflection could lead to the formulation of new learning. This practice of "active-experimentation to abstract conceptualization" occurs through the learners' selection and control, the common ground behind the development of personal learning environments. All of these early theoretical constructs prompted discussions of alternative learning activities outside the traditional classroom; each of these perspectives examined how external interactions contribute to the learning process.

As educational technology increased its influence in the classroom, new theories emerged regarding active and networked learning. Zubrinic and Kalpic (2008) assert that the collaborative nature of Web 2.0 tools readily made it easy for learners to create self-directed learning spaces to manage the information they collected for research and information needs. In their view, "the learners are able to engage in the knowledge of the community and at the same time contribute with their own knowledge" through the use of the Web as a personal learning environment to obtain and disseminate this information (54). Lave and Wenger (1998) identify "communities of practice (CoP) and communities of interest (CoI) as being important aspects of the personal and professional learning development that influences learning. They argue that communities inspire an incentive for learning and the desire to master the skills the community upholds. As Chatti (2207) explains, personal learning environments work toward "the integration of [these] communities.

In response, new theoretical frameworks began to address how learners gained knowledge through social networking. Constructivism" emphasizes the individual's role in finding meaning through interactions with others and within their [learning] environment. Constructivists believe that learners create "mental models" that are adjusted to gain new learning experiences. Jonassen and Land (2002) suggest that context, construction, and collaboration are the three cornerstones for creating constructivist learning environments. They believe that learners make meaning of their own experiences. These actions, in turn, lead to the creation of personal learning environments because learners develop skills within the framework they create.

Another theory that supports personalized learning environments is Connectivism. Principles of "Connectivism" focus on the role of decision-making in the learning process and the process of connecting information resources to facilitate continuous learning. Siemens (2005) asserts "learning is a process of connecting specialized nodes or information sources." In his view, individuals create learning communities that enable a "clustering of similar areas of interests . . . for interaction, sharing, dialoguing, and thinking together." Connectivism" sees "knowledge structures as a network" which learners manipulate to create their personalized learning environments. Learners make decisions throughout their learning process by connecting information through their inquiry and selection of resources to address their information need. Individuals seek networks to foster new learning and resources that expand their personal and professional development. These networks can go beyond traditional modes of learning.

The actual phrase "personal learning environment" was documented as early as 2001 when Oliver and Liber discussed "peer to peer" learning models that used personal and customized lifelong learning practices. The realization that Web 2.0 participant learning technologies were opening up the boundaries of learning and that traditional pedagogies could no longer restrict these systems, prompted discussions of identifying a new learning platform for responding to this style of learning. The phrase "personal learning environment" became a tag word for the 2004 Joint Information Systems Committee – Centre for Educational Technology Interoperability Standards (JISC-CETIS) in 2004 and in the following year, the focus of discussion focused on identifying models of this new learning paradigm. In 2006, Scott Wilson "published a conceptual model for a new type of system, termed at the time 'VLE of the future' (Wilson 2005). Wilson then began to establish a framework for PLES to identify the basic features PLEs required. In his view, personal learning environments should be constructed with the following tenets in mind:

1. The system should focus on coordinating connections between the user/learner and a wide range of services offered through a wide range of contexts.
2. The system enables the user/learner to "consider and publish resources" which "able [them] to organize their resources, manage contexts, and adapt tools to suit the needs" (32).
3. Users control all contexts. (Contexts of learning, contexts of the tools and resources; contexts of the processes to facilitate the learning).
4. The openness of the learning and the openness of the content give the user/learner greater opportunities for collaboration and knowledge construction with other users/learners. It is here that the difference between personal learning environments and learning management systems can be seen.

FEATURES OF PERSONAL LEARNING ENVIRONMENTS

. Although personal learning environments vary in design, they do have common features. All personal learning environments possess some form of a "learning space" (formal or informal) that requires an identification of the user or learner (Oliveira and Morgado 513). Although it may not be obvious who is managing the personal learning environment (in the case of systems managed by multiple users), someone must create the platform, subscribe to the accounts of the applications that exist in the environment and establish the login or access to the system to manage the content.

Personal learning environments must have tools, resources, and services to function effectively and be able to coexist in transformative architectures. These elements exist as the "building blocks" of the environment and influence the environment's sustainability. Since the success of a personal learning environment depends greatly upon its level of functionality, tools and services that do not acclimate to the learners' changing preferences must be modified or removed altogether. Although the learner controls which elements exist in the personal learning environment, these elements as a collective exist as the second primary feature of the personal learning environment. The flexibility in personal learning environments allow learners to add or remove these elements.

Another important feature of personal learning environments is that there needs to be a method of communication that enables learners to interact with others through the learning process. Some personal learning environments use simple tools such as email and others make use of social software to create a personal learning network with the framework of the environment. It is important to distinguish that a personal learning network is not a personal learning environment. Oliveira and Morgado (2014) explains "the PLN is integrated in the PLE because with the technological and social advancement, the tools, processes and activities that enable one to share, reflect, discuss, and rebuild with other knowledge, encourage and nourish this exchange and the acquisition of knowledge" (530-31). Castanedo and Avell (2013) believe that personal learning networks serve as "relationship tools" that offer a strategy for generating interaction and getting feedback toward the production of knowledge. Although some personal learning environments may limit the level of interaction within their design, they do nonetheless possess a feature that allows for communication.

Finally, the last feature that personal learning environments have relates to storage. Since the learning space contains information, tools, resources, and other materials, it must have a way to provide containment of all of these learning objects. A storage element within a personal learning is important because it helps the learner have a secure space to store and retrieve knowledge products.

Models of Personal Learning Environments

Since there are numerous designs of personal learning environments, attempts to classify them have been daunting. At the most basic level, Milligan et al (2008) presents a "generic model" that incorporates tools that enables the learner to create learning relationships with others, control and manage the learning activities that occur, and integrate the learning from different sources toward the desired outcome. This model is simple in format, but serves as a beginning format for individuals new to creating a personal learning environment. To better organize PLES, Scott Leslie (2008) collected a variety of personal learning environments and encouraged other researchers to submit their PLES to a wiki (https://edtechpost.wikispaces.com/PLE+Diagrams). The list is arranged by focus orientation which is often used to identify model formats for personal learning environments. These orientations are categorized as follows: 1)

Tool-oriented; 2) Use/Action oriented; 3) People oriented; 4) Hybrid/Abstract orientation. Leslie's list is a useful way to distinguish model formats and also a

To understand the differences, it is important to examine the architectures of these model types. Tool based models focus on the nature and structure of the system. One tools-based model, the Jafari Model (2006) focuses on a "smart learning environment" that responds to the users' learning preferences and customizes the integration tools to meet the user/learners' needs. These tools then can be connected to external services that can create learning communities within the system. Unlike an LMS system that remains closed to external learning spaces, the Jafari model employs a mobile "lifelong learning repository" that contains all of the tools the learner would need (EduTech). An example of this model would be the Google Classroom and its corresponding application tools that learners can use away from the educational or workplace environment with other learners external to those environments. Although most of the tools the learner/user needs are within the system, most of these tools can connect with external resources and interact with services outside of the system, itself.

As the use of participant technologies emerges, many personal learning environments are constructed around the use of these technologies. Chatti (2007) explores the role of integrating external services and applications, but discusses the importance of learning communities in personal learning environments. Chatti explains how differ types of communities serve as the integration that creates the connections needed for learning and professional development. He suggests that the "integration of communities" is the central function of personal learning environments because the learner engages with these communities to gain and acquire knowledge and meaning. An example of Chatti's concept can be seen in the Personal Learning Environment Framework (PLEF) from the University of Aachen. In this personal learning environment, "learners [take] control over their learning experiences by aggregating, managing, tagging, commenting, and sharing their favorite resources within a personalized space"(Edutech wiki).

Other researchers have suggested hybrid designs offer greater flexibility because their designs are more readily linked to different modalities. The taxonomy for these personal learning environments is organized by specific orientations that reflect the primary emphasis of the PLE. With the development of new technologies, some researchers have begun to examine how participant Web 2.0 applications influence the function of a personal learning environment. These models are designed to adapt to any environments and have the ability to transition into new environments the learner may enter. For example, hybrid personal learning networks can facilitate school to work transitions. Zubrinic and Kalpic (2008) believe the Web serves as the best representation of a hybrid model.

Still other models are much more complex. Hiebert's model offers a continuum for past, present, and future learning. In this model, the ability to collect, reflect, connect, and publish can occur with information gathered through the course of time. An illustration of this model would be a teaching portfolio which collects artifacts and documents that reflects a teachers' personal, professional, and career development. Chris Sessums () has created a model that centers on action. The networks in this model are built around active learning behaviors; collective activities

Model distinctions have also been made on whether the personal learning environment is contained or distributed. A contained model usually has a single login that connects the learners to all of the applications in the personal learning environment. One example of this model is the Personal Learning Environment Framework (PLEF) which provides several web 2.0 applications that do not require individual integration. There is one login and the learners can customize the space using the tools that are within the framework. Another example would be Google Classroom. Distributed models link applications by their function. Since the learners are using multiple applications to build this type of personal learning environment, more than one login may be required and more than one interface may have to be understood. Although distributed models may require greater skill to manage, personal learning environments that are constructed in this manner give learners greater levels of freedom to modify the PLE.

Stephen Downes (2008) summarizes it succinctly when he states that personal learning environments should adhere to three principles: interaction, usability, and relevance.

Challenges of Personal Learning Environments

One of the common criticisms of personal learning environments is that they are difficult to apply in educational and workplace settings. In educational settings, some teachers believe that personal learning environments cannot replace proven pedagogies. Teachers are reluctant to use personal learning environments in their classrooms for several reasons. First of all, since the learners control the design of the personal learning environment, it can be difficult to unify multiple personal learning environments toward a common learning objective. Johnson and Sherlock (2014) suggest that "the absence of shared experience or common purpose has an impact on the motivation for engaging with personal technology" (161-162). Secondly, the process of self-directed learning requires a skill set that some learners might not yet possess; learners may not have mastered specific information and technology fluency skills to use certain tools. Novice learners may also have more difficulties selecting the right tools and then using them properly. In response, they may only rely on basic tools that are less effective for the outcomes they need to achieve. Tu .et al. (2012) explains that "if students are not clear with their learning goals and uncertain how to appropriate relevant technologies to achieve these goals, an effective PLE would not occur at all (14). In their view, "a PLE requires learners with competent self-regulatory skills" (14).

The unevenness of learner *preparation* can also pose problems in the creation of personal learning environments. In many situations, the learners are not the novices, but in fact, the teachers. Most pre-service education programs isolate one course that discusses technology integration. Since this course is often a general introduction to the principles of using technology in the classroom, it does not serve as an effective means to teach people how to anticipate the complexities of managing personal learning environments. Even after, most school districts do not invest time to train teachers in technology integration directives. Teachers are given technology tools to use in the classroom, but little time to fully master the use of these tools to meet their learning objectives. In many cases, the tools are used in a basic sense and not to the levels of their full potential. Teachers also might not want to manage class instruction through mediation of numerous personalized learning networks. Johnson and Sherlock (2014) state "the success of the PLE depends on the effectiveness of practices to make a difference to individuals in using technology effectively to manage their learning and their live … It is not enough simply to present the technology to learners and expect them to 'get on with it' (154). Teachers may not want to take the time to evaluate individualized learning plans for every student in their class. Furthermore, it would be incredibly difficult to measure and compare learning outcomes through examination of every unique personal learning environment.

In workplace settings, similar problems exist. Juarros et.al (2016) notes that "building a PLE demands more time" (216). As a result, employees may not wish to engage in developing a personal learning environment because it redirects too much focus from their primary job responsibilities. Such individual research may even be considered counterproductive to the management of specific projects. Johnson et al (2008) note that it can become a "cognitive burden" for the learner having to learn all of the different platforms of the personal learning environment. Johnson explains "to operate within this environment, the user must manage a number of different dispositions and skills required for different interfaces." Even if employees do create personal learning environments, they may soon find that their tools are incompatible with the organizations' IT setup. Some companies may not permit the transfer of communication and documents on personalized learning environments due to confidentiality policies and other workplace regulation.

However, there are many solutions to address these challenges. One method involves using personal learning environments as an activity to provide individualized learning opportunities. Students or employees can use their personal learning environments as supplemental instructional tools to help them improve upon areas in which they need to improve their skills. Many university and college developmental courses are using these systems for helping students improve their mathematics and science competencies. Employees can explore and investigate learning projects related to their interests and sense of inquiry with global partnerships. Personal learning environments can offer employees the opportunity to build networks within the organization to work on solving various problems. As a workforce development platform, human resources departments can help employees create a professional development plan that helps them advance and secure the training they need for promotions.

In higher education settings, personal learning environments can be used to provide students with differentiated learning activities; it gives students external opportunities to expand their knowledge through the integration of instruction the school may not have access to support. Advanced students can take courses that their schools may not offer; instructors can teach courses that link students from several districts which promotes more global learning outcomes and a better understanding of diverse ideas. Flat classroom activities can be conducted through community driven personal learning environments. Educational opportunities can be offered to community learners The level of interaction that students gain from these experiences improve their cultural awareness and understanding of global issues more readily. Personal learning environments need not replace traditional pedagogical practices, but like any other emerging instructional concept, they can increase the manner in which learning takes place.

Two other issues regarding personal learning environments involve accessibility and cost. Some personal learning environments may not be ADA compliant; others may require costly plug-ins or other devices. Still others may be incompatible with the existing infrastructure. Learners may not know how to determine the appropriateness of a given tool or understand how to evaluate the accessibility features of the tools. While most new tools are being created with universal design features in mind, there are still some tools that are not suited for people with disabilities. More research and development must be done to ensure that emerging technologies meet design standards for all learners to use. To address this issue, universal design must be at the forefront in the development of the personal learning network. People can be educated to select the tools that support universal design features.

The cost of these platforms can also make them inaccessible. In many instances, tools that were free to use, suddenly become fee-based. NING, a popular social network application was initially free for educators to use, but decided to charge a monthly hosting fee. Since many educators protested, NING responded by allowing educational networks to operate at a lower rate; however, they still required a fee. In most instances, free versions of most tools and services have restrictions that limit the value of the tool for larger projects. People who favor the tool end up paying for the expanded version simply because they do not want to have to transfer to a new platform. Complex personal learning environments may also require funding the costs for several single site licenses for every application. This situation can prove expensive to maintain each year. Even if the costs are supported but the institution, the learner may be required' to back-up the information should the institution or organization changes the system they were using to reduce costs.

FUTURE IMPLICATIONS FOR PERSONAL LEARNING ENVIRONMENTS

Personal learning environments are making an impact in both educational and workplace environments because they are able to acclimate effectively with emerging technologies and a wide range of digital architectures. They are transformative and support of individual aesthetics which is important in a self-directed cultural landscape.

The value of using personal learning environments in various educational settings can be measured through careful implementation and thoughtful technology integration. Kompen, Edirishingha, and Mobbs (2008) note: "A PLE has the potential to not only support lifelong learning, but to bring together all forms of learning, including both formal and informal, occurring at a particular time. Learning takes place in different contexts and situations, and a PLE can enable the learner to organize his or her own learning." (3). Personal development environments are already demonstrating success among researchers in health medicine and other academic fields. Corporations are using personal learning networks as part of their workforce development directives to offer their employees platforms for professional and career development. Personal learning environments are also useful mechanisms for establishing global partnerships.

Since personal learning environments continue to evolve, we need to support their infrastructures and successful implementation. The following considerations are offered to prompt discussions of the potential of personal learning environments:

1. *We need to identify a transitional integration of personal learning environments into current educational practice.* Fielder et al (2011) assert that "from an educational intervention perspective, we need to make an attempt to re-configure teaching activities so that the individual personal learners can actualize and execute control and responsibility . . . [over] their own personal learning activity and its specific (personal learning) environment" and that:digitalization and networking" have become the "dominant medium" in education (7-8).
2. *We need to demonstrate how to use personal learning environments efficiently and effectively.* As an emerging platform, personal learning environments have not been tested and proven with measurable outcomes of their success. Research has not truly identified the value of these tools to improve learning outcomes in educational and workplace settings. Until more studies produce measurable results, critics will resist adopting this platform.
3. *Quality training and support in the use of personal learning environments must be provided to ensure successful implementation.* If the desired outcome is to encourage more learners to pursue using personal learning environments, there needs to be a strategic operative in training people about the value of these platforms in both educational and workplace settings. Some universities and colleges have begun this process through the use of eportfoilos, MOOCS, and development of creating learning pathway plans; however, there still exists a lack of education and training for educators and administrators and the leaders that make the decisions regarding the employment of these architectures. Industry has also begun to create new tools that can be adapted to a variety of personal learning architectures, but much more research and development must be done to show

people why the use of these systems can be valuable in their personal and professional development. All the focus is on creating the systems rather than teaching people how to construct them.

4. *Finally, more open network learning environments must be created.* Vu et. al. states that "ONLE permits learners to build their own PLES [seamlessly] through open, social and network learning architectures" (14). The infrastructure has not kept pace with the technology. We need to reexamine how issues associated with accessibility, interoperability, and cost impact the use of personal learning environments.

Personal learning environments will continue to transform the educational landscape as technology continues to impact our culture. New modalities of learning will be needed to meet the needs of individuals who wish to pursue education in a manner that best serves their needs. Self-directed learning will require flexible landscapes that can coexist with traditional educational platforms; personal learning environments, if implemented effectively, can meet the emerging challenges in the future of education.

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Chapter 22
Gender Difference in Perception and Use of Social Media Tools

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ABSTRACT

Research on gender difference remains a strong interest today because the gender equality issue has not been fundamentally tackled in many areas due to traditional and cultural gender values. However, on the technology adoption, especially social media tools usage, the gender difference is less prominent. The research study in this chapter was conducted in a higher education institution and data were collected from 1534 students in eight years (2009–2016). The purpose of this study is to find out if there are any gender difference in familiarity of social media concept and use of social media tools, and if the traditional gender values are affecting social media adoption. The results indicate that there is no statistically significant gender difference in media concept knowledge. Both genders were using the same top four social media tools. However, male participants have higher usage of resource-based social media tools, while females have higher usage on relationship building platforms.

INTRODUCTION

How did the gender values originate and why do these traditional values still influence people's behaviors today? Based on two origin theories (Archer, 1996) – evolutionary psychological theory and social structural origin theory, the evolutionary theory stresses that male and female have different adaptation ability to the physical and social environments during primeval times (Buss, 1995a, Tooby & Cosmides, 1992) "Men and women differ in domains where they faced different adaptive problems over human evolutionary history" (Buss & Kenrick, 1998 p.994). Because of these differences in evolutionary adaptations, male and female developed a different behavioral pattern, men are likely to develop strategies and skillsets favoring violence, competition, risk taking and striving for more resources to be successful; while women, due to the task of reproduction and domestic responsibility tend to develop an inclination to nurture (Eagly & Wood, 1999). Social structural origin theory looks at the sex differences from the perspective of social structure, different social roles and unequal treatment of women in the society.

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Ridgeway and Diekema concisely stated that man's accommodation to roles with greater power and status produces more dominant behavior, and women's accommodation to roles with lesser power and status produces more subordinate behavior (1992). Dominant behavior features "controlling, assertive, relatively directive and autocratic, and may involve sexual control", while subordinate behavior "is more compliant to social influence, less overtly aggressive, move cooperative and conciliatory, and may involve a lack of sexual autonomy" (Eagly & Wood, 1999, p. 412).

Both evolutionary and social structural theories have strong ground in making the argument of the different human behaviors between genders. Some of this traditional value has become a stereotyped judging standard for what men can do and what women should not and cannot do. Women's Rights Movements starting in 1848 and second wave in 1960's have shaken the historical perceptions toward women. Women's participation in the social activities, assuming important leadership roles and joining different labor forces to become financially independent has greatly changed women's image in the society. Women are voicing their opinions in different media. However, there is still prevalent evidence that females are unfairly treated in many areas in today's society. The change is gradual and it takes efforts from both men and women to achieve true gender equality because the constraints either natural or social put in the disposition of gender roles in what they do and these constraints, to certain extent, help sustain the traditional gender value (Eagly & Wood, 1999).

In technology adoption, especially in regard to the use of social media technologies, the gender difference is less prominent than that in work place and social roles. The purpose of this research study is to find out if there are any gender differences in familiarity of social media concept and use of social media tools, and if the traditional gender value, either natural or social, is still playing any role in affecting social media adoption. Pew Research Center has been conducting digital media and social networking research for many years on entire population and provided a more comprehensive overview of social media use with general classification of information. Its data have become authoritative sources for most research on social media technologies. The uniqueness of this study as compared to Pew's research is that this study focuses on students in higher education, which is the most popular age group that uses social media. Since they are all educated college students, the variable of education as an important factor affecting internet and social media access does not exist in this study. The study covers a period of eight consecutive years from 2009 to 2016; the data are very helpful in comparing the gender difference in using social media tools and also in investigating the trend of the participants' preference and change in those eight years. The data are very important for documenting how social media has become an indispensable communication channel for people's daily life in modern time.

GENDEN DIFFERENCE IN EARLY TECHNOLOGY ADOPTION

According to Roger's (1983) adoption theory, the process for adoption involves knowledge of innovation, persuasion, decision, implementation and confirmation. So the knowledge is the first factor for innovation adoption, and it is not surprising that numerous research studies indicated that education level is positively correlated with the use of technology. Early technology adoption by individuals was strongly affected by managerial influences and organizations (Leonard-Barton and Deschamps, 1998; Kwon and Zmud 1987; Robertson and Gatignon 1986; Roger 1983). With higher employment and income rate of men than women, men definitely have advantage of accessing and using of technology. The research studies on gender difference in technology and internet adoption in late 90s' demonstrated the obvious gender gap on the internet use, the majority internet users were men (Sherman, et al., 2000). Bimber (2000) conducted a research study on measuring the gender gap on the Internet from the data collected in 1996, 1998 and 1999 and concluded that two statistically significant gender gaps exist on the Internet access and use, however, the access gap was due to socioeconomic difference rather than gender-specific factors. In 2005, Wasserman & Richmond-Abbott conducted a research to find out the causes and variables in Internet access, level and scope of use between male and female and concluded that "access to the web was independent of gender, but was related to education, race, income, age, and marital status" and "knowledge related to web use is an important independent variable that influences Internet use by men and women" (252).

Ajzen's Theory of Planned Behavior (TPB, 1985) provides an exploration of technology adoption from a difference perspective. The TPB explains that an individual's intentions and behaviors are shaped together by 1) the attitude toward behavior, 2) subjective norms, and 3) perceived behavioral control. Taylor and Todd (1995) further researched and investigated the causal effect for these three elements and established that attitude toward using technology is determined by perceptions of usefulness; subjective norm is affected by peer and superior's influence and perceived behavioral control is influenced by self-efficacy. In the longitudinal study by Venkatesh, Morris & Ackerman (2000) on the gender differences in individual technology adoption and usage decision over a 5-month period among 355 workers they used the TPB framework in their research. Their data indicated that "men were more strongly influenced by their attitude toward using the new technology in making decisions while women were more strongly influenced by subjective norm and perceived behavioral control" (p.33). Women are more likely to conform to a majority opinion (Eagly, 1978; Maccoby & Jacklin, 1974) and may even internalize subordination to be part of their personality (Crawford, Chaffin, & Fitton, 1995). The TPB research by Sparks, Guthrie, and Shepherd (1997) refined and focused the thinking with evidence showing that perceived difficulty is the most important component of perceived behavioral control. Women display somewhat higher levels of computer anxiety (Bozionelos, 1996) and lower computer aptitude (Felter, 1985) compared to men.

Another study conducted by Zhou and Xu (2007) on technology adoption at a large Canadian university. They investigated all full-time faculty and sessional instructors to see if gender matters in using technology to teach courses. They found out that "Females had lower confidence and less experience in the use of computers in teaching and they tended to learn how to use technology from others, whereas males were more likely to learn from their own experience" (pp. 140). This result confirms the technology decision making process in the TPB theory.

Gender differences also portray the different communication style and focus. Women tend to pay more attention to please others than men (Miller, 1976). Based on a review of research, Minton and Schneider (1980) concluded that women are more people-oriented and less self-confident and independent than men. On average, women pay more attention to social cues and men pay more attention to nonsocial cues such as objects and visual patterns (Williams & Best, 1982). Men are more apt to a competitive attitude with a self-confident approach (Lundeberg, Fox, & Puncochar, 1994), while women value informational inputs more and take advantage of the opportunity to improve their communication ability (Venkatesh, Morris, & Ackerman, 2000). In an early study, Barnett and Karson (1987) reviewed the research studies in this area and concluded that women are likely to select actions in terms that are likely to be approved by others as opposed to following rules or principles that are separate from relationships.

SOCIAL MEDIA USAGE TODAY

There is no comparison between Internet social media and traditional media regarding the speed of development and expansion. It only took a bit over a decade for social media to spread globally. Since the first Web 2.0 defined at the conference hosted by O'Reilly Media and MediaLive, according to the data summary in 2016 Digital Yearbook, today active social media users have reached to 2.307 billion (31% of global population), of which 1.968 billion are mobile social users. The growth rate of active social media users from 2015 to 2016 is 10%, which are 219 million additional users for one year. Facebook is ranked the top social network platform, which has a total number of 1,590 million users in 2016. Based on the data from the report of the Pew Internet & American Life Project, in 2015, 90% of adults aged 18-29 are social media users and the next age group is 30-49 of 77%. Social media adoption between genders is pretty comparable in last decade with women slightly higher than men in less than 8%. In 2015, women users are 68% vs. men users of 62%. Pew research data from 2008-2013 indicate that women users were taking a leading position in social networking use. In 2015, anther Pew research indicates that men have been catching up the women users.

In the book *The Culture of Connectivity* (2015), the author, Jose van Dijck provided the major functions of social media based on her analysis of the case studies on multiple social media tools, such as Facebook, Twitter, YouTube, Flickr and Wikipedia. She summarizes that social media provides platforms for 1) social networking, 2) resources from user-generated content, and 3) possibilities of a not-for-profit public service. The connection through social media is global and without boundaries. Social media tools are used for Internet communication by people from all walks of life, old and young, male and female for difference reasons to achieve their goals. The unique characteristics of social media tools enable people to connect not only with family members but also with people all over the world. However, men and women have different attitude toward and focus on different social media tools and activities. Men use the internet mainly for entertainment purposes and as new resources while women use the internet for research purposes including getting health information, reading spiritual and religious information, gaining access and participate in support group websites, interacting with friends and family members through social media platforms (Pew, 2015). Eversave conducted a research and concluded that about 77.1% of the women population use FB post statuses to inform, men on the other hand use FB to boost social status or research. Thanuskodi (2013) conducted a comparison research study on gender different in internet usage among 340 college students at Annamalai University and found out that male students are more likely to use internet resources for information and communication, obtaining e-publications while female students have more issues, feeling overwhelmed by information overload and information pollution.

THE RESEARCH STUDY

This study was conducted at the Jack J. Valenti School of Communication at the University of Houston, a 4-year higher education institution. The data were collected from 1534 college students in a period of eight consecutive years from fall 2009 to spring 2016. The purpose of this study is to find out if there are any gender difference in familiarity of social media concept and use of social media tools, and if the traditional gender values are still playing any role in affecting social media adoption. Survey research method with convenient sampling was used to collect data. The participating students were taking the same course in the subject area of communication and information technologies. An online survey was distributed to partial students who took the course. The participation was voluntary, however, 2 incentive bonus points were provided to students who answered all questions truthfully based on their understanding and use of social media tools. So the participation rate was about 95% of the students who received the survey invitation. Since the data cover a span of eight years, in addition to the gender comparison, a close look at trend of change will also be compared. Frequency analysis and *t*-Test have been used to analyze data. Table 1 shows the total male and female participants in eight years. The number of female participants doubles the number of male students in average in eight years because female students have higher enrollment than male students in the school of communication.

Seventy five percent of participants were in the age group of 18- 24 and followed by 21% of age group in 25-34; three percent were in the age group of 35-44 and only one percent in the group of 45-54 years of age. Ninety-six percent of the participants were either in junior or in senior level, and sophomore takes up 3 percent.

FAMILARITY OF SOCIAL MEDIA CONCEPT

The social media concept in the study means the knowledge and awareness of social media platform for social networking and social media user contributed online resources, such as Facebook, LinkedIn; online communication and interaction, online discussion forum, blogging, twittering; and interactive media presentation, wiki, YouTube, etc. Social media tools are the applications that are used for above purposes. The first survey was conducted in 2009, and it was a decade after the time when the Web 2.0 was first defined by Darcy DiNucci in 1999. Between the years of 2009 and 2011, there was about 30% of participants indicated that they were only somewhat familiar with social media concept. Table 2 shows the media concept trend of male and female over the years.

Male students outnumbered female students on the concept of social media at the scale of "Very Familiar" every year except in 2013, but combined the scales of "Very Familiar" with "Familiar" both genders are about the same. Year 2012 saw big jumps in both genders with male increase to 98% and female to 94%. Spaventa (2012) stated the fact that social media played important role in the 2012 election and both Twitter and Facebook users increased tremendously, which would definitely increase the awareness and knowledge of social media in public. By 2016, 100% of both male and female students are familiar with social media concept.

Table 1. Total participants in eight years

	2009	2010	2011	2012	2013	2014	2015	2016	Total
Male	47	116	50	48	49	72	85	41	508
	47%	31%	41%	35%	32%	29%	29%	35%	35%*
Female	52	253	71	88	104	173	208	77	1026
	53%	69%	59%	65%	68%	71%	71%	65%	65%*
Total	99	369	121	136	153	245	293	118	1534

*Average of 8 years percentage

Table 2. Social media concept trend between male and female

Year	Very Familiar		Familiar		Somewhat Familiar		Not at all Familiar	
	Male	Female	Male	Female	Male	Female	Male	Female
2009	34%	31%	30%	38%	36%	31%	0%	0%
2010	41%	36%	34%	42%	24%	21%	1%	0%
2011	44%	30%	26%	44%	30%	25%	0%	1%
2012	69%	58%	29%	36%	2%	6%	0%	0%
2013	59%	78%	37%	18%	4%	3%	0%	1%
2014	76%	76%	18%	17%	6%	6%	0%	1%
2015	82%	77%	18%	21%	0%	1%	0%	0%
2016	98%	86%	2%	14%	0%	0%	0%	0%

USE OF SOCIAL MEDIA TOOLS

Ten popular social media tools at 2009 were listed for participants to select. They are Facebook (FB), YouTube, Wikipedia (Wiki), Twitter, Online Forum, LinkedIn, Online Blogging, Podcasts, RSS and Second Life. There is a text box on the survey that allows participants to enter any other unlisted social media tools that they were using. When eight years' mean value is compared between male and female, they are pretty comparable with slight variations on some tools as shown in Table 3.

The data analysis indicates that male and female participants used the same top four social medial tools; they are Facebook, YouTube, Wikipedia and Twitter. Female participants have higher percentage than male users in Facebook and Twitter; while male users were taking the leading positions in YouTube and Wikipedia. Table 4 shows the detailed data between their uses in eight years. For the first top used Facebook tool, there are more female users than males since 2011, however a 2-tailed *t*-Test result indicates that the difference is not statistically significant (with a confidence level of 95%). Makashvili, et (2013) conducted a research study on the gender difference in the motives for the use of Facebook among college students and found out that female users prefer to use FB to contact existing friends and uploading pictures while male users prefer making new relationship and passing time.

The second top used tool is YouTube. Male users are consistently higher than female users every year except in 2011. In 2012, male users jumped from 70% to 96%, a 26% increase. Female user also has a 24% increase in the same year. The peak year of using YouTube for both male and female is 2014, and in 2016 both numbers have dropped, male by 11% and female by 6% as compared to the peak year. A 2-tailed *t*-Test shows that there is no statistically significant difference between male and female.

Table 3. Mean comparison between male and female in using social media tools

	FB	Wiki	Forum	YouTube	LinkedIn	Blogging	Twitter	Podcasts	2nd Life	RSS
Male	90%	72%	39%	88%	34%	27%	48%	35%	9%	12%
Female	93%	64%	33%	86%	38%	35%	53%	30%	5%	10%

Table 4. Trend comparison of top four used tools between male and female

	Gender	2009	2010	2011	2012	2013	2014	2015	2016	Mean	SD	t-Test
Facebook	Male	81%	94%	100%	98%	88%	88%	87%	85%	90%	0.07	0.51
	Female	79%	94%	94%	99%	95%	93%	89%	95%	93%	0.06	
YouTube	Male	74%	88%	70%	96%	90%	99%	94%	90%	88%	0.10	0.61
	Female	60%	83%	82%	94%	89%	92%	92%	87%	86%	0.11	
Wikipedia	Male	70%	79%	76%	77%	69%	68%	70%	68%	72%	0.05	0.01
	Female	54%	71%	80%	63%	59%	59%	50%	56%	61%	0.10	
Twitter	Male	23%	30%	36%	50%	53%	69%	57%	63%	48%	0.16	0.20
	Female	37%	45%	44%	74%	70%	64%	63%	65%	53%	0.14	

Wikipedia is the third top used tool. From the trend comparison, male users are pretty consistent for the past eight year with about 10% fluctuation between 68% - 79%, while female users have as high as 30% fluctuation between 50% - 80% and female users decreased from 2009 to 2015, and 2016 saw a slight increase of 6%. *t*-Test value strongly indicates that there is a statistically significant difference between male and female in using Wikipedia tool with male taking the leading position. Wikipedia is a free resource for everyone. The significant gender difference is also reported in Wikipedia contribution. According to data analysis by Glott and Ghosh (2010), only 13% of Wikipedia contributors are female, with 9% worldwide and 15% in US. This gender difference was further confirmed in a study by Anti, Yee, Cheshire and Nov in 2011 that "male Wikipedia editors drastically outnumber female editors overall" (201, p.13,) with 18% female editors only. Bear and Collier (2016) investigated into this significant gender difference and reported that women report less confidence in their expertise, more discomfort with editing other's work and more negative responses to critical feedback compared to men, all of which are crucial aspects of contributing to Wikipedia. So the psychological and behavioral differences play a very important role in this gender gap and Wikipedia is considered as a masculine environment.

The fourth top used tool is Twitter, with more female users than male users. In 2012, 74% of female students reported that they were using Twitter, which is 24% higher than male students. In 2014 when male students were climbing to 69%, female users were decreasing. Female's mean value is 5% higher that male's, however, the difference is not statistically significant. eMarketer's data from 2010 to 2014 also indicated that female had more active users than male.

Both Facebook and twitter are social relationship building and interactive media tools, while YouTube and Wikipedia are resource media tools. The data analysis echo the research on the gender difference in media use, men focus on resource information while female on social interaction. Karr (2014) summarized the data from Financesonline.com and concluded that men are more likely to use social media for business or dating. Men prefer quick access or deals or information. Women are more likely to use social media for relationships, sharing, entertainment, and self-help, staying in touch with family and friends, blogging and photo uploading and sharing. Women also outnumber men in the top reasons for using the Facebook, they are seeing photos and videos, sharing with many people at once, seeing entertaining or funning posts, learning about ways to help others, and receiving support from people in the network.

For the next top used tool, male and female selected different tools, for male students, they preferred online discussion forum, while female users favored online blogging. Table 5 shows the trend comparison between male and female students in using online forum and blogging tools.

Table 5. Trend comparison of online forum and blogging tools between male and female

	Gender	2009	2010	2011	2012	2013	2014	2015	2016	Mean	SD	t-Test
Online Forum	Male	51%	49%	28%	40%	37%	26%	40%	39%	39%	0.088	0.087
	Female	21%	45%	39%	31%	26%	23%	20%	38%	30%	0.094	
Online Blogging	Male	19%	36%	28%	25%	20%	31%	29%	32%	28%	0.059	0.011
	Female	19%	42%	48%	40%	37%	35%	41%	48%	36%	0.092	

The data indicate that males are consistently outnumbered females in discussion forum use except in 2011, but the difference is not statistically significant. However, females are much more interested in using blogging tool than males and outnumbered males every year and the difference is statistically significant.

These two tools are similar in some aspects, such as online publishing, posting thoughts and personal opinions, making comments on the postings. However, they have fundamental differences in locus of control, authoring of new topics, intent and responses. Leelefever (2004) posted on the Common Craft making the following summary on those differences, see Table 6.

Other online resources also provide similar discussions and definitions on the differences between online forum and blogging. Owyang (2008) stated that “Forums are like social mixers, where everyone is at equal level, milling about and discussing with others. Blogs are like a keynote speech where the speaker (blogger) is in control of the discussion, but allows questions and comments from the audience.” Arfaoui (2015) at Trustiko, an online place to find information about small business, blogging tips and web hosting brought up other distinctive differences between online forum and blogging. Blogs are more trusted with dedicated authors while the different opinions on the forum make readers confused and lost. Blogs articles are more organized than forum threads and easy for readers to follow.

From above definitions and discussions, four points stand out. 1) online forum participants are more focusing on topic discussions, obtaining information and resources, less on sharing personal private information; 2) bloggers are more interested in expressing personal thoughts and feelings, less interested in getting information from others; 3) bloggers prefer trustful relationship and environment while discussion participants are less concerned with trust and security issue except the information they need; and 4) bloggers like focused and easy-to-follow information source while discussion participants try to make sense out of difference discussion postings, a much more complex process than blogging. This study data indicate that male students like to participate in discussion forum than female participants, while female students prefer to use blogging tool to express themselves than male participants.

Table 6. Weblogs vs. message board

	Weblogs/Online Blogging	Message Boards/Online Forum
Locus of control	Centralized and personal	Decentralized and group
Authoring of new topics	Individual or small group drives all new topics	Group shares equal responsibility to post new topics
Intent	Personal accounts, news, reflection	Group input, decision making, collaboration
Responses	Comments are extraneous, not required	Replies are required for a discussion

Table 7 shows the trend comparison of other four social media tools used by male and female participants. They are LinkedIn, Podcasts, Virtual world (Second Life) and RSS.

LinkedIn is a professional network. The Table 7 data indicates that females had higher usage of LinkedIn than males in six out of eight years. 2016 has the biggest difference with female more than 10% than male. The general public data show that male usage was higher than female usage by 8% in 2015 (Statista, 2015), the data in this study show that male has 2% higher use than female in the same year.

Both podcasts and RSS are online resource based tools. The mean values indicate that male users are 5% higher than females in both tools. However, the difference is not statistically significant. According to the data on podcasting fact sheet from Pew Research Center (2016), podcasting audience continues to grow since 2013 of 12% to 21% in 2016 of Americans age 12 or older. The data in this study show that the usage is much higher with average of 35% male users and 30% female users in past eight years. The trend did not show steady increase, but some fluctuation in each year and 2010 is the peak year for both male and female users. RSS stands for Really Simple Syndication, this technology enables users to get automatically syndicated information, which allows users to get timely updated online resources. The syndication technology is mostly used in the online technology, business, news and shopping. In this study, male users take leading position in all years except in 2013. Male reached to highest usage rating in 2011 with 22% and female reached to highest rating in 2010 with 14%.

The least used is Second Life, a virtual world social networking tool by Linden Lab. Users need to create an avatar, a self-created virtual person, to access this virtual world. According to Linden Lab's press releases in 2013, 10 years after the creation of Second Life, the regular users reached more than one million monthly. The most popular activities are games, events, adventure and fantasy. In this study, male participants outnumber female participant seven out of eight years and *t*-Test result indicates that the difference is statistically significant. The peak use for male participants is 2016 with 15%, and female is 2011 with 10%, and afterward, female users continue to drop.

In addition to above ten social media tools, participants reported other tools that are not listed. Starting from 2012, very few students mentioned about Instagram, in 2015, 30% of male students and 90% of female students reported that they used Instagram. By summer 2016, 78% of male students and 95% female students stated that they use Instagram. The second highly mention the application is Snapchat, in 2015, 30% male students and 60% of female students reported the use of Snapchat, in summer 2016, male students increased to 75% and female students increased to 94%. Other reported tools include Tumblr, Yik Yak, Urbanspoon, Yelp, Twitch, etc.

Table 7. Trend comparison by years between male and female

	Gender	2009	2010	2011	2012	2013	2014	2015	2016	Mean	SD	t-Test
LinkedIn	Male	9%	27%	18%	46%	41%	36%	49%	44%	34%	0.144	0.52
	Female	14%	32%	27%	40%	42%	51%	47%	54%	38%	0.134	
Podcasts	Male	36%	49%	24%	40%	29%	32%	33%	37%	35%	0.075	0.122
	Female	29%	38%	31%	41%	23%	17%	23%	27%	30%	0.080	
RSS	Male	13%	21%	22%	15%	4%	8%	8%	7%	12%	0.067	0.076
	Female	2%	14%	11%	11%	6%	2%	4%	4%	7%	0.076	
Second Life	Male	9%	14%	10%	10%	4%	3%	6%	15%	9%	0.044	0.010
	Female	4%	3%	10%	0%	2%	4%	2%	1%	5%	0.031	

CONCLUSION

The results in the study indicate that there is no statistically significant gender difference in media concept knowledge. Both male and female students were using exactly the same top four social media tools. However, male participants have higher usage of resource based social media tools, such as Wikipedia, YouTube, Podcasts, RSS; while females have higher usage on relationship building platforms like Facebook, online Blogging and Twitter.

In early technology adoption, social structure played a more important role in causing the gender difference in computer technology access and use since men had higher rate of employment, income and more opportunities to access and use technology. The influence of evolutionary psychology also showed up in the early technology adoption in that women were less risk-taking and intimidated by the complicated technology, which affect their adoption of new technologies. In today's social media adoption process, the difference is more obviously caused by evolutionary psychological effect since the accessibility of social media tools are no longer constrained by financial barriers and technology complexity, most social media tools are free and easy to use. The preference from the users is more dominated by what they are willing to adopt and feel comfortable to use. The traits of influence from the traditional gender value have demonstrated through the use of social media tools. Male traits are observed as following:

1. **Dominant Behavior:** Male students prefer using online forum to express themselves, they are not following but at least in equal level position. Men dominated the most contribution in Wikipedia posting, the environment is considered more masculine;
2. **Striving for More Resources:** Male participants outnumbered females students in all resource social media tool selections: Wikipedia, YouTube, Podcasts and RSS;
3. **Competitive and Risk-Taking:** Contributing to Wiki and posting in online forum is a competitive behavior, which needs enough self-confidence, and participants risk being commented and criticized by anybody in the world.

At the same time, female natural traits are also demonstrated with their selections of social media tool use:

1. **People-Oriented Relationship Building:** Female students outnumbered male students in all relationship building social media tools, Facebook, Twitter, Blogging. They use these tools to build and strength relationship with family members and friends;
2. **Obedience:** Female participants use blogging much more than male students. Blogging is more a follow-along interaction instead of challenging activities;
3. **Avoiding Competitive Environment:** This is showing up in the less use of discussion forum and wiki contribution. In this environment, personal opinions will be challenged and the person who posts information might face criticism.

In social media world, there are no constraints from social structures, both male and female have an equal opportunity to join different social networks and use social media tools. When technology is available and easy to use, it is user's personal preference based on their needs (psychological, emotional, professional, for daily life, etc.) to adopt social media tools. There is no right or wrong in these preferences. The good news is that the availability of different social media tools can accommodate the needs of both men and women based on their gender traits, men tend to use more exploratory and risk-taking tools while women prefer to use tools with secure environment to build and strengthen relationship. The important issue here is that it is the responsibility of both men and women to be respectful to each other and make social media networks a more friendly and peaceful environment for the harmonious co-existence of people in the world.

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Chapter 23
Social Media and Technology May Change the Culture of Rape on College Campuses

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ABSTRACT

This chapter per the authors identifies the problem of rape culture on college campuses, and within the nation, and the idea that social media and technology have not only brought much-needed attention to the issue of sexual assault and violence to the forefront, but it can also serve as a catalyst for college campuses to combat the issue by enlisting the help of its faculty, staff, students, and especially the college's student celebrities. It examines the effect of Social Learning Theory, Differential Association Theory of Deviance, and Feminism as a means to identify faults in our nation's culture, and to use this same method to correct the attitudes of all involved concerning rape culture, bystander intervention, and other aspects of fighting rape culture through the avenue of social media and technology.

INTRODUCTION

In November 1990, the *New York Times* reported there was a list on the bathroom wall of Brown University warning female students of which male students were considered rapists (Celis III, 1990). Back then, the list was repeatedly scrubbed off by janitors each time the women rewrote it. In recent years, the list became harder to wipe clean as survivors of campus rape took to social media to spread the word of the dangers of sexual assault on college campuses across our nation (Clark & Pino, 2016).

In June 2016, Brock Turner became a household name when he was convicted of raping an unconscious woman, only to be given three to six months in prison when he was facing up to 14 years (Rocha, 2016). The judge in the case stated that sentencing the former Stanford swimmer and student would cause him too much harm. The victim in the case fought back on social media by posting a letter claiming she had

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been irreparably damaged by Turner's actions and did not see the justification for leniency in his case. Many people were outraged with the sentencing and demanded the judge be removed for his ruling. The case, however, has once again refueled the question of rape culture and sexual assault on college campuses, a question that can no longer be painted over on a bathroom wall.

According to a 2015 study (Perrin), almost two-thirds of American adults use social networking sites, with 90% of young adults between the ages 18 and 29 using social media at the highest rate. With the prevalence of social media usage among college age students, individuals and organizations have the potential to bring national and sustained attention to sexual violence on campus. Many young adults use multiple social media platforms, including Facebook, Instagram, Snapchat, Tumblr, Twitter, and YouTube among others. These platforms give the user the ability to connect with and influence not only their peers but also the rest of the world. With this power to communicate, comes the opportunity to bring about social change. Organizations dedicated to sexual violence prevention have already begun to develop social media toolkits aimed at eliminating sexual violence on college campuses. These resources combined with the variety of social media platforms available allow individuals to support survivors and take action to end sexual violence.

It is also equally important to acknowledge that social media can be detrimental to sexual violence victims by providing a forum for sharing videos and photos of the assault, trivializing the victim's experiences, making the victim feel ashamed, or otherwise bullying the victim (Ed.gov, 2013). In these ways, social media can be used to continue to assert dominance and power over the victim. Unfortunately, it is not only attackers using social media in this negative way but also their peers and sometimes the community at large who bullies the victim. It is essential that campuses change the culture that condones attackers and encourages bullying.

This chapter will examine the history of sexual violence on college campuses and provide examples of how social media influence can positively and adversely affect the climate.

Background of Rape Culture on College Campuses

In January 2016, the case of Erica Kinsman and Tampa Bay Buccaneers player, Jameis Winston, resurfaced when Florida State University (FSU) was ordered to pay Kinsman, a former student who accused Winston of rape in 2012, $950,000 after she filed a civil suit for "mishandling" the investigation of her report (Chandler, 2016). Winston maintains his innocence; however, the suit was settled since Kinsman was able to prove the school did not investigate Winston, then an FSU quarterback, in a timely manner. Kinsman was forced to drop out of college due to the amount of harassment from the community over her claim (Dick & Ziering, 2015).

In February 2016, six former female students of the University of Tennessee filed civil suits against the college for creating a climate of rape culture on campus that not only allowed them to be victimized, but also favored the male athletes accused of sexual assault during the investigation (Wadhwani & Rau, 2016). The University settled this suit, now with 8 complainants, for $2.48 million (Wadhwani & Rau, 2016). The University of Tennessee suit claimed the college had a long-standing history of protecting its athletes by naming Peyton Manning, a former student, as an example of similar behavior when he was accused of sexual assault on campus over 20 years ago (Bonesteel, 2016).

Rape culture is a series of community situations where rape is considered wrong, but victims are blamed for how much they had to drink or what they were wearing, where rape jokes are funny, where men and women are not paid equally, where people don't intervene when they see someone in danger, where men don't necessarily recognize that what they are doing is rape, and women don't necessarily realize that what just happened to them was rape (Fletcher, 2010). Celebrity situations also exemplify the meaning of rape culture. Kesha, a popular American performer, was recently in the news when she asked Sony to let her out of her musical contract with their producer, who Kesha claims has raped her (McKenzie & Dresdale, 2016). Sony responded by letting Kesha continue to work with Sony, but to have no more contact with the producer, Dr. Luke aka Lukasz Gootwald, who Kesha has accused of raping and sexually assaulting her.

Hill (2014) identified six signs of rape culture that could be taught by examining the reports of Bill Cosby sexually assaulting over 40 women over the past few decades. The signs include patriarchy, denial, blaming the victim, perpetuating myths, trivializing sexual violence, and turning rapists into victims.

Cosby's alleged victims were coming forward as late as 40 years after the claimed assaults, and the stories of those women had been consistent, reoccurring themes of being drugged and raped; these stories were not believed by many who considered Cosby a role model (Gray, 2015). Women have had a long history where their voices have been considered less valuable than their male counterparts (Freedman, 2002). Germain (2016) discusses the role of the perfect victim icon as a female who is forcibly attacked by a stranger, visibly displays bruises and cuts, did not ingest alcohol or drugs, is slightly shaken, but steady enough to perfectly describe the attacker. Some people believe rape has traditionally thought to have been committed by deranged strangers "hiding in the bushes, but it is really a gendered violence against women often committed by husbands, partners, soldiers, strangers, and male family members, with the purpose of controlling women through fear and domination" (Wooten & Mitchell, 2016, p. 33). Hill stated, "We live in a society where even the most ordinary and anonymous of accused rapists is offered the benefit of social and legal doubt" (2014, p.2). Even when a 16-year old Texas female spoke out about a viral video of her drugged body being raped, the young woman became a hashtag (Culp-Ressler, 2014). #jadapose became a popular hashtag as peers joked and shared images posing like that of Jada's drugged body being violated. Jada's perpetrator denies the assault and stated the reporting party was a "hoe." In the video itself, bystanders were laughing and joking at the assault.

Society often finds fault with the victim and criticizes the actions they took before and after the attack. Victims will often blame themselves for drinking, doing drugs, trusting another person, and begin to rethink the entire situation as if they did something wrong. Even after the documentary *The Hunting Ground* brought light to the commonality of sexual assault on campus, many people showed rape culture was alive by questioning the reports on the documentary and threatening those who shared their story (Casey, 2016).

Rape culture envelopes college communities, celebrity perceptions, and community ideas making jokes out of otherwise unfunny situations. Old Dominion University fraternity, Sigma Nu, was suspended for hanging signs on their lawns that read, "Rowdy and fun, hope your baby girl is ready for a good time", "Freshman Daughter Drop Off", and "Go ahead and drop off mom too." (Tadt, 2015). The university and the national chapter of Sigma Nu found the signs were sexually offensive and suggestive. In *The Hunting Ground*, there is an entire section dedicated to fraternities who promote sexual assault as the norm on campus (Dick & Ziering, 2015). College women interviewed in the film stated they understood there was a certain risk a woman would take in being raped at particular fraternities. Rape myths include, but are not limited to, that rape is more often committed by a stranger or that the sexual assault was more coercion than rape (Paludi, 2016). However, most rapes are perpetrated by someone the victim knows, someone who they may have been emotionally connected to, or another family member. This is another a possible reason why many rapes are not reported. Many people have been standing by Cosby since the first public accusation that he raped a woman, stating that Cosby was the one being victimized by someone in search of fame and money (Hill, 2014). As Brock Turner, the Stanford swimmer who began our story, continues to be defended in a "boys will be boys" society, rape culture continues to perpetuate. Not only did Turner get an extremely light sentence for being convicted of several felonies, he has had social media support from many claiming he is the victim of someone who had rethought her choices the next day (Rocha, 2016). A high school guidance counselor, publicly apologized for a letter of support she wrote for Turner before his sentencing. Kelly Owens was reportedly one of at least 39 others who wrote similar letters of support for Turner to the judge. Owens later apologized in the *Dayton Daily News* that she regretted her letter of support, and that Turner should definitely be held accountable for his actions.

UNDERSTANDING THE CULTURE OF RAPE FROM A THEORETICAL FRAMEWORK

Changing the way men and women view rape and the rights of women is an ongoing issue. Differential association theory of deviance also may explain when fraternities or athletic teams bond together in incidents of gang rape or multiple incidents of rape on the team, because differential association theory is when people learn deviance from those they associate with; if everyone else is doing something, it becomes acceptable in your circle of friends (Henslin, 2014). In 2012, Republican Todd Akin, House of Representatives in Missouri, made headlines when he suggested in a taped interview that women who were victims of "legitimate rape" had biological defenses that kept their bodies from becoming pregnant; this was Akin's way of defending his stance on anti-abortion support during an interview when he was running for the Senate (Williams, 2012, p. 1). Akin went on to lose the Senate race to Claire McCaskill who eventually led Obama's 2014 subcommittee regarding sexual violence on college campuses.

Social learning theory suggests that people learn aggression by modeling and observation, so this would tie in with theories of feminism that suggest acquaintance rapists may not know completely that what they are doing is culturally wrong because they have been conditioned that the man is in charge of the relationship (Feldman, 2015). Social learning and modeling can be used to retrain and re-educate the campus community on inclusiveness and a less violent community overall (Ali, 2011). Raphael (2015) agrees that a change in how men and women view rape and sex will not only change the way men see consent, but also the way women see how to say no when they mean no.

FIXING THE CULTURE

Women in college are at a high risk of being stalked and becoming victims of sexual violence, so recent legislation is stressing that colleges and universities take responsibility for the victimization of their students on campus; these responsibilities include not only encouraging the reporting of these crimes, but also being trained to receive, investigate, and refer these students to appropriate community resources.

President Obama created a White House Task Force in January 2014 as a response to two national surveys that revealed one in five females, one in twenty males, and one in four transgender students would experience some sort of sexual violence after they enrolled in college (Morse, Sponsler, & Fulton, 2015). As a result of these findings, an executive summary was released in July 2014 stating that many institutions of higher education were not complying with laws such as SAVE and VAWA, as well as best practices, when it came to handling sexual violence among students (S. Rep. No. 2014, 2014).

Addressing the idea of rape culture involves the cooperation of many. Colleges should provide reporting options, mental health resources, ongoing prevention and awareness programs, inclusion of students and staff on sexual assault teams, and the ability to continue adaptation of policies and procedures (Culture of Respect: The CORE Blue Print, 2016).

Bystander intervention is one suggested best practice; this is simply looking out for someone and helping if you they might be in trouble. The victim in the Stanford rape case was saved by two men who were riding bikes and saw Turner on her unconscious body; they intervened (Baker, 2016). Wooten and Mitchell (2016) promote bystander intervention as a promising prevention strategy because teaching students how to prevent risky behavior, or friends how to stop the sexual violence during the attempt, just makes sense. Intervention training involves primary which is before the assault, secondary which is during the assault, and tertiary which is after the assault. Because victims are more likely to disclose to a friend or fellow student, the tertiary bystander training is important to college campuses. It's important for students to know the best way to respond, the resources to connect friends to, and the right people to go to for help. Teaching students they're okay to become involved and to step in to help others is also important to educate students with; there is often a misperception by students that students are not in danger until the assault is over (McMahon et al., 2014).

Raphael (2013) reports a variety of reasons why victims do not report sexual violence crimes, such as rape including, but not limited to, fear of retaliation, fear of being blamed, fear of getting in trouble themselves, fear of being shamed, being in overall shock, self-blame, self-shame, or simply not wanting to relive the experience.

Forty percent of colleges had no reports of sexual assault cases in the last five years, which might explain that 90% of the sexual assault cases went unreported, suggesting institutions were not encouraging the reporting of the cases (McCaskill, 2014).

The White House Task Force (2014) recommended a better response to reports as a way to encourage a better and more accurate reporting system for each campus that included clear sexual misconduct policy, trauma-informed training for school officials, appropriate school disciplinary systems that give protections to both the victim and the accused, and a confidential option for reporting for the victim. Society, as a whole, is not often the most receptive or believing of the victims' stories; there are many rape myths in our world today, and the only way to identify those on a particular campus is to survey that campus' students. Colleges and universities surveyed in 2014 were shown to fail in several areas of law and best practices with how to handle sexual violence situations regarding students; it was suggested that most colleges and universities do not know the extent of the sexual harassment and assault issue of their campuses (McCaskill, 2014). Because of this, the government has suggested that institutions learn the extent of their campus problems, and do their best to change the climate of their campus to that of a more positive environment toward women and gender acceptance (Parry, 2015).

There are many other steps colleges can take to prevent sexual violence. The Bureau of Justice recommends involving all student groups, such as fraternities or athletes, in establishing campus policy and raising awareness (Fleck-Henderson, 2012). Including survivors of sexual assault in the policy making and prevention awareness programming is also a recommended best practice (Jackson,2015).

Colleges can also support students by implementing programs where well-being checks and case-management-type services are provided to the victims/survivors of students assaulted on campus. (Wilson, 2016). Wilson started a program at the University of Central Missouri where students who were victims of gender-based violence were assigned a case manager to track their recovery and coordinate services to help them get through to their next semester. Wilson reported a 78% retention of these students compared to a 71% retention of students from the general student population.

USING SOCIAL MEDIA TO CHANGE THE CULTURE

Annie Clark and Andrea Pino, two former students of University of North Carolina Chapel Hill, were so upset by the way they were treated when they reported their assaults to college administration that they took it upon themselves to figure out not only what a Title IX complaint was, but also how to file one (Dick & Ziering, 2015). These two were able to utilize the Internet and Social Media to not only help themselves, but also to become advocates for others who had been sexually assaulted.

The variety and number of social media tools increases daily, but all of the tools allow users to communicate their uncensored, unedited ideas to the masses. These tools include, but are not limited to, forums, wikis, podcasts, social networking sites, mobile phone applications and video/image sharing. With this ability, comes the power to spread both positive and negative messages far and wide. Mobile phones make image/video sharing easier for anyone. This can make trivializing or re-victimizing someone more possible when their assault is shared and re-shared through mobile video (Wooten & Mitchell, 2016). Sharing photos and videos of the assault is a way to bully the victims, especially as a retaliation for reporting the attack. This contributes to a culture that places the blame on the victim. However, these photos and videos also provide additional evidence of the attack and can be used to help in secure the convictions of the assaulters.

There are current applications for iPhone and android devices that are available for campuses to allow students to video their statements, collect evidence, and walk them through the post-assault situation; however, there is no current research as to how effective these applications are in assisting with the reporting for college students ("NoConsent.org," 2016). Some of these applications offer no-cost trial periods.

Social networking sites are frequently used. Facebook has more than 1.5 billion users, while Instagram has 400 million, and Twitter 320 million; Snapchat has 200 million (statistica.com, 2016). These communication tools have the power to reach that many people. When not used appropriately, social networking sites can be devastating to someone who has been victimized by sexual assault. 21-year-old rape victim, Delaney Henderson, recently wrote on Facebook, "I feel (the Stanford rape victim's) pain…I know what it feels like to have a school and the justice system completely fail you. I felt like my attacker, like yours, only received a slap on the wrist for raping me." (Bryant, 2016, p.3). According to Delaney, Facebook was used by others to threaten her. Delaney stated a friend of her attackers wrote and posted a rap threatening to kill her.

Students, faculty, staff members, and community members need to work together to change the environment from one where men and women are ashamed and self-blaming when they are the victims of sexual assault to one where men and women should not be afraid to get an education.

Advocacy and other public service organizations have created campaigns aimed at helping prevent sexual violence. It's On Us (itsonus.org) engages celebrities, public figures, and organizations to stop sexual assault. The campaign provides videos featuring actors, actresses, musicians, politicians, and other familiar faces to spread that everyone plays a role in stopping sexual violence. The National Sexual Violence Resource Center (2015) prepared a social media toolkit for Sexual Assault Awareness Month.

They suggested strategies such as using the hashtag #SAAM on Twitter, Instagram, Pinterest, Tumbler and Facebook to connect all Sexual Assault Awareness Month related posted.

All social networking sites have the power to promote change. Sites such Facebook, Google+, Instagram, Pinterest, Tumblr, and Twitter already have the ability to share with others; this sharing is the benefit of social media. One individual can make many others aware of a situation, which puts the power in the hands of the few. As each social media user encourages his or her friends to like, share, or comment, a movement is created and change is possible.

CONCLUSION

Women ages 18-24 who enroll in college are three times more likely than women not in college to suffer from sexual violence; male students are 78% more likely than their non-student counterparts to be the victim of rape or sexual assault (Rape, Abuse and Incest National Network, 2016). Although measures have been put into place, they may not be effectively protecting America's students. Social Media, and other forms of technology, can be useful in changing the culture on college campuses. Victims, can become advocates, and advocates can continue to educate the masses on prevention, intervention, and assisting others. Instead of allowing technology to re-victimize others, a stand can be taken to use technology for the greater good.

College campuses must implement new measures to better protect students from sexual violence. All members of college communities can unite and take a stand to communicate that sexual violence and disrespect of another person is simply unacceptable and will not be tolerated any longer. By raising awareness, serving as advocates, and speaking out against those who bully and undermine victims, every citizen can help end sexual violence. While many strategies are needed to ultimately end sexual violence on college campuses, social media has the power to make a difference. Instead of allowing technology to be part of the problem, individuals can collectively help to use technology to be the solution to rape culture everywhere.

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KEY TERMS AND DEFINITIONS

Blog: An uncensored, electronic journal of information.

Forum: An online site where people can discuss a particular subject by posting messages relaying their own thoughts and opinions.

Mobile Devices and Video/Image Sharing: Portable phones and devices that allow consistent and convenient video and imaging sharing.

Podcast: Audio or video programming that can be downloaded to an automated feed to allow individuals to express their opinions about a great deal of subjects.

Rape Culture: Behaviors are allowed in the climate that promote rape.

Sexual Misconduct: Sexual violence and/or harassment; dating/domestic violence.

Wiki: A website that people can use to explain a particular subject, but anyone can continue to add, delete, or revise the information.

Chapter 24
Social Media, Mobile Technology, and New Learning Opportunities:
Implications for Social Justice and Educational Spaces in Schools

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ABSTRACT

Engaging youth in meaningful social and educational spaces is one of several goals related to urban education (Obiakor & Beachum, 2005). With the advances of Web 2.0 technology tools and information and communication technologies, access to educational and social spaces have become open and ubiquitous (Bonk, 2009). Harnessing the power of these tools may help facilitate a knowledge exchange within these environments. To that extent social media has been shown to provide relevant engagement and collaboration to an educational and social learning process for urban youth (Greenhow, Robelia, & Hughes, 2009). Exploration into the uses of social media within creative formal and informal spaces by urban youth may provide insights into how these tools may be used within a broader teaching and learning context to facilitate a more engaged learning experience that involves technology and ultimately social justice. Engaging youth in meaningful social and educational spaces is one of several goals related to urban education. With the advances of Web 2.0 technology tools and information and communication technologies, access to educational and social spaces have become open and ubiquitous. Harnessing the power of these tools may help facilitate a knowledge exchange within these environments. To that extent social media has been shown to provide relevant engagement and collaboration to an educational and social learning process for urban youth. Exploration into the uses of social media within creative formal and informal spaces by urban youth may provide insights into how these tools may be used within a broader teaching and learning context to facilitate a more engaged learning experience that involves technology and ultimately social justice.

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ALICE TUMBLES DOWN THE RABBIT HOLE: ENTER THE MATRIX

The movie the Matrix (1999), describes a future in which reality, as perceived by most humans, was actually a simulated reality, created by machines to pacify and control humans in order to grow them and use them as a source of energy. The main character, Mr. Anderson, who becomes known as "Neo" learns of this reality and is drawn into a rebellion against the machines, who represent the "state" and group against those who are free. However, Mr. Anderson could not learn or understand the world in which he was led to perceive and engage in until he was presented with an opportunity of enlightenment and emancipation by Morpheus.

Morpheus offers Neo a choice between two pills. The first pill is a blue pill that would return him to his old life within the matrix (i.e. continuing to live within the status quo). The second pill, a red pill, would allow him to learn the answers he seeks and freedom from the oppressive matrix (emancipation). Neo takes a leap of faith and swallows the red pill, servers and releases himself from the matrix and is emancipated to rebel and free other from the virtual institution. This virtual institution represents socio-economic and political cycles and structures that work against the creative energy of the masses.

Neo, in his efforts chooses to work with other humans, who have been freed from the oppressive "virtual institution," the matrix. This group of emancipated agents, possessed similar beliefs that the oppressive institution at work was not real or fixed in reality. Together, this group of freedom fighters stands against the status quo, the sentinels, and the agents who represent repressive tools used to control a population. In the end, Neo is able to unlock, expose, examine, and learn from the digital code of the Matrix, thereby revealing its hidden "curriculum", systems, and meaning that supported the power of the machines and the virtual institution they created. This discovery led to exploring and creating spaces for new possibilities for learning and engagement with the natural world. Just as Neo is able to unlock and learn with the use of digital code, urban learners are able to unlock and learn with the potential uses of technology (Greenhow, Robelia, & Hughes, 2009). In essence technology becomes the new red pill.

INTRODUCING A SOCIAL CONTEXT OF EDUCATION FOR URBAN YOUTH

Engaging youth in meaningful social and educational spaces is one of several goals related to urban education (Obiakor & Beachum, 2005). With the advances of Web 2.0 technology tools and information and communication technologies, access to educational and social spaces have become open and ubiquitous (Bonk, 2009). Harnessing the power of these tools may help facilitate a knowledge exchange within these environments. Of the various ICT tools available, social media has been shown to provide relevant engagement and collaboration to an educational and social learning process for urban youth (Greenhow, Robelia, & Hughes, 2009). Exploration into the uses of social media within creative formal and informal spaces by urban youth may provide insights into how these tools may be used within a broader teaching and learning context to facilitate a more engaged learning experience that involves technology.

Like Neo, urban youth face a matrix within a real, tangible world. This matrix involves real problems associated with education, social justice, literacy, socioeconomics, and engaging in a social world as a full member of society (Bourdieu, 1977; Bourdieu, 1985; Bourdieu, 1990; Carter, 2003; Obiakor & Beachum, 2005). While, urban youth seek to make meaning of these social and educational spaces, research suggests that technology plays a significant role in this process (Augustsson, 2010; Greenhow

& Robelia, 2009; Greenhow, Robelia, & Hughes, 2009; Kirkland, 2007; Kirkland, 2008; Kvasny, 2006; Lenhart, Madden, Macgill, & Smith, 2007; Moje, 2004; O'Brien, & Scharber, 2008; Pincket, 2003; Resnick, Rusk, & Cooke, 1998; Zhang, 2009).

Recent studies, as outlined by Lenhart, Arafeh, Smith, and McGill (2008), Lenhart, Madden, and Hitlin (2005), Rideout, Foehr, and Roberts (2010), Bonk (2009) and anecdotes from U.S. national digital learning initiatives from the MacArthur Foundation have promulgated an persona of today's youth as "digital natives" and "millennial learners." These young people, as described by recent studies and digital initiatives, are constantly online, internet savvy, and prefer technology enhanced communication channels such as texting, instant messaging, and online posts (Ito, 2009). These reports also suggest that youth spend approximately 10 hours a day using some form of technology, including social media. Ito (2009) suggests that technology and social media play a large role in the daily lives of youth and that these technologies are deeply intertwined in the lives of youth. This suggests that today's youth are increasingly connected to the world through technology and social media. Mesch and Talud (2010) provide a similar discussion and suggest that the internet and its social media affordance allows youth the opportunity to engage in social, leisure, and extracurricular activities. However, prevailing media accounts and reports as suggested by Greenhow and Robelia, (2009) and Thurlow, (2006) portray youth media and technological practices as deficient or harmful to academic learning without, as Greenhow and Robelia (2009) and Thurlow, (2006) suggest, acknowledging the full complexities of technology or students' experiences. This dichotomous view between youth experiences and the adult perspective has caused the use of technology by youth to be seen as separate from academic processes and practices, a perspective Mesch and Talud (2010) concurs. Mesch and Talud (2010) adds to the theoretical discussion of youth and their engagement within a social world through the internet, most notably social media and mobile technology, suggesting that the internet and its affordance of social media is and in some cases have displaced other forms of social ties. This displacement has caused a shift in how youth engage in their home family life, school, and in their workplace settings.

In addition, while urban youth are engaged with technology and social media, they are disengaged from other areas of their lives; mainly school (Ito, 2009; Mesch & Talud, 2010 p. 110; Obiakor & Beachum, 2005). Evidence of this can be drawn from national reports (Cataldi, Laird, & KewalRamani, 2009; NCES, 2010; Pellerin, 2005) that find approximately 30% of high school students do not obtain their high school diplomas. As suggests by the US Department of Education (2010) and NCES, (2010) at the high school level nearly one-third of high school urban students ultimately drop out of school. Clearly, the evidence speaks to unengaged youth in an educational process.

While technology has been heralded by many as the dawn of a new era in American education, social media has been seen as a new opportunity to engage youth in educational and learning processes, both in the formal and informal learning context (Jenkins, 2006; Mesch & Talud, 2010). In order understand the uses of social media in educational and creative spaces, either formal or informal and to devise strategies that capitalize on this use within an educational setting, exploration into the use of social media by urban youth is critical, as educators seek ways to improve the teaching and learning process with technology (Augustsson, 2010; Greenhow & Robelia, 2009). Additionally, as urban youth engage in social media in both formal and informal creative spaces to support their collective self-interest, research is needed to:

- Understand their experiences;
- Document how urban youth engage with social media tools;

- Determine how urban youth use social media to communicate, socialize, develop relationships, and learn; and lastly;
- Explore how social media tools may be applied in an educational context to support the collective self-interests of urban youth.

As researchers engage urban youth in creative educational spaces, bridging the interests of these learners with their use of technology outside of the classroom may provide applications and insights into their interests, knowledge, skills, and accomplishments that may be transferred and connected to formal educational settings that advance their academic participation and future career goals. In this study, the case is made that as youth continue to engage their lives with information and communication technologies and social media practices outside of school, academic practices should be broadened to encompass experiences, skills, and abilities urban youth bring to the formal academic settings (Cuban, 2001; Coiro, Knobel, Lankshear, & Leu, 2008; Greenhow & Robelia, 2009; Lew, O'Byrne, Zawilinsky, McVerry, & Everett-Cacapardo, in press). These symbiotic relationships maybe prove advantageous for urban schools and their students.

To open this discussion, this chapter sought to explore the experiences of urban high school youth as a social practice within the context of their activities in social media. Research has shown that the meaning of social media use various across individuals and technologies (Donath & boyd, 2004; Greenhow & Robelia, 2009; Greenhow, Robelia, & Hughes, 2009; Ajjan & Hartshorne, 2008; Boulos & Wheeler, 2007; Burden & Atkinson, 2008). Building on efforts to discover and document social media practices among urban high school youth, this research explores social media use among high school teenagers. Understanding their experiences, communication, and practices in out-of-school social contexts (informal environments) may provide data to build educational practices within formal academic environments.

As the researchers approach this chapter, to explore the literature surrounding urban high school youth perceptions, activities, and conditions in using social media, understanding urban youth and social media are important, while at the same time focusing on social media and their role in urban youth lives and ultimately what this means for meaning schooling and learning. Three questions were used to guide this investigation and overall construction of this chapter:

1. How do urban high school youth construct and describe their experiences with social media?
2. How and to what extent is social media used?
3. How might social media be used as instruments to engage urban high school youth as a means to understand the formal and informal educational implications of social media for these learners?

DEFINING URBAN YOUTH

To understand the framing of this chapter, it is important that we establish a concrete definition of urban youth. Within the past decade, the restructuring of schools has produced a growing emphasis on a type of learner that is different from those characterized by society. These learners have been characterized as urban students. An urban student can be described as a youth (e.g. students) who is an active participant in an urban educational or inner city school setting (Noguera, 2005; Obiakor & Beachum, 2005). These students can be involved in primary PK – K, elementary first to fifth, or secondary, sixth to twelfth grade). These youth represent various racial groups such as Native Americans, African Americans, Mexican

Americans, Puerto Ricans, and a substantial number of socio-economically challenged Whites (Carter, 2008; Ginwright, Camarota, & Noguera, 2005; Martin, 1975; Noguera, 2001; Obiakor & Beachum, 2005). Data are now available that provide a glimpse into the lives of urban youth in these environments. Within this context, urban learners remain a difficult concept to define and understand as it is abstract and ever evolving as new quantitative and qualitative data emerge (Noguera, 2005; Obiakor & Beachum, 2005).

Related to discussion of youth in urban environments is the ever encompassing context of social ills many urban youth are face including poverty, structural and institutional racism, class, and gender bias (Banks, 2001; Carter, 2003; Carter, 2010; Ginwright, Camarota, & Noguera, 2005; Javeri, 2007; Ladson-Billing, 1998; Noguera, 2003; Obiakor & Beachum, 2005; Ogbu, 1974; Ogbu, 1978; Ogbu, 1988; Teclehaimanot 2006). With regards to a structural education environment urban youth, tend to fall behind socially, developmentally, economically and academically as a consequence of social the social ills that plague their lives (Carter, 2003; Carter, 2010; Ginwright, Camarota, & Noguera, 2005; Javeri, 2007; Murphy, Richards, Lewis, & Carman, 2005; Obiakor & Beachum, 2005; Teclehaimanot 2005; Teclehaimanot 2006). Further, urban youth bring fewer traditional resources (e.g., they have less-educated parents, more poverty, and poorer health) to the school setting. This can ultimately hinder their educational future (Banks, 2003; Epstien, 2006; Landson-Billings, 1995; Ladson-Billing, 1998; Ladson-Billing & Tate, 1994; Noguera, 2005; Obiakor & Beachum, 2005).

Research indicates that learning environment urban youth engage in and experience, has been poorly funded, poorly equipped, and poor staff (Ginwright, Camarota, & Noguera, 2005; Obiakor & Beachum, 2005). It may not be surprising that youth in these environments lack the resources to forge ahead socially and academically.

Understanding urban youth and engaging in productive urban school reform calls for an exploration and analysis of urban youth, including their families, schools, and environments in which they engage in. For the purposes of this study, urban youth refer to high school students, who engage in contexts similar to the environment outlined above.

DEFINING SOCIAL MEDIA

Left undefined, the term "social media" is often synonymous with "social networking sites." Indeed, most discussions of social media focus on social networking sites; however, in this paper, the term social media is used to describe a wide range of collaborative, user centered online technology tools.

The literature defines social media as Web 2.0 technology (boyd & Ellison, 2007, Greenhow, Robelia, & Hughes, 2009; Mesch, 2006; Mesch & Talmud, 2010). This technology includes blogs, wikis (Wikipedia), social networking and social bookmarking (boyd, 2007). According to boyd, (2007) social media and their associated technologies are media technology tools for social interaction. Social media uses web-based technologies to turn communication into interactive dialogues. Kaplan and Haenlein (2009) define social media as a "group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, which allows for the creation and exchange of user-generated content." This new web of interactivity, creation, and collaboration was a transition from a read-only passive web environment.

Contextualizing the use of social media and its associated technologies facilitates participatory, collaborative, and distributed practices within formal and non-formal spaces (Lankshear & Knobel, 2006, p. 38). Along with active practices, social media is also characterized as "relationship" technology

(Schrage, 2001, para. 6), "participatory media" (Bull et al., 2008, p. 106), and "social digital technologies" (Palfrey & Gasser, 2008, p. 1).

Cormode and Krishnamurthy (2008) suggests that social media is both a platform on which innovative technologies have been built and a space where users are as important as the content they upload and share with others, integrating both the social and technology aspects of the web. Indeed, social media provides an interactive social platform where users are involved both in the content creation and acquisition process through the uses of technology.

As reported by Greenhow, Robelia, and Hughes (2009) technology is essential to social media. Dennis and DeFleur (2010, p. 342), Greenhow, Robelia, and Hughes (2009), and Kaplan and Haenlein (2009) suggest that social media takes on different forms though technological advances, including social network sites, such as Facebook, MySpace, Blackplanet, LinkedIn, and Ning; media sharing, such as YouTube, Odeo, and Flickr; social bookmarking, such as Delicious; collaborative knowledge development through wikis (e.g., Wikipedia and Wikispaces); creative media works including podcasts, videocasts, blogs, and microblogs (e.g., Twitter, Blogger, WordPress); online collaboration such as Google docs, Bubblius, and Zoho; virtual game worlds and communities such as World of War Craft and Second Life; lastly, content aggregation and organization, such as RSS feeds and tagging tools. These tools, as suggested by Greenhow, Robelia, and Hughes (2009) allow for remixing and mash-up of content from different content providers and sources into new forms, such as combining geographical data (e.g. Google Earth) with transportation, satellite (e.g. GPS), or with crime data. This is a new affordance brought on by advances in ICT's and the World Wide Web, which are now a distinct feature of social media. Based on these new affordances, Cormode and Krishnamurthy (2008) and by applying various theories to social media, Kaplan and Haenlein (2009) suggests that social media promotes interconnections and can be classified through:

- User-defined linkages between users and content (e.g., posting on others' pages);
- Simple mechanisms to share multimedia content (e.g., blogs);
- Prominent personal profiling (e.g., displaying user preferences on customized profile pages); and lastly
- Inter-technology applications, enabling interfaces with services and features on other sites.

Kaplan and Haenlein (2009) suggest a classification scheme for different social media types. This classification allows for a systematic break down and review of social media tools and uses. Table 1 depicts a classification of social media. In other words, social media is well suited for collaboration, collective knowledge building, knowledge management, social networking, social interaction, and content creation, which means individuals become more active and personally involved within creative and educational spaces (Ajjan & Hartshorne, 2008; Greenhow, Robelia, & Hughes, 2009; Kirkland, 2007; Kirkland, 2008; Kok, 2008; Liccardi, Ounnas, Pau, Massey, Kinnunen, & Lawthwaite, 2007; Maloney, 2007; McLoughlin & Lee, 2007; Ullrich, Borau, Luo, Tan, Shen, & Shen, 2008).

For this chapter, social media refers to tools and technologies used for uploading, sharing, collaborative learning, collective knowledge building, social networking, interaction, and content creation, including but not limited to Internet forums, weblogs, blogs, social networking sites (Facebook, MySpace, Mocospace, Blackplanet), microblogging, wikis, podcasts, photographs or pictures, video, rating and social bookmarking.

Table 1. Classification of social media

Type	Example
Communication	**Blogs**: Blogger, LiveJournal, WordPress, Xanga, Blog.com, Ning **Microblogging**: Twitter, Google Buzz, **Location-based social networks**: Facebook places, **Social networking**: Blackplanet, Facebook, LinkedIn, MySpace
Collaboration	**Wikis**: Wikipedia, Wikimedia **Social bookmarking** (or social tagging) CiteULike, Delicious, **Social news**: Digg, Mixx, NowPublic, Reddit, Newsvine, **Social navigation**: Trapster, Waze **Content Management Systems**: Wordpress **Document Managing and Editing Tools**: Google Docs,
Media Content Creation	**Photography and art sharing**: Flickr, Photobucket, Picasa **Video sharing**: Vimeo, YouTube, Dailymotion **Livecasting**: Livestream, Skype, **Music and audio sharing**: Napster, MySpace Music, **Presentation sharing**: Scribd, SlideShare
Reviews	**Product reviews**: epinions.com, MouthShut.com **Business reviews**: Customer Lobby, Yelp, Inc. **Community Q&A**: Askville, EHow, Stack Exchange, WikiAnswers, Yahoo! Answers, Fluther
Entertainment	**Media and entertainment platforms**: Cisco Eos **Virtual worlds**: Active Worlds, Second Life, The Sims Online **Game sharing**: Kongregate, Miniclip; Xbox Live, World of War Craft

RECENT STUDIES EXAMINING SOCIAL MEDIA PRACTICES

Understanding social media and its use by urban youth, not only draws upon an academic foundations through research, however social media also advances practice aimed at exploring the technical, cognitive, and aesthetic basis of human interaction as mediated by technology. This interaction mediated by technology is a consequence of advances in information and communication technologies, where the social presence and opportunity to create, produce, and share media, but also to read, write, communicate, and reflect, has become popular in the 21st century (Akdemir, 2008; Ito, 2009; Kirkland, 2007; Kirkland, 2008; Lew, O'Byrne, Zawilinsky, McVerry, & Everett-Cacapardo, in press; Mesch, 2006; Mesch & Talmud, 2010).

As the world moves into the second decade of the 21st century, one of the major advances in technology has been in the rise of online collaborative content creation and sharing tools. These tools have become known as Web 2.0 or by its more popular identity, social media. These tools are now an integrated part of daily life and compel questions of how these media platforms affect human development, relationships, and interaction (Donath & boyd, 2004; Greenhow, Robelia, & Hughes, 2009; Ito, 2009; Kirkland, 2007; Kirkland, 2008; Lankshear & Knobel, 2006, p. 38; Mesch, 2006; Mesch & Talud, 2010).

With the rise of social media, society has capitalized on the opportunity to distribute user-generated content by eliminating gatekeepers. This opportunity has provided the affordance of and seeking out alternative avenues to self-publish and share music, writing, videos, and pictures. This tendency toward user-generated content invariably leads to an increased variety of perspectives on any given issue and less control over content by media (Donath & boyd, 2004; Greenhow, Robelia, & Hughes, 2009; Ito, 2009; Kirkland, 2007; Kirkland, 2008). These perspectives have been well documented in the literature.

Eldridge and Grinter (2001), Grinter and Eldridge (2001), Grinter and Eldridge (2003), and Grinter and Palen (2002) lay a previous foundation in researching youth, social media, and their associated technologies. These authors discovered that the focus of research studies involving youth and social media tended to focus on who was using the technology and why, employing either in-depth ethnographic data with relatively small sample sizes. Lenhart (2003), Lenhart, Madden, and Hitlin (2005) and Lenhart, Rainie, and Lewis (2001) expanded the work of Eldridge and Grinter (2001) with questionnaires focusing on basic user data. The main findings of such research revealed, youth were using social media related technologies to enhance their ability to communication among their friends and family, to make plans with one another, and to maintain social contact outside of their day-to-day face-to-face conversations. These authors also found that these technologies have been adopted by teens relatively quickly because they are more convenient, less expensive, and faster than traditional technologies. Lastly, their findings revealed social media and its associated technologies were on the rise and that the use of these tools surpassed that of email and that youth engaged with these tools hold in-depth, important conversations offline, extending their social networks and relationships.

Such research is vital to understandings how urban youth use social media and related technologies. However, these earlier studies do not delve into the heart of some of the more interesting questions, such as the qualitative aspect of urban youth and their experience with social media technology within formal or informal environments including perceptions, values, usage, and interactions.

Moje (2004) studied the lives of Latino, marginalized youth as they engaged in literacy practices outside of a traditional schooling context. Using the literature, Moje develops a conceptual framework that offered a reconceptualized view of literacy that increases opportunities for content literacy learning for this group of youth. She contends that the tensions between in-school and out-of-school discourses were mediated through dynamic social interaction that drove urban marginalized youth to seek other alternative environments where they could engage in social interactions and practices that were educative and socially beneficially. Moje (2004) suggests that these alternative environments are "third spaces" and that third spaces provided youth and opportunity to connect traditional academic practices with their informal literary practices outside of school. Third spaces, as Moje (2004) pointed out, drew on "lived experience" in formal curriculum as mediation between the 'official' and 'unofficial' spaces of school. These "third spaces" included malls, movies, theatres, virtual/internet spaces, and restaurants. With the neighborhood and suburban spaces, the virtual/internet provided youth an opportunity to engage in a wide variety of text and media. This use of text and media allowed youth to link to and construct new communities, spaces, and potential texts and identifies (Moje, 2004).

Lenhart, Madden, and Hitlin (2005) again revisiting the idea of youth and their use of social media technology found that young people often accessed these technologies in their homes and that this access was used primarily for social communication reasons. This access has become a "virtual meeting place" where youth could spend time socializing with their peers. Further, the authors found that these virtual venues for socializing have overtaken malls and other physical spaces as the primary venue for teens and their interactions. Lastly, Lenhart, Madden, and Hitlin (2005) found that social media and their related sites have flourished as a means to keep in touch with a friends and family. What was profound about this particular study was that the authors suggest that increasingly youth engage in digital practices outside of school and that adolescent youth actively compose meaning through new kinds of texts in their social worlds. Although these studies give us insight into some of the reasons and places social media is used by youth, these studies again do not give insight on how these youth engage in the creation of content for the Web or their participation on the Web through multimedia artifacts they create and share (Buckingham, 2005).

Buckingham (2005) was one of several recent studies that examined youth engagement and participation in the creation of media content for the web that could shared. In his work, he discovered that youth developed media content using a variety of literacy skills even in the absence of explicit attempts to encourage and promote those literacy skills within a formal educational context. This suggests that young people already possess levels of functional literacy - that is, the skills and competencies needed to gain access to media content, using the available technologies and associated software to create new content, and make meaning from that content. Additionally Buckingham (2005) found that there was considerable potential for social media to be used as means of communication and self-expression through media content creation. What was profound about this work was that the creative involvement in social media and the creation and sharing of content, particularly in the context of education, could make an important contribution to the development of critical thinking. Lastly, Buckingham (2005) suggests that social media such as online gaming and social networking could provide possibilities for new forms of interaction and situational engagement.

Kirkland, (2007) explored the literate lives of urban youth outside of the schooling process and made the case that researchers and educators speak of pedagogical or educational "space", as generally referring to "the social forums" (i.e., relative positions/directions) that feature instructional activities in a traditional perspective and that these interactional processes promote individual knowledge production. Spaces as he refers to them coincide with the description Moje (2004) suggests. While these waves have been helpful in describing and pushing classroom boundaries, these spaces as Kirkland, (2007) describes alone are no longer sufficient for describing pedagogical space in the digital moment. He contends that educators and researchers should look at the uses of digital and social media in an informal context. His work found that youth who participated in social and digital media seemed to have occupied spaces within spaces and spaces beyond spaces—that is, space in its most dynamic and pluralistic extent, meaning they were more engaged in creative and learning processes. What was unique about this study was that Kirkland (2007) found that urban students used and extended traditional academic literalities to creative spaces, where they as students became producers of digital media content, using skills from the academic content at a high cognitive level, as illustrated from the Blooms taxonomy.

Boyd (2007) discovered that social media could enhance creative learning and critical thinking opportunities and that expanded social media access and contexts can be used for learning. Boyd (2007) states that the affordances of social media including interconnections, content creation, remixing, and interactivity might facilitate an increased interest in learners' creative practices, participation, and production, suggesting new ways of thinking about digital-age competencies in an academic environment.

Revisiting the idea of urban youth and their engagement with digital and social media, Kirkland (2008) found that new technologies and online social communities changed how urban youth practice literacy. He further found that while many literacies in the classrooms seemed detached from such changes, digital and social media provided students the opportunity to connect and extend academic literacies to meet their social, creative, and learning needs. To help bridge this divide, Kirkland (2008) broaden the notions of literacy and provides a new context towards looking at social media from the traditional perspective of tools, to that of a conduit of literary (reading, writing, communication, and critical thinking), while situating them in the current culture of technology, where youth media literacies thrive.

Looking at ways in which social media might be used to facilitate participatory and creative practices, Greenhow and Robelia (2009) explored how social media characteristics, applied and adapted in formal and informal contexts, may support learners' development of competencies that are valued in education. They articulated several important themes. These themes included, learner participation and creativity, online identity formation, and transformative social scholarship—that support a new wave of research questions relating to social media and how these tools may be applied to learning. In their study they argue for a stronger research focusing on students' everyday use of social media technologies and their learning with social media and their associated technologies within and outside of classrooms. This particular study was profound in the sense that Greenhow and Robelia, (2009) suggest that social media supports collaborative creativity, promotes social interactions and sharing, innovative youth learning ecologies, and the facilitation of innovative teaching strategies that lead to new instructional approaches.

Important to the discussion of urban youth and social media is the discussion of learning ecologies. Greenhow and Robelia (2009) suggest that learning ecologies stipulates that:

- Individuals are simultaneously involved in many settings;
- Individuals create learning contexts for themselves within and across settings;
- The boundaries among settings can be permeable; and
- Interest-driven activities can span contextual boundaries and be self-sustaining given adequate time, freedom, and resources.

These stipulations reinforce the creative collaborative social interactions of social media. As stated by Moje (2004) and reinforced by the work of Barron (2006) what youth learn outside of school can shape what they learn in school, as they seek out projects based on their interests. In turn, school projects can stimulate students' interest that can motivate them to seek more information, opportunities, and like-minded people with whom to learn on their own terms. Overall, learning can manifest itself across settings and informal or formal crossing of boundaries might enhance learning (Barron, 2006; Greenhow and Robelia, 2009; Kirkland, 2007; Kirkland, 2008; Moje, 2004).

Implications of social media, as described here, is changing the way researchers and educators think about educational and creative spaces with respect to what, how, with whom, and for what purposes learning might occur through such practices (Greenhow, Robelia, & Hughes 009). Greenhow, Robelia, and Hughes (2009) suggests that social media and its associated technologies allow learners to link up, create, consume, and share independently created or produced information, media, and applications on a global scale. They also suggest that many features of social media encourage interconnections among learners, allowing them to develop their networks and increase the number and range of people to consult for feedback or support. This active engagement is a central component of social media. Further, these authors purport that social media and its capacity for content creation and "remixing" practices, is also a hallmark of social media. Graphics and text can be repurposed, recreated, and rearranged, blurring the lines between information consumption and production and between individual and group authorship of expression in richly visual and social media (Greenhow, Robelia, & Hughes, 2009).

A third aspect of social media as identified by Greenhow, Robelia, and Hughes (2009) is interactivity facilitated by features that do not require sophisticated technical expertise, but allow users to publish, share, consume, and remix content. Greenhow, Robelia, and Hughes (2009) state that blogs, wikis, and video-sharing, photo-sharing, and audio-sharing sites can engage students in promoting their works, while also critically considering the works of others, including friends' works; mainstream "authorized" sources, such as primary and secondary sources and unsanctioned sources, such as political blogs or agenda specific wikis. This component can engage youth in public dialogue on cutting-edge issues (Greenhow, Robelia, & Hughes, 2009).

In relation to youth and their experiences with social media and related technologies, Mesch and Talmud (2010) provide a systematic exploration into various affects of internet, social media, and mobile phones access and use on youth. These affects emerged in three distinct categories, social, leisure, and extracurricular activities. Specifically these authors, through their research and seminal work *Wired Youth,* shed lights on the many concerns that have been expressed concerning how the internet, social media, and mobile communication devices have changed the way in which young people interact, in addition to their patterns of interaction. These arguments and focus rest on the theoretical perspectives of the nature of internet based social interaction. Mesch and Talmud (2010) force scholars to think whether the internet and its related technologies simply reflect and/or substitute for traditional human connectedness or does virtual interaction create a new form of human communication with unique opportunities for creative identify formation.

CONCLUSION

Of importance to education, Mesch and Talmud (2010, p. 110) presents two prevailing societal views of social media and related technology. The first is the dystopian school view, "which regards individuation, urbanization, and globalization, combined with the rapid incorporation of ICT's in households, as destructive to the social fabric." This a similar perspective to Greenhow and Robelia, (2009) and Thurlow, (2006) who suggest that current traditional academic authority portray youth media and technological practices as deficient or harmful to academic learning. The utopian perspective is in direct contrast with dystopian school view. This perspective depicts ICT's as a "significant contribution to the emancipation of individuals and cultural groups from constraints of time, space, and critical elements of the western social structure such as gender, race, geographic boundaries, and class background." Lastly, Mesch and Talmud (2010) indicate that for many young people, ICT enhances and facilitates positive social interactions, meaningful engagement, and rich collaborative learning experiences.

These perspectives and attributes of social media, interconnections, creativity, and interactivity, as described by Donath and boyd, (2004), Greenhow, Robelia, and Hughes (2009), Ito, (2009), and Mesch and Talmud (2010), offers youth a richer opportunity to make learning more personal, contextual, meaningful, collaborative, and socially relevant. Additionally, the literature suggests that social media may be a possible link to connect the informal learning and social world with the formal academic context.

If youth, educators, and schools are to harness social media for educative purposes, research is needed to reconceptualize the way in which social media is perceived and used in social educative spaces (Greenhow, Robelia, & Hughes 2009; Mesch & Talmud, 2010) and ultimately how these tools are using learning setting in formal academic spaces. Additionally, research is needed to understand the technological, ethical, educational, and social practices of social media and related technological mediums across a life span, including technology and social media use of urban youth across an entire day (e.g., home, work, school, mobile devices) thereby giving us a glimpse into the lives and experiences of urban youth who engage in their social world through social media (Greenhow, Robelia, & Hughes 2009; Mesch &

Talmud, 2010). Lastly, research is needed to theorize, frame, and engage in theory building for social media and related technologies for their seamless adoption and integration into traditional academic spaces and practices that are not in conflict or resistant to technology use for learning in the digital age (Cuban, 2001; Coiro, Knobel, Lankshear, & Leu, 2008; Lew, O'Byrne, Zawilinsky, McVerry, & Everett-Cacapardo, in press). Therefore, this chapter embarks on the exploring the experiences of urban youth, who engage their social world through social media in hopes that their use may inform traditional academic practices. More work is needed.

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Chapter 25
Mobile Learning

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ABSTRACT

Developments in Information and Communication Technologies (ICT) affect our world in a tangible way and cause observable transformations in the way of interact information and people. One of the most popular of these transformation is mobile technology. Mobile technologies influence our interaction with information as never happened before and meet with great interest and anticipation like every new technology. Educators and instructional designers perform various researches since the mobile technology emerged. The wide adoption of mobile technology revealed the idea of mobile learning. Mobile learning is learning that occurs anywhere anytime via mobile devices. People is continuously communicating in the virtual world through mobile devices. Educators intend to use for education of people the potential of this communication which is continuous in anywhere and anytime. Mobile learning which educators use for supporting formal learning is especially has the potential to affect lifelong, self-directed learning, contextual learning and in-service learning deeply.

INTRODUCTION

Rapid change in Information and Communication Technologies (ICT) affect our world in a tangible way. This movement of change transforms education, health, industry and many more fields dramatically. Thus, new technologies are constantly uncovered by this transformation. One of the most rapidly spreading and familiar technologies is mobile technologies. Mobile technologies involve different type of portable devices such as wearable devices, smart-phones, media players, game consoles, laptops and virtual reality devices. Common functions of mobile devices are communication between people and other devices. Mobile technologies influence our interaction with information as never happened before. Mobile devices are among the essential elements of life because wireless internet access and mobile service providers has great developments.

Mobile technologies have been met with great interest and anticipation like every new technology. Usage potential of mobile technologies as a supporting formal and informal learning anywhere and anytime causes increased interest. Every new medium arises interest when considering the history of

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educational technology. Over the time, this interest disappears because medium encountered extreme interest and generally cannot meet these expectations such as radio, television and computer (Reiser, & Dempsey, 2011). In terms of education, important sides of mobile technology are connectivity and mobility. Today, mobility is not a big issue because of the nano-technological developments but connectivity is still. Nowadays, the fourth generation (4G) compatible devices are used in many countries. 4G is the last version of the mobile technology. The 2G and 3G compatible devices were followed after 1G compatible devices which were seen in the 1950s (Dunnewijk & Hultén, 2007). 4G provides high internet speed for different aims such as multimedia services, social media, learning management system, teleconference and whatever technology which need high speed internet. In addition, 5G is expected to be released around 2020. 5G should be more improved technology than we never have. Some of the 5G technology specifications are listed (Sapakal & Kadam, 2013, p. 570):

- High speed and cheaper connectivity;
- Supporting interactive multimedia services;
- Global access and service mobility;
- Providing large broadcasting capacity up to Gigabit;
- Combined with artificial intelligent;
- Very high upload and download speed.

The wide adoption of mobile technology revealed the idea of mobile learning. Educators and instructional designers who are in intense expectation from mobile technology to perform various research since the technology emerged. The proliferation of access to information from mobile devices by students provides the necessary supports and research for mobile learning by different institutions. The views of educators about mobile learning is considered very important because educators are the practitioners of mobile learning in different institutions. Educators admits that mobile learning has some advantages such as learning in anytime, anywhere, easy access to content, efficient use of time, increased learning opportunities, providing collaboration, personalization and responsibility of learning. On the contrary, educators draw attention to some disadvantages of mobile learning such as cost, screen dimension, connectivity issue, difficulty of control, battery life, capacity, health and time-consuming (Yılmaz, 2011). Mobile learning is not just seen as learning that occurs with transfer e-learning contents to mobile devices. Instructional designers should design and produce mobile learning contents on the basis of mobile learning design principles. Mobile learning contents should be small, meaningful parts instead of much information. These types of mobile learning contents called as "nuggets" or "bite-sized" learning contents (Parsons, Ryu ve Cranshaw, 2006). Mobile design principles were listed (Herrington, Herrington and Mantei, 2009, p. 134):

- **Real World Relevance:** Use mobile learning in authentic contexts;
- **Mobile Contexts:** Use mobile learning in contexts where learners are mobile;
- **Explore:** Provide time for exploration of mobile technologies;
- **Blended:** Blend mobile and non-mobile technologies;
- **Whenever:** Use mobile learning spontaneously;
- **Wherever:** Use mobile learning in nontraditional learning spaces;
- **Whomsoever:** Use mobile learning both individually and collaboratively;
- **Affordances:** Exploit the affordances of mobile technologies;

- **Personalize:** Employ the learners own mobile devices;
- **Mediation:** Use mobile learning to mediate knowledge construction;
- **Produce:** Use mobile learning to produce and consume knowledge.

Mobile learning has different definitions in the literature. Some of these definitions is set in the following manner. Kukulska-Hulme and O'Malley et al. (2003) defined mobile learning as any kind of learning that learner in a predetermined place or learning as learner can translate into advantages of opportunities offered by mobile technology on the learning time. Trifonova and Ronchetti (2003) defined mobile learning as e-learning via mobile devices that we can take with us every moment of daily life. Stone (2004) defined mobile learning as e-learning via mobile devices that hosts many features as small in size, bandwidth and network technologies. Georgieva, Smrikarov and According to Traxler (2005) mobile learning can be defined as "any educational provision where the sole or dominant technologies are handheld or palmtop devices".

In terms of technical definition, Keegan (2005) defined mobile learning that "restricted to learning on devices which a lady can carry in her handbag or a gentleman can carry in his pocket." Georgiev (2005) defined mobile learning as usage of portable devices in education that can present learning materials and provides interaction between teacher and student in anywhere and anytime. Additionally, in this section, how can private sector locate mobile learning in business life will be described. Traxler (2005) defined mobile learning as changing place of education from school to home, workplace and community and qualified mobile learning as spontaneous, portable, personal, situated, informal, unobtrusive, ubiquitous and disruptive. According to the Walker (2007), mobile learning is not just learning from mobile devices but learning from different contexts. When the definitions were reviewed, there is seen trend from technical to contextual vision. There are many other advantages of mobile learning for business in addition to education sector (Woodill, 2011):

- Workers already use mobile phones in workplace;
- Workforce including salespeople, consultants and maintenance workers are mobile;
- Mobile worker can do her work in home, cafe and wherever;
- Having a time for communication and learning via mobile devices while transporting;
- New generation wants that mobile will be part of their job;
- Necessary of real time data for organizations whenever possible;
- Providing reliable communication in the case of emergency;
- Globalization of sources and labor force.

Business and private sector should concern value-added side of mobile learning. People already have mobile devices and use them in their daily life wherever possible. However, they are used to familiar their mobile devices. Business and private sector should benefit from this situation. Feser (2014, p. 31) explained the reasons why employer care about mobile learning below:

- With mobile devices, your employees always have their learning tools/devices with them;
- Mobile is global;
- Performance and productivity improvements are a fact of life;
- The volume of information your employees need to know is increasing at an incredible rate;
- Mobile learning is contextual;

- Mobile learning is cost-effective;
- Mobile learning is reusable;
- Mobile learning has adaptability and speed;
- Mobile devices allow improved data capture;
- Mobile learning is convenient.

People is constantly communicating in the virtual world through mobile devices via Web 2.0 technologies. Educators intend to use for education of people the potential of this communication which is continuous in anywhere and anytime. Educators efforts appears to be important when considering informal learning communities meet and share information on social network sites. Mobile learning provides continuing education outside the classroom with interaction opportunities (Sharples et al., 2009). McQuiggan, McQuiggan, Sabourin and Kosturko (2015, p. 10) explained the benefits and challenges of mobile learning:

- **Benefits:**
    - Ability to learn on the go;
    - Reach underserved children and schools;
    - Improve higher-order thinking skills;
    - Support alternative learning environments;
    - Enable personalized learning and motivate students;
    - Challenges
- **Challenges:**
    - Differentiated access to devices and Internet;
    - Use must be monitored;
    - Prevailing attitudes and prejudices against using technology for instruction;
    - Limiting physical attributes;
    - Mobile devices are shared among a group;
    - Way in which the devices are implemented impacts the effectiveness of them.

Mobile learning which educators use for supporting formal learning is especially having the potential to affect lifelong, self-directed learning, contextual learning and in-service learning deeply. In addition, mobile learning as an element of contemporary learning approaches is used for different purposes such as flipped learning and e-learning. Classification of activities that relevant to mobile learning is listed below (Naismith, Lonsdale, Vavoula & Sharples, 2005, p. 2):

- **Behaviorist:** Activities that promote learning as a change in observable actions;
- **Constructivist:** Activities in which learners actively construct new ideas or concepts based on both their previous and current knowledge;
- **Situated:** Activities that promote learning within an authentic context and culture;
- **Collaborative:** Activities that promote learning through social interaction;
- **Informal and Lifelong:** Activities that support learning outside a dedicated learning environment and formal curriculum;
- **Learning and Teaching Support:** Activities that assist in the coordination of learners and resources for learning activities.

The portable nature of mobile devices and ability to access the information whenever people need anytime and different contexts liberates individuals. In this way, mobile devices affect the learning in terms of socio-cultural and cognitive (Pachler, 2009). If educators and instructional designers want to integrate mobile learning to their teaching process, they need to consider capability of mobile devices. Mobile learning is always associated with capability of mobile devices. Mobile devices have ability to accomplish these tasks (van't Hooft, 2008, p. 33):

- Accessing information online (such as news, sports, entertainment, hobbies);
- Navigating the physical environment, such as GPS devices, Google Maps; and
- Google Earth for maps and directions, or sites like Flickr for geo-tagged images;
- Accessing or interacting with digital information embedded in the physical environment (such as GPS, RFID or QR tags, and NFC);
- Interacting with the physical environment (for example, using embedded chips to make payments or accessing public transportation);
- Communication (such as SMS, IM, VOIP);
- Entertainment (games, music, and videos/movies);
- Media creation (recording video and audio, and to some extent, editing and publishing from a mobile device);
- Media tagging (labelling audio, video, and images with key words).

In addition to this, five basis properties of mobile devices listed below (Klopfer, Squire & Jenkins, 2002):

- **Portability:** Can be moved from one place to another where learner wants to take away;
- **Social Interactivity:** Can share information and work together with other people head to head;
- **Context Sensitivity:** Can collect real time information in terms of current location, environment, and time;
- **Connectivity:** Can connect other portable devices and networks;
- **Individuality:** Can ensure unique scaffolding.

Mobile devices that used in mobile learning, has hardware and software features that assuming a decisive role. Therefore, mobile devices' properties and potential areas of application should be considered. The technical, pedagogical and organizational criteria that who design to mobile learning environments should appraise the situation (Traxler and Wishart, 2011). Today, there are different mobile devices which have different mobile operating system. However, every operating system have both same application and unique application. Mobile applications 'Local Practices' (Native apps), 'HTML5 Applications' (HTML5 apps) and Hybrid Applications (Hybrid apps) are to be divided into three. Local applications, hardware and software features to ensure full access and offline storage features make the application on mobile devices are showing the best performance. HTML5 Applications (HTML5 apps), HTML5, JavaScript and CSS applications created using Web applications (web apps) as is known. The most important advantage of mobile applications can be created that can work cross-platform. The limitations of session management, offline storage properties and cannot provide access to the hardware and software features. Hybrid Applications (Hybrid apps), is a combination of native and HTML5 apps. HTML5, JavaScript and CSS is created using the HTML5 application hardware and software to provide access to the properties into the local application layer by placing. Local and hybrid applications when they are distributed by the application market is more secure than HTML5 for applications. Before submitting the application store applications to end users and re-evaluated according to specific criteria. These criteria include privacy, intellectual property, situated harmful content and advertising (Google Play Policies and Guidelines, 2013).

Improving the learning environment plays a key role in implementing and improving the assessment. Usability, usefulness and effectiveness are important points that constructing evaluation plan when configuring mobile learning assessment. Micro-level learners use during mobile learning activities, the availability of mobile technology, efficiency, effectiveness and satisfying change. Mid-level learning experience, the educational value of new technologies, training of how to change, provided that the issues are examined and reveal contributions. According to principles of Quinn (2011, p. 28) for effective mobile learning experience, practitioners should follow these principles:

- **Clear (or Emergent) Goal:** The ultimate desired outcome of the activity should be(come) apparent;
- **Appropriate Challenge:** The task should be hard enough to avoid boredom but not so challenging as to be frustrating;
- **An integrating Story:** The action should be set in a thematically coherent world;
- **Meaningful Link Between Action and Story:** What the learner does impacts the storyline;
- **Meaningful Link Between Learner and Story:** The learner has to care about the problem embodied in the world;
- **Active Exploration:** The learner must make choices and discover the consequences, not just see the question and then the answer;
- **Direct Manipulation:** The learner must act on the represented world of the problem in a method as close to the real mechanism as possible;
- **Appropriate Feedback:** The consequences of choices should be conveyed in ways that reflect how the world would react (and ultimately should communicate via the concept of why the choice was right or wrong);
- **Novelty:** Ideally, there is unpredictability in the outcome, or at least some unexpected components rather than linear and deterministic outcomes.

Mobile learning is widely accepted by the educators. Many projects were conducted to investigate different aspects of mobile learning. One of the hardest challenge of mobile learning is evaluation. Evaluation is still not easy activity for educators and learners in the learning environments such as classroom because of its nature. Mobility makes evaluating harder to implement properly because of different learner context firstly. Sharples, Arnedillo-Sánchez, Milrad and Vavoula (2009) propose the evaluation framework for mobile learning to assess usability, educational effectiveness and overall impact. This framework comprises three levels such as micro level, meso level and macro level. Individual activities and user's experience are the focal point at micro level. Learning experience and technology integration is the key issue at meso level. The effects that technology creates in the long run are very important at macro level.

Educators and instructional designers should consider this evaluation framework or another framework to assess. Students and their behavior can be traced from mobile learning management system and can be evaluated.

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Chapter 26
Teaching Through Mobile Technology:
A Reflection From High School Studies in South Africa

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ABSTRACT

The use of mobile technology to support teaching and learning in schools, has extended technology learning tools in schools across different socio economic divides. There have been various studies throughout the world which reflect the improvement of such technology in schools. In this chapter we reflect on a series of studies conducted in developing countries with focus on Jantjies and Joy (2012, 2013, 2014, 2015) studies. The studies were conducted in schools with the objective of providing teachers and learners with multilingual mobile learning content specifically designed to support teaching and learning in their science and mathematics classrooms and beyond. This chapter provides a culmination of lessons learnt from all studies reflecting on the journey of mobile learning in schools across South Africa. The use of mobile technology to support teaching and learning in schools, has extended technology learning tools in schools across different socio economic divides. There have been various studies throughout the world which reflect the improvement of such technology in schools. In this chapter we reflect on a series of studies conducted in developing countries. The studies were conducted in schools with the objective of providing teachers and learners with multilingual mobile learning content specifically designed to support teaching and learning in their science and mathematics classrooms and beyond. This chapter provides a culmination of lessons learnt from all studies reflecting on the journey of mobile learning in schools across South Africa.

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INTRODUCTION

This chapter presents two mobile learning studies conducted in mathematics and science classrooms in South Africa. The study looks at how mobile technology was used to support the process of teaching and learning in these subject areas, whilst considering the language barriers and the context.

The premise of these studies was motivated by the annual increase of mobile phone access and Internet access (ITU, 2015), and the use of mobile phones as learning platforms in situations where other e-learning platforms are not easily accessible. While research studies have advanced our knowledge about the platforms used to support teaching and learning, such as tablet devices in many schools, the instructional design and implementation challenges relating to mobile learning across different countries and contexts still require further research (Jaffer, Ng'ambi & Czerniewicz, 2007; UNESCO, 2012a; UNESCO, 2012b).

There is thus a need for different scenarios of mobile learning use in schools to provide various views of how we can improve mobile led design and instruction. In recognising that use of technology in schools depends on the teachers and learners, this chapter also presents the skills and contextual offerings which influence the use of mobile devices in the schools being studied. Research has highlighted the various challenges that teachers face when unable to integrate technology into their teaching process. This could be as a result of many factors, such as lack of ICT skills and support infrastructure (Bitner and Bitner, 2002; Roth, 2014), and there is thus a need to reflect on studies in different contexts.

The development of mobile learning to support high school/K12 education has seen various advancements across the world. In this chapter we provide a reflection on studies conducted in several schools with the objective of supporting teaching and learning in science and mathematics classrooms. In each study mobile applications were developed with education experts and teachers and the applications were used to support learning inside and outside the classroom learning context. Furthermore, learners were provided with mobile phones loaded with airtime/data which allowed them to access the learning content on their phones. The teachers would then provide various tasks which required the use of this technology when learning inside and outside the classroom. The content was also presented in multiple South African languages, as suggested by the multilingual context of the studies.

The chapter presents the challenges in the study and lessons learnt from conducting mobile learning research in a developing country context. While some of the lessons are context specific, such as the multilingual nature of the country, there are various elements of the research which resonate with the use of education technology to support teaching and learning across the world. These reflections can thus benefit teachers and researchers on how to best to develop and use mobile driven instructional design in schools.

MOBILE LEARNING IN SOUTH AFRICA

One of the earliest mobile learning project in South Africa was the MELFA project which was aimed at providing building construction workers with training content through voice recorded multilingual learning content (MELFA, 2009).

Dr Maths was later developed by a South African research institution, CSIR, which aimed to provide a real time tutoring platform for mathematics. In conjunction with a local university, learners in high schools could access the system from their mobile phones and ask university tutors questions related to mathematics content (Butgereit, 2007; Butgereit, 2012).

MoMaths (UNESCO, 2012b) was another mobile learning project where the South African government partnered with Nokia to create a platform where learners could access mathematics learning resources from their mobile phones, and was seen to successfully involve educators, government and a private company as stakeholders. The challenge with such projects is often the lack of continuity as a result of many factors which include funding and change of leadership.

Another notable project was the M4girls project, in partnership between the government, Nokia and Mindset, which was a pilot study to provide a platform where young girls in rural areas can get access to mathematics learning materials. The material was in the form of gaming providing a serious gaming approach to learning (Vosloo, 2009; UNESCO, 2012; Brown and Mbati, 2015).

Yoza was a project where novels were presented in multiple South African languages and accessible on mobile phone platforms allowing readers to having discussions related to the novel through an online platform (UNESCO, 2012b).

While there have been many projects that have reflected on the mobile phone as a potential learning platform, none of them has been focused on science and mathematics whilst also considering language as a barrier to learning the South African content. With this in mind, we looked at ways in which we could involve teachers in improving the process of teaching and learning through mobile phones in South African high schools.

METHODOLOGY

Two main case studies were conducted in South Africa in Gauteng and in the North West province. The North West province is a largely rural province where most of the country agricultural produce come from, while Gauteng is considered to be the economic 'heart beat' of South Africa. Four schools from North West participated in this study together with one from Gauteng. In both studies a mobile learning tool called M-Thuto was developed to support teaching and learning in the formal and informal classroom learning context.

South Africa has 11 official languages, even though English is the national language of instruction. In considering the cultural, and linguistic challenges of the country we presented learning technology which was available in English and Setswana in the M-Thuto system, since Setswana was the first language of most participants in the study. The sample sizes in the study were limited as a result of government ethics application process in relation to school access, however the findings of the study can be used to understand and reflect on the use of mobile learning and resources in South African schools.

In each study learners were provided with mobile phones to use for a month with access to the Internet, with each phone having being preloaded with data. In both studies the teachers played a vital role by either referring learners to the application for some of the learning objectives or by working with them through some of the study tasks using the application. Following this time, a series of data collection strategies were used to establish the experiences of the participants.

The studies below ensured triangulation by using more than one method of collecting data. The studies used interviews, questionnaires, observation of participants, and interaction with participants with the technology (Cohen et al., 2011). While the study provides limited sample sizes, lessons leant from the studies can be applied in other similar contexts. As this study is interdisciplinary and involves human beings we also note that when applied to other settings, the findings may be different (Bryman, 2012).

Details of the participating schools and the characteristics are presented in Table 1. Each school has been given an alphabetical name from A to D and learners have been given pseudo names to ensure anonymity.

The Technology

When developing both technologies in the study we were guided in the pedagogical perspective of the technology by Shih and Mills (2007), who stress the following important perspectives in developing pedagogy used in mobile technology:

- The importance of understanding the learners in the way they acquire knowledge;
- The local social settings and context affecting the learners' manner in acquiring knowledge;
- The varying roles of the mobile technology in the teaching and learning process;
- The factors affecting mobile learning use – the context, the teacher, the technology and the learner – affects the study.

Learners

When developing the underlying pedagogy we first had to understand the manner in which learners learn and thus we considered learning theories as they play an important role in the interaction process. We looked at constructivism and behaviourism as commonly used theories and thus modelled elements of the system around these theories as summarized in Table 2 (Ang et al., 2008; Boghossain, 2006; Hunter and Benson, 2007; Nagowah and Nagowah, 2009; Shih and Mills, 2007).

Educators

The introduction of technology in many schools across the world tends to ignore the vital role the teacher plays in using the technology to enhance the teaching and learning process, and teachers are also often not included in the technology development process. In this light, we invited teachers and government subject advisors to help create pedagogy that would be used in the M-Thuto platform.

Table 1. School descriptions

School A	Urban based school with good learning infrastructure and resources. Based in an affluent residential suburb.
School B	Township based school based in a low income area, has limited infrastructure and resources
School C	Township based school based in a low income area, has limited infrastructure and resources
School D	Rural based school based in rural village with limited infrastructure and resources.

Table 2. Learning theories and M-Thuto

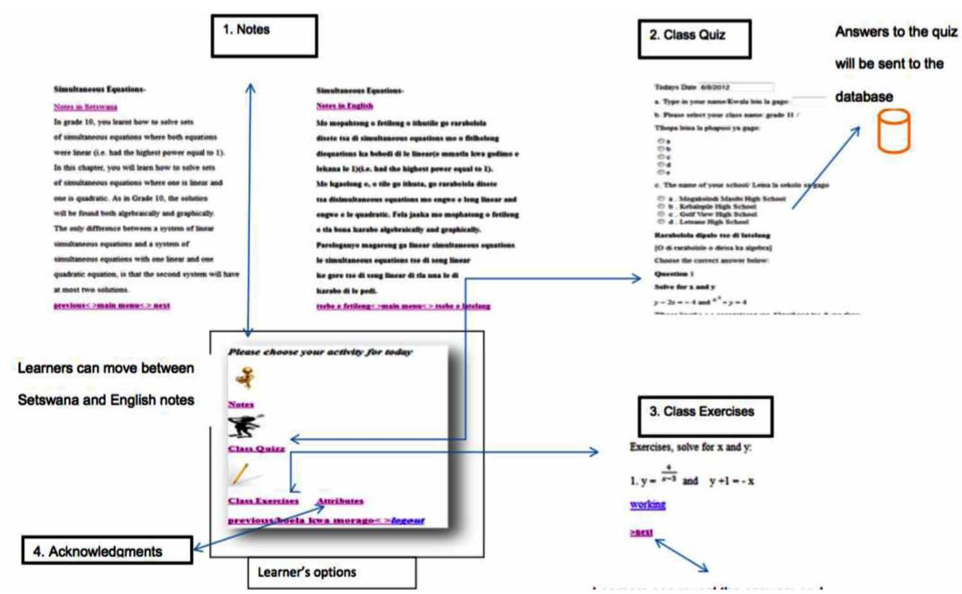
Theory	M-Thuto
Constructivism was used a theory which allows a teacher to enable learners to create their own knowledge.	Learning material encompasing class notes, access to online learning material and text book content created with the teacher allowing the learner access at any time to be able to learn. Class exercises with solutions allowing the learner to practice and reflect on their answers.
Behaviourism was used as a theory to help reinforce learning through incentives.	A class quiz section allows learners to reflect on their responses and gain marks based on their performance.

We engaged the teachers in informal discussions by explaining the concept of mobile learning and spent time with them showing them the different roles and benefits of technology use in education. We further evaluated with them the potential challenges that came with mobile devices in the learning process and how they could consider these. The teachers also discussed the linguistic challenges that learners faced and we discussed ways in which technology could overcome these. Upon completion of the M-Thuto development process the teachers gave feedback on the system which we further improved on. In each study, teachers were thus able to align their teaching and the technology to their teaching objectives as they were part of the design and development process.

The four elements of the Figure 1 are reflected in these diagrams.

1. The first section was a *notes* section which consisted of related notes formulated by a mathematics subject advisor from the department of education in North West province with inputs from teachers. Each page of notes was available in English and Setswana, since Setswana is one of the languages largely spoken in the area where this research was conducted;

Figure 1. The M-Thuto system



2. The second section was a *class quiz* which allowed learners an opportunity to test their understanding of the topic area. Their answers were sent to the database for teachers to keep track of;
3. The third section consisted of a *class exercise* questions page that allowed learners to attempt potential class exercise questions and potential exam questions and later view the correct answer to the questions. The presentations of the answers were extensive providing the learners with ways that they could have attempted the answer;
4. The fourth section was an *acknowledgement* section that acknowledged the parties that contributed to the development of the learning content including the translation of the content. (Jantjies, 2014: 103).

TESTING BEFORE THE CASE STUDY

We first piloted the system with children who volunteered to participate in the pilot study chosen from the participating schools aged between 16-18 years. The pilot study was however conducted with the participants who accessed the system using their own mobile phones. The pilot aimed to establish the usability perspective of the system and the users' interaction with the interface, whether the system was able to handle multiple users at a go, and the ability of the system to attain its objectives (i.e. providing content and multiple language views), while establishing if the data collection instruments were easy for learners to understand and evaluating the system usability. (Creswell and Clark, 2011).

STUDY 1 (JANTJIES AND JOY 2012)

Background and Methodology

In the first study, following the software development process engaging various teachers, we visited students in 4 classes in 4 schools, each aged between 16 and 19. The schools were all based in Mafikeng in the North West province of South Africa. The main language of communication in the province is Setswana with English being the official language of teaching and learning. Considering this, the content of the system was available in English and Setswana with learners being able to switch views of the content. The schools were all based in different geographic locations in the city, details are presented in Table 1. In this study we used questionnaires to collect the first set of findings. Following this we interviewed some of the participants to get further data from participants who had participated in the questionnaire study. 90 learners across all 4 schools filled in questionnaires and 5 learners in each school were further interviewed.

Study Findings

Technology Use of M-Thuto by Teachers

Most of the learning through technology in this study occurred during formal learning classes, with teachers weaving technology use into their different classroom activities. It was important to note that none of the participating teachers and learners had ever incorporated mobile larning in daily formal learning activities, and all learners were provided with mobile phones for the study. During the month of technology use in which the learners were using M-Thuto, each school focused on the *simultaneous equations* subject area. During the study teachers used the M-Thuto software in different ways. On some days, time was allocated during class for the learners to go through exercises on simultaneous equations. The exercises each had possible answers which the learner could view after attempting the exercises. On other days the learners went through a quiz on their own on the mobile phones. The teachers gave learners tasks to revise notes on simultaneous equations from their textbooks before coming to class. The teachers planned different ways of using the technology to achieve their objectives.

Accessible Learning Resources

At the end of the month of daily technology use in the mathematics class, participants filled out questionnaires with some being further interviewed on their perspectives of the technology use in their classroom and beyond the classroom context.

Participants were asked what type of learning resources they had access to and where they got access to these resources (textbooks, educational websites, online learning material. etc.). The learners coming from schools B, C and D relied on learning material which was provided to them by their teachers, and other free resources such as special edition newspaper sections which presented topic areas related to their learning content. Local newspapers often provided sections where they covered different learning areas related to the national school curriculum. Furthermore learners also relied on each other for material. Learner A reflected that, “if we find a good past mathematics paper, we photocopy it and circulate it amongst each other.” Students also had a senses of sharing resources. Students from these schools mainly came from under-resourced home environments, and thus learning resources mainly came from the teacher or school. When asked about online learning resources, most of the participants has no knowledge of existing online learning resources. Regardless of this, a total of 56% of participants from all schools reflected that their teachers would at times request them to use technology to do this homework, i.e. search the Internet or type up their homework. When asked about access to personal mobile phones, 48% of them had full ownership of a mobile phone while others had access to their parents or family members’ mobile phones, in comparison with only 22% of them having access to computers which were all only accessible on school grounds (in computer labs).

The Use of Language for Teaching and Learning

Language in South Africa is an important component in the teaching and learning process. Most of the learners are second, third or fourth language speakers of the language used in schools. In this section we thus posed questions related to the language of teaching and learning in the schools and beyond the classroom context. School A was based in an affluent part of the city where English was commonly spoken while the school was also known to be leading in teaching through English as a medium of instruction. Schools B, C and D were all based in the middle to lower income parts of the city and the use of language in the schools was largely influenced by the poor English background of learners. This was also evident in the interviews, where learners from school A were able to fully articulate themselves verbally and also while filling in the questionnaires, while learners from schools B, C and D would constantly switch between languages. No participant from any of the schools had English as a first language. Further to that learners in schools B to D often only started learning English in their first year of primary school.

When asked about code-switching (switching between languages) while talking in class to their teacher, 63% of them reflected their constant switching between English and Setswana to communicate. It was important to note that the switch was mainly in verbal learning as opposed to written content as the schools were all strict about language presentation across subject areas. It was interesting to note that the learners who did not code-switch mostly came from school A. The learners from school A, C and D reflected that their teachers also used both languages when teaching a particular subject area. It is also important to note that the teacher in school B was a foreign national and thus did not speak Setswana. Learners reflected that their books are only published in the English language.

Using M-Thuto

After establishing the background of participants and schools in relation to language and technology resources, the learners were asked about their interaction with M-Thuto over the previous month. The learners were initially asked which language they used for reading the content, which was available in both English and Setswana allowing the learners to switch at any point during their learning process. Of the 90 participants, 61% reflected that they used both languages throughout their learning process, while the remaining learners only used the English language. An important trend to notice was that the remaining students who only used the English language all came from school A. When asked about the need for similar applications which support multiple languages, 98% of them reflected that there is a need for more similar applications. Learners were also asked about the learning support perspective that the technology gave them. Many of the learners requested an extension of time on using the system as they found it beneficial in helping them access learning resources which they could previously only get as hard copy. Learners also reflected enjoying working on their own while being able to get answers in the class exercise section. We also asked the learners to mention the type of challenges they had come across while learning using M-Thuto, and slow Internet connection was identified by learners as the biggest problem.

Study Findings

The study presented above reflected the different challenges that schools still face, such as lack of access to computer labs, Internet, and knowledge of exiting open education resources. Many participants when asked about online resources which they could remember, could not reflect on any known resource even though they had knowledge of social media technology which was unrelated to the school curriculum. This shows the existing educational digital divide that children, especially in rural areas, still face regardless of the widespread use of mobile phones across sub- Saharan Africa, and the knowledge of the importance of additional learning resources known to schools and governments across the world (Legotlo et al., 2002). When looking at the potential of technology resources to support teaching and learning, mobile phones emerged to be the most accessible technology resource across all schools. This is consistent with similar studies that have reflected the common use and access to mobile phones by young South Africans (Vosloo & Botha, 2009). This gives schools and teachers an opportunity to use mobile related resources to effectively support the process of teaching and learning, especially considering tools being available online. It was also important to note that the lack of use of technology in schools could also be linked to the lack of technology skills of teachers. Technology skills have been reflected as one of the greatest challenges that teachers across the world face (UNESCO, 2012b) is a potential reference). Teachers are not supported with the necessary technology skills to teach a 21st century technology native learner, and thus end up not being able to use technology effectively to support teaching and learning.

Considering access to technology, learning content language use came up as an important aspect of the study. Subject areas such as mathematics and science are often poorly delivered in schools as a result of multiple aspects which also include the language of teaching and learning (Botes & Mji, 2010; Setati, 2008). The learners further reflected the importance of mobile technology that is able to provide them with resources that would otherwise be provided as textbooks or physical notes. The learners enjoyed the portability of the devices as they could also access them from home.

STUDY 2 (JANTJIES AND JOY, 2013, 2015)

Background and Methodology

We conducted our study in one school based in the Gauteng province, in which 32 children from a physical science class and one teacher participated. Similar to school C in study 1 the school is also based in a township which usually has middle to low income dwellers. In this study all learners were provided with smart phones. The learners were asked to create a mobile clip summarising each physical science lesson and upload it onto the M-Thuto system after the lesson. The learners were allowed to use any language of their choice. The study followed a constructivist approach where learners were expected to create their own knowledge by summarising their knowledge of the class and using online mobile resources. Participants then filled in questionnaires at the end of the study on their experiences with some participants having being interviewed in the process.

The study essentially evaluated the following:

- The role of the mobile device in supporting the construction of learning in science classrooms;
- The language use in the mobile learning process;
- The experiences of the learners o relation to bilingual mobile learning.

Study Findings

Mobile Technology Use to Support Teaching and Learning

Learners were expected to log into the M-Thuto system following their physical science lessons and thus most of the learning happened in informal learning spaces. In each lesson during the day, the teacher would teach a particular topic, following this the learners would be referred to readings online and be expected to conclude by constructing their understanding of that topic and what the teacher had taught them. The frequency in which they uploaded their clips was entirely up to them and the language of creating clips was also up to them. At the end of each week, the teacher went through the clips to listen to each learner’s content. This also gave them an opportunity to listen to topic areas which the learners had not clearly grasped.

In the data collection phase, 61% of learners reflected that they created clips weekly and used the clips to revise, with the remaining 39% creating clips daily. The learners were also asked on the mobile phone ease of use when requested to use learning materials online before creating clips related to the day's topic. The learners were also asked on the ease of use of creating voice clips. All learners reflected that creating clips was easy, however using additional resources from the mobile phone was not as easy. A total of 53% of learners preferred using physical textbooks as a source of knowledge, and other sources which they were familiar with, as well as using the mobile phone to search for learning material. 33% preferred only conventional learning material while 13% preferred only the mobile phone as their primary learning material source. Locating free and accessible learning resources was also cited as a challenge for the learners.

The Internet was cited as one of the biggest challenges when loading voice notes. Other challenges included the limited knowledge of resources from before the study. In the interview, learner 1 reflected that, "It is difficult to focus on learning on the phone and it's easier in a book because a phone has many distractions, especially if it has online access" (Jantjies, 2014; 138). This was contrary to learner 2 who reflected, "I found it easier to create material on my own phone and listen to myself while making sense of what I was saying. I think my personal notes are easier to understand than the ones in the book". In relation to the content created by learners there was a clear link between what the learners had been taught in class and their audio clip understanding and interpretation of the content they created. It was interesting to note how learners were able to critique their interpretation of the topic. An example of this is when Learner 2 reflected, "The theory of atomic molecules is defined by..... I think my explanation may be wrong and I would need you (the teacher) to explain it better because I was rather confused with it" (Jantjies, 2014).

Language and Learning

All participants were either second, third or fourth language speakers. When asked about the use of language by their teacher the learners expressed that the teacher would often switch between English and Sepedi (a South African official language similar to Setswana). The learners were then asked which languages they used to create the voice clips. All learners switched between English and a local language with 58% of the leaners using Sepedi and English while the rest used other South African languages including Setswana. It is important to note that the school was located in a largely Sepedi speaking area.

When going through the clips it was also interesting to note how relaxed the participants were. The learners would even go as far as asking the teacher questions during the clip recording session. The teacher further expressed that, "It was useful for me to access the audio notes of the learners. The learners are free when making them which helps me realise the challenges that they might not be able to raise during class." The class reflected a need for electronic learning resources tailored to support their resource and linguistic challenges.

Study Summary

This study reflected the important role that technology can play in creating novel teaching approaches while considering contextual issues such as language. Infrastructure challenges such as a good Internet connection also comes out in the study as a key problem with technology when learners try and upload their clips onto the system as well as searching for information. The high cost of data was also a problem as the learners would report the challenge of data finishing quicker than they thought when searching for information online. Learners were also not exposed to existing online open educational resources and thus reflected on the lack of learning resources online. This also reflected the learners' challenge of not being exposed to creating their own knowledge by also looking for learning sources. The learners were used to being given learning material from specific sources such as their teacher and from their set textbooks.

It was important to note that some learners found the device to be a distraction in their learning process. The learners were familiar with the role that technology can play in their learning process. The learners were also challenged by the thought of creating their own learning content. While some enjoyed the ability to construct their own knowledge, for other learners the technology posed both a challenge and a new learning experience.

In being able to construct their own learning content, it was also interesting to note that learners could not come to the same conclusion or data as they had used differing sources to curate their material (Boghossian, 2006).

DISCUSSION

1. **Mobile Learning and Infrastructure:** Mobile learning is a specialised research field and still growing in developing countries as a result of contextual challenges which many countries still face. In South Africa, there are policies and various initiatives in place to support e-learning and mobile learning in schools, however infrastructure, which includes slow and expensive Internet access and localised technologies, and content, often hinder the use of such technologies and applications in schools (Brown and Mbati, 2015);
2. **Mobile Learning and Pedagogy:** In many mobile learning studies, teachers and learners are often left out of the technology development phase and thus see technology as a "foreigner" in the classroom and in the teaching and learning process. In study 2, learners at times saw technology as a distraction rather than a useful tool. While many teachers and learners have access to technology platforms such as mobile phones and computers, they tend to find these resources irrelevant to the teaching and learning process. Mobile phones are often only seen as personal devices only used for social media access. Personalised and localised mobile learning technologies are essential in considering the adoption of technology across schools (Wang et al, 2015; Georgiev et al., 2015);
3. **Teachers Skills:** Teachers in many countries are still unable to see the use of technology as an enabler in the teaching and learning process. Teachers often see technology as an additional burden which they are forced to use by governments looking to embrace e-learning. It is also important to reflect on the lack of ability of many learning institutions internationally to facilitate the use of mobile device for trainee teachers. This affects their experiences and use of technology in their careers as it is seen as an extra skill which they need to gain often in their own time. There is also a lack of organised local support for teachers who try and adopt technology in their teaching process, with many teachers finding themselves isolated (Traxler and Vosloo, 2014; Kearney et al., 2015; Wang et al., 2015; Domingo et al., 2016);
4. **Language, Culture, and Context:** Language in pedagogy development and use of technology are often not considered in many schools. This has led to separation of technology and the study context. Where most of the world population speaks multiple languages, pedagogy development needs to consider that many learners use more than one language to acquire knowledge. It is also important to note that the culture of technology in supporting the teaching and learning process is still a foreign concept to many teachers across the world, this making it vital to consider language, culture and context in deploying mobile learning schools (Hwang et al., 2008; Liu, 2015, Georgiev et al., 2015).

SUMMARY

In this study we have presented two case studies that reflect the development and use of mobile learning in science and mathematics lessons. In both studies participants gave accounts of their views on the role of mobile learning in the high school learning space. Both studies reflected on the important role that teachers also play in the development of pedagogy to be used for mobile learning technologies. The study found that mobile phones are the most accessible technology in South African schools. This presents them as vital learning platforms which can be used to support teaching and learning in STEM related subject areas, reducing the resource gaps amongst schools spanning different income areas. Furthermore the study reflected that language and context of technology use become important role players in the use of technology to support teaching and learning. In both studies all participants were multilingual speakers who were not first language speakers of the language of teaching and learning, which prompted the mobile pedagogy to reflect this. Thus the M-Thuto software presented learners with dual views of the same content in English and Setswana to allow them to switch at any point while learning. In our future work we aim to conduct further studies on the design of mobile learning technologies considering the context of learning in developing countries.

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Chapter 27
Exploring the Role of Mobile Learning in Global Education

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ABSTRACT

This chapter describes the current trends of mobile devices in education, the applications of mobile technologies in learning, the overview of Mobile Learning (m-learning), and the importance of m-learning in global education. M-learning encourages both blended learning and collaborative learning, thus allowing the learners at different locations to get in touch with their peers or others teams to discuss and learn. The m-learning environment is about access to content, peers, experts, portfolio artifacts, credible sources, and previous thinking on relevant topics. Given the convenience of m-learning, there is less time spent getting trained, and the overall costs are lowered as a results. With m-learning, learners are able to learn in their own style at their own pace. M-learning provides easy access to the learning at any place and any time, which is more convenient to the learners.

INTRODUCTION

Mobile learning (m-learning) technologies present an educational innovation toward supporting the real-time learning scenarios through various mobile devices (Boticki, Baksa, Seow, & Looi, 2015). M-learning occurs if learners utilize mobile devices to obtain the learning materials and to support their learning activities at any place and any time (Reychav & Wu, 2015). M-learning can augment formal education and bridge the gap between formal and informal education by creating the extended learning communities using any digital technology in the modern learning environments (Nguyen, Wahman, Pissinou, Iyengar, & Makki, 2015). As mobile technologies emerge, teachers have to keep up with the technological changes so that they can take advantage of the power of modern technology to design and deliver the learning materials (Ally, Grimus, & Ebner, 2014).

In an era of digitally connected students, there is a demand for academic material to be delivered through electronic mobile devices and not just through traditional methods, such as lectures and tutorials (Stewart & Choudhury, 2015). Mobile technologies can be used to enhance the learners' learning moti-

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vation (Ciampa, 2014). The integration of mobile devices in the educational system presents enormous opportunities stretching from the improved efficiency to the accessibility of education to communities living in remote areas (Khan, Al-Shihi, Al-khanjari, & Sarrab, 2015). Mobile phones are the most accessible tool for both teachers and students (Kafyulilo, 2014).

This chapter focuses on the literature review through a thorough literature consolidation of m-learning. The extensive literature of m-learning provides a contribution to practitioners and researchers by indicating the advanced issues and applications of m-learning in order to maximize the impact of m-learning in educational settings.

BACKGROUND

Technologies have become synonymous with living and learning. Grant et al. (2015) indicated that mobile devices become ubiquitous in society, particularly with the current generations of student. With rapid advances in technology, mobile devices have become widely available and progressively affordable (Hung & Zhang, 2012). Kim et al. (2011) indicated that mobile devices are highly portable, easily distributable, substantially affordable, and have the potential to be pedagogically complementary resources in education. The capabilities of small mobile devices (e.g., mobile phones and tablets) have advanced, with an explosion in the number and types of devices that can access the World Wide Web, toward promoting m-learning (Nedungadi & Raman, 2012).

Mobile technology is increasingly widespread and offers the immense opportunities for learning (Terras & Ramsay, 2012). The integration of mobile technology into the online learning environments plays an important role in enhancing m-learning effectiveness (Huang, Jang, Machtmes, & Deggs, 2012). M-learning, with its features of pervasiveness and flexibility, enables users to learn in any appropriate place and at any appropriate time (Chang, Liang, Yan, & Tseng, 2013). M-learning is recognized as the natural evolution of electronic learning (e-learning) (Martin, Pastore, & Snider, 2012).

IMPORTANT ASPECTS OF MOBILE LEARNING IN GLOBAL EDUCATION

This section emphasizes the current trends of mobile devices in education, the applications of mobile technologies in learning, the overview of m-learning, and the importance of m-learning in global education.

Current Trends of Mobile Devices in Education

There is an increasing interest in the utilization of mobile devices in educational settings (Merchant, 2012). Mobile devices are the resource-limited systems that provide a large number of services and features (Oneto, Ghio, Ridella, & Anguita, 2015). Mobile devices are becoming more pervasive in the modern world for both personal utilization and educational purposes (Ducate & Lomicka, 2013). Mobile devices provide an educational connection to the digital world (Franklin & Peng, 2008). With the heterogeneous proliferation of mobile devices, the delivery of learning materials on such devices becomes subject to more and more requirements (Su, Tseng, Lin, & Chen, 2011).

Mobile devices become embedded in formal educational environments (Levene & Seabury, 2015). The interactive m-learning system built with the wireless personal digital assistant (PDA) devices can enhance individual practices and reinforce peer influences (Du, Hao, Kwok, & Wagner, 2010). Common types of contents are accessed through mobile devices, including videos and texts, such as portable document format (PDF), audio, or video files, or a combination of these file types evidenced in e-books and online articles (Reychav & Wu, 2015). Interactivity (Uzunboylu, Cavus, & Ercag, 2009), ease of use, and mobility are the major advantages of learning using mobile devices.

As mobile devices become increasingly more prevalent, it is imperative to study their application on the growing field of distance education (Fuegen, 2012). Liu et al. (2014) found nine comparative studies showing positive learning outcomes including greater achievement among students who utilized mobile devices compared to students who received traditional instruction and without mobile access.

Applications of Mobile Technologies in Learning

Mobile technologies have a huge potential to transform education provided these technologies are designed and implemented in such a way that they are relevant to the social and cultural context of learning (Keengwe & Bhargava, 2014). Regarding the advent of Web 2.0 and the Internet, social media enables the creation of knowledge value chain to customize information and delivery for a technological business growth (Kasemsap, 2014). The successful integration of mobile technologies in education primarily demands that teachers' and students' perceptions of such technologies should be recognized (Ozdamli & Uzunboylu, 2015).

Mobile technologies are recognized as the important tools to enhance learning (Rogers, Connelly, Hazlewood, & Tedesco, 2010). Mobile technologies are being utilized in a number of initiatives across the globe (Chen, 2013). Wireless technologies (e.g., laptop computers, palmtop computers, and mobile phones) are revolutionizing education and transforming the traditional classroom-based learning and teaching into education (Cavus & Ibrahim, 2009). The demands of an increasingly knowledge-based society and the dramatic advances in mobile technologies are combining to expedite the growth of m-learning (Wang & Shen, 2012).

Mobile technologies provide a substantive, fertile, and invigorating area for teaching and research in higher education (Evans & Johri, 2008). Khaddage et al. (2015) indicated that with the advent of mobile technologies and the proliferation of mobile applications at a rapid pace, and combined with a massive adoption of social networking platforms, mobile technologies are currently transforming people's daily lives. Different learning methods can be compared in several aspects, especially those related to learning outcomes (Furió, Juan, Seguí, & Vivó, 2015).

Semantic Web is the extension of the World Wide Web that catalogs information on a web page and reprocesses it so that other machines including computers can understand the information (Kasemsap, 2017a) and has the potential to revolutionize the way online learning services are discovered, adapted, and delivered to mobile users based on their context toward effective m-learning (Benlamri & Zhang, 2014).

Overview of Mobile Learning

Mobile learning (m-learning) can improve access to educational resources (Godfrey & Duke, 2015). Utilizing m-learning promotes teacher training and curriculum development in education (Acedo, 2014). The ability to provide m-learning in informal settings through mobile devices is a key challenge of the lifelong learning initiatives (Gu, Gu, & Laffey, 2011). Lifelong learning and knowledge management have become a fundamental goal of education policies, both at a national and international level (Kasemsap, 2016a). Students in general hold positive attitudes toward learning vocabulary via mobile phone (Lu, 2008). Adult learners' intention to use m-learning is influenced by their cognitive, affective, and social needs through attitude (Hashim, Tan, & Rashid, 2015).

M-learning contents should be developed based on specific users and their learning styles (Khan et al., 2015). The multicasting, transmission, and coverage of network affect the m-learning accessibility (Sarrab, 2014). Almeida et al. (2015) indicated that learning through mobile games is increasingly gaining acceptance as a valuable training tool within the education and training community due to its simplicity and cost effectiveness. Mobile phones effectively perform the informal learning activities related to the content of their educational courses outside the classroom (Santos & Ali, 2012).

Mobile phones in education can be used for text messaging (Keengwe, Schnellert, & Jonas, 2014). There is a strong relationship between culture and m-learning adoption behavior (Arpaci, 2015). While designing m-learning policies for a region, policymakers should have a clear understanding of the social and cultural norms and practical experience in the region (Khan et al., 2015). Cultural influences are dramatically changing, as cultures are no longer dependent on local resources to formulate their perspectives, preferences, and behaviors (Kasemsap, 2015).

Importance of Mobile Learning in Global Education

Teri et al. (2014) described that m-learning, as the advanced information technology (IT), is a relevant innovation in teaching and learning in higher education. The success of m-learning largely depends on the ability of teachers to maximize the educational advantages of mobile devices (West & Vosloo, 2013). M-learning provides opportunity for change, thus focusing on learning based on collaborative instruction, skill developments, higher-order thinking, and learning for life (Alvarez, Alarcon, & Nussbaum, 2011). The favorable results of m-learning can be obtained through mutual understanding, cooperation between stakeholders, and involvement of private companies in the education sector (Khan et al., 2015).

Mobile users have different judgments about the quality of service (QoS) depending on their environmental conditions, and personal and psychological characteristics (Ghahfarokhi & Movahhedinia, 2013). The usefulness and ease of use perceived by learners effectively increase satisfaction in m-learning, and usefulness and satisfaction in learning positively create the mobile device-related intention to use (Joo, Lee, & Ham, 2014). Acceptance of m-learning by individuals is critical to the successful implementation of m-learning systems (Wang, Wu, & Wang, 2009). Performance expectancy, effort expectancy, social influence, perceived playfulness, and self-management of learning are all significant determinants of behavioral intention to utilize m-learning (Wang et al., 2009).

Cober et al. (2015) explained that as teachers have unique and valuable perspectives on the role of technology in education, it is of importance to engage them in a participatory design process with technology-enhanced learning environments. Mobile technologies can be applied in teacher development (Royle, Stager, & Traxler, 2014). Professional development is essential to help teachers realize the potential of m-learning (Ally et al., 2014). The design, implementation, and outcomes of professional development programs effectively help teachers incorporate mobile devices in teaching and learning (Ekanayake & Wishart, 2015).

FUTURE RESEARCH DIRECTIONS

The classification of the extensive literature in the domains of m-learning will provide the potential opportunities for future research. M-learning is the important educational platform to be engaged in training. E-learning allows students to choose content and tools appropriate to their differing interests, needs, and skill levels (Kasemsap, 2016b). Web-based learning encourages students to learn at their own pace, access the information at a time that is convenient for them, and provides education to the remote students (Kasemsap, 2016c). Learning analytics can gather data, analyze data, generate reports, and enable interventions in the modern educational world (Kasemsap, 2016d).

Students can develop the sense of being a learner and the understanding of being an expert through the use of educational computer games, educational video games, and serious games (Kasemsap, 2017b). Virtual team members often collaborate across institutional boundaries (Schiller, Mennecke, Nah, & Luse, 2014). Leaders of virtual support teams may need to assume a coordinating role to ensure effective collaboration and communication among virtual team members toward improving organizational performance (Kasemsap, 2016e). The relationships among m-learning, e-learning, web-based learning, learning analytics, educational computer games, educational video games, serious games, and virtual teams in educational settings should be further studied.

CONCLUSION

This chapter highlighted the current trends of mobile devices in education, the applications of mobile technologies in learning, the overview of m-learning, and the importance of m-learning in global education. Widely recognized as the one of the most important features of mobile technology, the convenience of mobile devices gives users anytime-anywhere access to information and applications. Mobile technologies provide real-time and all-around access to the information. As technology keeps changing at a rapid rate, mobile devices should be frequently upgraded in order to gain the favorable m-learning results. M-learning encourages both blended learning and collaborative learning, thus allowing the learners at different locations to get in touch with their peers or others teams to discuss and learn.

The m-learning environment is about access to content, peers, experts, portfolio artifacts, credible sources, and previous thinking on relevant topics. Given the convenience of m-learning, there is less time spent getting trained, and the overall costs are lowered as a results. With m-learning, learners are able to learn in their own style at their own pace. M-learning provides easy access to the learning at any place and any time, which is more convenient to the learners. However, there may be some connectivity problems while uploading and downloading of data and because of poor mobile network signals. Utilizing m-learning has the potential to improve educational performance and reach educational goals in global education.

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KEY TERMS AND DEFINITIONS

Education: The field of study that is concerned with the pedagogy of teaching and learning.

Electronic Learning: The course that is specifically delivered through the Internet to somewhere other than the traditional classroom where the professor is teaching.

Information Technology: The technology involving the development, maintenance, and utilization of computer systems, software, and networks for the processing and distribution of data.

Internet: The single worldwide computer network that interconnects other computer networks.

Learning: The activity or process of gaining knowledge or skill by studying, practicing, being taught, or experiencing something.

Mobile Learning: The type of learning that takes place through a portable electronic device.

Social Media: The sharing of information and communication between people on the Internet or using mobile devices.

Technology: The application of science, especially to the industrial or commercial objectives.

Chapter 28
Using the Flipped Classroom to Improve Knowledge Creation of Master's-Level Students in Engineering

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ABSTRACT

Student engagement in traditional teacher centered model of teaching is limited to independent working or working in a small group on a task designed by the teacher. Flipped classroom is a blended learning strategy that reverses the traditional educational arrangement by delivering instructional content, often online, outside of the classroom and moves activities, including those that may have traditionally been considered homework, into the classroom. Various studies support and recommend flipped model of teaching at graduate and undergraduate level but very less have analyzed the impact of flipped classroom on academic performance and especially knowledge creation at post graduate level. In this paper we are analyzing the performance and knowledge creation of master's level students using Data Mining Techniques in a flipped classroom model.

INTRODUCTION

Student engagement in traditional teacher centered model of teaching is limited to independent working or working in a small group on a task designed by the teacher. Flipped classroom is a blended learning strategy that reverses the traditional educational arrangement by delivering instructional content, often online, outside of the classroom and moves activities, including those that may have traditionally been considered homework, into the classroom. Various studies support and recommend flipped model of teaching at graduate and undergraduate level but very less have analyzed the impact of flipped classroom on academic performance and especially knowledge creation at post graduate level. In this paper author is analyzing the performance and knowledge creation of master's level students using statistical data mining and opinion mining techniques in a flipped classroom model.

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BACKGROUND

Numerous studies have been conducted on various facets of Flipped Classrooms focusing on the increased levels of active learning, student's participation and collaboration among the students in the flipped class and effect on coping with absence from the class. None of the studies has compared the level of knowledge creation in flipped classroom. This study uses educational data mining methods and quasi experimental methods to compare the academic performance of the students at master's level and secondly the comparison of knowledge creation in flipped classroom with normal teaching setting.

Flipped Classroom

The idea of reverse classroom or Flipped teaching was conceived by pair of high school teachers, Jon Bergmann and Aaron Sams from Colorado in 1990's. They began recording their lectures for students who have missed their classes. The strategy was first employed to facilitate the students who missed their lecture but later it turned into the concept of authentic learning model (Maureen et. al., 2000).

In 1993, Allison King coined the phrase "From sage on the stage" to "Guide on the side" in her article discussing flipped instruction. In this article king focused on the importance of the use of class time for the construction of meaning rather than information transmission. King directly does not illustrate the concept of flipping the classroom but his work is often cited as an impetus for an inversion to allow for the educational space for active learning (King, 1993).

Perhaps most recognizable contributor to flipped classroom is Salman Khan, graduate from MIT and MBA from Harvard. He took a job as a financial analyst. In 2004, Khan began recording videos at the request of a younger cousin he was tutoring because she felt that recorded lessons would let her skip segments she had mastered and replay parts that were troubling her (Sarah, 2011). Salman Khan founded Khan Academy based on this model. For some, Khan Academy has become synonymous with the flipped classroom; however, these videos are only one form of the flipped classroom strategy (Thompson, 2011).

Talley and Scherer (2013) studied the effect of flipped classroom instruction in a Physiological Psychology course with psychology students. Comparing student's performance between the flipped classroom semester and the previous year's performance, along with learning techniques, self-explanation and practice testing increased the final course grade over previous semesters. Also, researchers found a significantly higher performance level for students taking the flipped classroom. The researchers also reported an overall positive attitude of students (Talley & Scherer, 2013).

Students' achievement and attitude were also examined in a flipped college-level information systems spreadsheet course. The study provided convincing evidence of the effectiveness of the flipped approach over both the regular and simulation-based. Authors used pretest posttest quasi-experimental mixed methods design to determine differences in student achievement associated with the instructional approach being used. In addition, the scalability of each approach was evaluated along with students' perceptions of these approaches to determine the affect each intervention might have on a student's motivation to learn. The conclusion of the study stated that a technology enhanced flipped classroom was more effective and scalable in facilitating learning in comparison to traditional learning classrooms and simulation based training classrooms. Students were more motivated since flipped model allowed greater differentiation of instruction (Davies et. al. 2013).

Harvard University and MIT announced the launch of edX, an open online learning platform in spring 2012. edX allowed anyone with internet connection to register and complete the online courses. A quasi experimental design was adopted by Yiran Zhao and Andrew Ho (2014) that supports interpretations about the causal impact of the flipped classroom on student learning from two administrations of the undergraduate Chinese history course. The main findings of the study state that there were fewer enrollments for the flipped course and was no compelling evidence of any significant impact of the flipped classroom on the midterm examination scores. Students also registered increased class engagement and collaboration (Zhao & Ho, 2014).

Gerald Robert Overmyer (2014) studied the effect of flipped classroom model for college algebra on students' achievement. The study was based on the statistical analysis and the treatment group and control group showed that there was no statistically significant difference in scores between traditional teaching model and flipped model of teaching but if the enquiry based experienced teachers are involved in the flipped model of teaching having prior experience of flipped model then there is a statistical improvement in performance of the students hence flipped model was advised with recommendation for teachers to have prior experience of flipped model of learning (Overmyer, 2014).

Data Mining in Education

Educational Data Mining is an emerging discipline, concerned with developing methods for exploring the unique types of data that come from educational settings, and using those methods to better understand students, and the settings in which they learn. In Educational data mining (EDM) multiple analytical techniques are used to understand relationships, structure, patterns, and causal pathways within complex datasets from educational settings (Baker et al. 2010). EDM is used to highlight the combination of learning sciences theories with data mining techniques for improving the design learning systems and to develop a better understanding about how people learn within them.

Educational data mining is emerging as a research area which is a collection of computational and psychological methods and research approaches for understanding students learning behavior. New computer-supported interactive learning methods and tools—intelligent tutoring systems, simulations, games—have opened up opportunities to collect and analyze student data, to discover patterns and trends in those data, and to make new discoveries and test hypotheses about how students learn. Data collected from online learning systems can be aggregated over large numbers of students and can contain many variables that data mining algorithms can explore for model building.

The work of Baker and Yacef in 2009 can be coined as the early efforts at educational data mining involving mining website log data (Baker & Yacef, 2009), but now more integrated, instrumented, and sophisticated online learning systems provide more kinds of data.

Hierarchy in the data is a unique feature in educational data. The data collected in context of educational data mining can always be arranged in hierarchical structure e.g. Data at the keystroke level, the answer level, the session level, the student level, the classroom level, the teacher level, and the school level are nested inside one another therefore method for hierarchical data mining is important development in educational data mining (Romero & Ventura, 2010).

In 2012, Siemens and Baker work on reducing learning into small components that can be analyzed and then influenced by software that adapts to the student (Siemens & Baker, 2012). Online learning systems also provide student learning data that is being explored to develop predictive models by applying data mining methods for classification and relationship mining. These models act as pivot for building adaptive learning systems in which adaptations or interventions are suggested on the basis of the model based predictions to support their learning.

The concept of longitudinal data modeling well suited on educational data as some other important features of educational data are time, sequence, and context. The concept of time, length and sequence are important to in terms of time to capture the data, length of practice sessions or time to learn and sequence of concept building on the basis of one another and how practice and tutoring should be ordered. Context refers in terms of explaining results and knowing where a model may or may not work (Baker et. al., 2011).

According to the literature studied the four goals of EDM can be classified as following:

1. Predicting students' future learning behavior by creating student models that incorporate such detailed information as students' knowledge, motivation, meta cognition, and attitudes;
2. Discovering or improving domain models that characterize the content to be learned and optimal instructional sequences;
3. Studying the effects of different kinds of pedagogical support that can be provided by learning software; and
4. Advancing scientific knowledge about learning and learners through building computational models that incorporate models of the student, the domain, and the software's pedagogy.

To accomplish these four goals, educational data mining research uses the five categories of technical methods. Baker et al. (2010) classify EDM methods into five categories: prediction, clustering, relationship mining, discovery with models, and distillation of data for human judgment. The brief description of the five methods is as follows:

1. Prediction involves in developing a model that can infer a single aspect of the data or predicted variable from some combination of other aspects of the data or predictor variables;
2. Clustering refers to finding data points that naturally group together and can be used to split a full dataset into categories;
3. Relationship mining is done to uncover hidden relationships between variables in a dataset and writing them as rules for later use. It can be further divided into two categories namely Association rule mining and Sequential pattern mining;
4. Distillation for human judgment is a technique that involves representation of the data in a way that enables machine learning methods to quickly identify or classify features of the data;
5. Discovery with models is a technique that involves using a validated model of a phenomenon (developed through prediction, clustering, or manual knowledge engineering) as a component in further analysis.

Using these techniques, educational data mining researchers can build models to answer such questions as:

- What sequence of topics is most effective for a specific student?
- What student actions are associated with more learning (e.g., higher course grades)?
- What student actions indicate satisfaction, engagement, learning progress, etc.?
- What features of an online learning environment lead to better learning?
- What will predict student success?

STUDENT PERFORMANCE AND KNOWLEDGE CREATION IN FLIPPED MODE CLASSROOM

This article investigates the Master's Level Students Performance and Knowledge creation in Flip Mode Classroom. The techniques used in the article are both quasi-experimental mix statistical method and data mining method. Use of opinion mining in terms of academic process is first of its kind.

Research Setting

This study involves students admitted for 3 years Master's Program in Engineering under the fellowship scheme of Chitkara University, Punjab. The students are admitted under the fellowship scheme of the University to pursue their Masters and also act as teaching assistant. The students are assigned to their respective mentors in the very beginning of Master's Program. The responsibility of the student is to assist the respective mentor in academic environment and have the responsibility of teaching the subject to the undergrad students in guidance of the respective mentors. This setting allows the student to work on the Masters dissertation throughout the program. The subjects that have to be studied as course curriculum are taught using flipped mode and students are assigned the courses & contents from various sources where they learn in flipped mode apart from teaching. Also the students are free to contact the respective subject mentors when required to discuss the problems they are facing with the online contents or any other course material. Students also discuss and share with the faculty mentors their bi-monthly report regarding the subject learned in flipped mode. The students are advised to learn independently and share their learning within a closed group of students learning the same subjects. The role of faculty mentor is more of a facilitator that provides the required input from time to time whenever students are stuck and face some problem during the course duration. The faculty mentors have more time to develop course related contents and assignment that add value to the course and students' knowledge creation which was not possible during the traditional model of teaching. The target students under this study are from Master in Engineering, Computer Science & Engineering batch 2011-14, 2012-15. Batch 2011-14 witnessed the conventional teaching paradigm whereas Batch 2012-15 witnessed partial flipped modes as some subjects were taught using flipped mode learning as shown in Table 1.

The students in both the models have studied same subjects. The list of the subjects is as shown in Table 2.

The courses from level 1 to 4 are taught in initial 2 years. Each level is of 6 months' duration. The courses taught in first two levels are same for every student whereas at level three students opt for the course which serves as the basic foundation of their research domain. At level 4 there are large variety of courses where students opt for the advanced level of courses in their research domain to narrow down on their area of the research/dissertation. Level 5 is of one-year duration where student explores his/her domain area and selects a problem/topic that is to be carried further for presenting a thesis. The flipped model of teaching is applied on the selected subjects during foundation courses and on all the subjects during core courses and concentration courses. During concentration courses students are advised to learn from multiple varied sources so that they open up for a larger limitless online domain of the subject of their interest.

Table 1. Teaching model adopted in the session 2011-14 & 2012-15

Session → / Mode ↓	2011-14	2012-15
Teaching Mode	Conventional	Flipped

Table 2. Core master courses

Level	Course
1	Foundation Courses
2	Core Courses
3	Concentration Courses
4	Elective courses designed to support concentration courses
5	Dissertation

PROPOSED WORK

This paper had two primary goals. First, the paper is intended to compare the academic performance of the students at master's level and secondly the comparison of knowledge creation in flipped classroom with normal teaching setting. The comparison of academic performance and knowledge creation was based on academic data and practical knowledge. Also the comments from evaluation panel during dissertation and thesis defense were incorporated in comparing the levels of knowledge creation. The comments are given on the basis of novelty and research input of the topic selected hence clearly witness the level of knowledge creation. The survey was conducted on both the groups of teachers and students involved in Traditional teaching method and flipped model of teaching. Data mining techniques were applied on the survey results to find out major influencing factors that enhance the teaching-learning process in flipped mode in comparison to the traditional teaching model.

The survey questionnaire was prepared on the basis of following points:

1. Improve students' critical thinking/creative problem solving/higher-order Thinking/professional skills;
2. Increase student participation, engagement, and motivation;
3. Improve students' team-based skills and peer-to-peer interaction;
4. Customize/differentiate learning;
5. Make students the center of learning/encourage student ownership of learning;
6. Better faculty to student interaction;
7. Increase faculty freedom/Student freedom;
8. Improve learning outcomes;
9. Dealing with leaves/absences;
10. Encourage faculty collaboration;
11. Compensate for limited classroom space.

The online survey was conducted based on a questionnaire consisting of 22 questions for students and faculty members engaged in Teaching/learning using flipped mode classrooms.

The questionnaire was prepared in two different formats. First questionnaire was for the teachers involved in flipped model and the second questionnaire was for the students.

Both the questionnaires consist of the questions dealing with the same aspect but highlighting the viewpoint in terms of teacher or student. i.e. a question in student's questionnaire was asked that "Did you feel that your role changed from passive to active learner in flipped model of teaching" whereas in teacher questionnaire it was asked as "Comment on flipped learning model changing the role of student in class from passive to active learner".

DISCUSSION

On the Basis of the Survey

The output of the study reveals that when the concern is students' engagement in the class, we found that students are more engaged, more involved in the flipped classroom in comparison to the conventional delivery approach. More than 80% of the students surveyed who witnessed flipped mode of learning voted 'YES' in the column "Increase student participation, engagement, and motivation" compared to 65% in the traditional classroom environment.

One of the interview questions asked the faculty to describe their role in the flipped classroom. Interestingly, all of the faculty interview participants described their role as a facilitator rather than an instructor since it increased the level of the questions asked by the students as they come to class to clear their doubts that arise during the video lectures and the responsibility of the teacher in the class changed from "sage on the stage" to Guide on the side".

When asked from the students to describe their role in the class some of their descriptions included: actively helping, actively learning, actively listening, actively participating, and actively working. Moreover, the student participants openly acknowledged their passive interactions during class lectures and limited communication between their teacher and other peers prior to the flipped classroom intervention. During the flipped model of instruction, however, the students witnessed an increase in their classroom participation and communication. Thus, the flipped model of instruction had a positive impact on student engagement.

Also, the question dealing with leaves/absences was answered "YES" from all the participants of the questionnaire i.e. students and faculty. Therefore, flipped mode can be advised in the scenario where numbers of meeting hours are not available for covering the full syllabus and the available time can be utilized in solving the queries and problems from the students rather than conventional mode of instructional teaching.

The question related to improved learning outcome was answered "sure" by 44% of the students, "Not sure" by 30% and "no improvement" by rest 26%. So we can easily see that in spite of majority of students support flipped mode in terms of increased participation, engagement and motivation they are not supporting flipped mode in terms of improved learning outcome. Table 3 shows the result of categories and subcategories resulting from the data analysis of the survey results.

On the Basis of the Students' Academic Performance

The academic performance in terms of the marks scored in end term examination demonstrated near about similar performance abilities between the traditional and flipped classrooms. Specifically, the

Table 3. Result of categories and subcategories resulting from the data analysis of the survey results

Categories	Sub Categories	Results
Academic Performance Expectancy(APE)	Study Efficiency	Same in both the models
	Motivation	Better in flipped model
	Open source Multiple Learning Resources	Not available in Traditional model but huge availability in flipped model
	Socialization	More in flipped model
Knowledge Creation	Collaboration	More in flipped model
	Integration and skill development	Improves in flipped model
	Implementation in Dissertation	Better implementation in flipped model

mean (average) for the traditional classroom was 83.26 out of a possible 100; the mean for the flipped model of instruction classroom was 80.36 out of a possible 100. An independent-samples t-test analysis confirmed the conclusion that no significant difference in performance existed between those students who were taught traditionally and those in the flipped model of instruction classroom.

A two-tail test (inequality) using SPSS was performed and it was observed that t Stat > -t Critical two-tail or t Stat < t Critical two-tail i.e. -2.022 < 1.938 < 2.022 as shown in Table 4. Therefore, does not reject the null hypothesis. The observed difference between the sample means (83.26, 80.37) is not convincing enough to say that the average number of marks between traditional and flipped model of learning differ significantly.

Not only was a new approach to learning introduced to the students, but extremely challenging content was also presented to them. While the students noted their preference for the flipped model of instruction, they felt the instructional approach should have introduced to them during easier content in order to lessen the demands and challenges of having to learn both a new approach and extremely difficult content. Unquestionably, the impact of the flipped model of instruction on student performance demonstrated similar results when compared to the traditional approach.

Comparing student interactions in the flipped model of instruction to the traditional environment revealed significant information. The students were more actively involved in the flipped classroom than the traditional environment. The environment was more of a student-centered environment within the flipped classroom. The students worked collaboratively among the various groups as they learned from each other by discussing problems, explaining procedures, and confirming answers. The teacher functioned as a facilitator, only guiding and directing when needed.

Interestingly, the student participants responded favorably to the flipped model of instruction; however, their academic performance did not show any significant changes when compared to students taught under the traditional approach. While the flipped model of instruction offered a sound way to modifying classroom instruction, this study did not reveal any significant changes among the students'

Table 4. T-test: Two-sample assuming unequal variances

	Variable 1 (Batch 2011-14)	Variable 2 (Batch 2012-15)
Mean	83.26315789	80.36363636
Variance	18.87134503	27.38528139
Observations	19	22
Hypothesized Mean Difference	0	
Df	39	
t Stat	1.93818362	
P(T<=t) one-tail	0.029932062	
t Critical one-tail	1.684875122	
P(T<=t) two-tail	0.059864124	
t Critical two-tail	2.022690901	

academic performance when compared to students within the traditional classroom. Thus, depending on the content, the traditional approach may be the most efficient method of instruction; yet, the flipped model of instruction may be the best approach for other content.

Opinion Mining from the Expert Reviews on Student Dissertation

The opinion mining task is to collect all the reviews from the different sources and then fed in a system that uses data mining techniques to classify the reviews as positive or negative (Archak. N., et. al. 2007). Opinion mining is also known as sentiment mining and is a part of text mining. The reviews are classified on the basis of rules defined and the summary sheet is prepared that highlights the positive or negative reviews of a particular feature of the product (Andreevskaia & Bergler, 2006). In this article review mining is applied on the comments/reviews given by the experts after the students had presented their Master in Engineering Dissertation with the help of power point presentation in front of the panel. The reviews or comments of the evaluation panel were recorded and manually fed to the database system. Irrespective of the name of the student two separate datasets of comments were stored for flipped model and conventional teaching.

Review mining was applied on both the data sets on the basis of following features listed below:

1. Application of the concept
2. Novelty/Innovation in topic
3. Communication
4. Presentation
5. Confidence

For each feature we identify review opinion sentences and decide whether they are positive or negative. A summary sheet for all the features in both teaching models was produced and we concluded that the positive reviews in flipped mode classroom were more than the traditional teaching model hence clearly witnessing the increase in the knowledge creation level of the students in flipped classroom in comparison to the traditional classrooms. The output of the summary sheet in form of a graph is as shown in Figure 1.

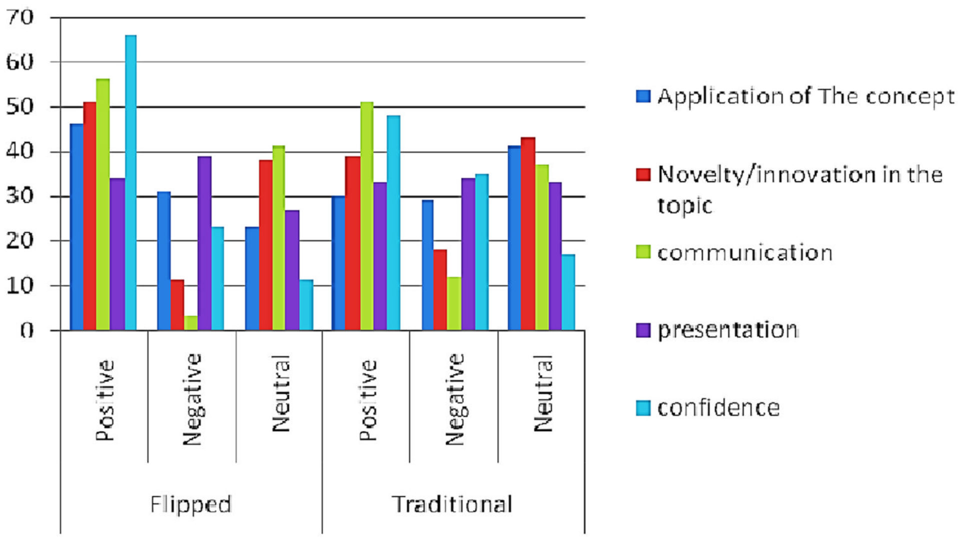
The knowledge creation level was judged on the basis of application of the concept and Novelty/Innovation in topic.

LIMITATIONS AND FUTURE SCOPE

Firstly, relatively small number of respondents exhibited some limitations as it can reduce the representativeness of the sample, which makes it difficult to generalize the results to a larger population. This study can thus only be regarded as a case study. For another, Discussions among two groups of participants, as well as the interaction among same group of participants, can encumber the independence of participants' answers.

Secondly, the selection of participants was restricted to Master's students. This limitation reduced the representativeness of this study further. In the future, this researcher can be expanded to the sample of a

Figure 1. Feature comparison of traditional vs. flipped model of teaching on the basis of summary sheet



wider range, including undergrad Students at lower knowledge creation ability levels than participants in this study.

Thirdly, as the participants were all Master Level students involved in teaching undergrad students and Faculty involved in teaching Master's. They all are matured volunteers, their personality, to some extent, was more inclined to be active rather than passive compared to normal students who are not into the role of teaching. In this way, the results of this study lack the ability to explain the knowledge creation of the students who are less active or passive in personality.

CONCLUSION

The applicability of flipped learning on every subject/ topic needs to be determined on the basis of experience. Every class may not be suitable for flipped learning. The implementation of the flipped learning depends on number of factors where the most influencing factors that are determined are quality of online lectures available related to the topic, and preparedness of the teacher for the session.

Flipped model of teaching does not provide improvement in academic performance but other parameters in teaching learning process get affected in flipped mode such as student's engagement, collaboration and knowledge enhancement. Also, the model approach in classroom shows positive effect on knowledge creation of the students in terms of the selection of topic for dissertation and implementation of the dissertation topic which can be directly related to the practical knowledge of the students.

The survey findings clearly indicated improvement in student engagement level and students' involvement during the class. Majority of students displayed active learning behavior in the flipped model of teaching which was passive otherwise. The students in the flipped model of teaching experienced quality instruction that was student centered and student focused which was not in traditional model where teaching was teacher oriented. The flipped classroom allowed for improved use of class time utilizing various instructional strategies, including hands-on activities and project-based learning structures. While research on the effectiveness of the flipped model of instruction is limited, this research study provided additional, valuable information regarding the model's impact on student engagement and performance and knowledge creation. Even though the flipped model of instruction is a relatively new instructional approach, it certainly has the potential to be deemed effective in terms of improving student engagement and performance at Masters level classroom. This flipped model of teaching was successful at Masters Level and demonstrated convincing results and in future this model will be applied to larger group of participants at graduate level with increased representativeness.

Regardless of the limitations, however, this research has brought to the surface important findings that help to move the field forward. Surely, further research will help solidify and emphasize these findings.

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KEY TERMS AND DEFINITIONS

Chitkara University: Chitkara University is a leading non-profit private university in India with its campus in Punjab and Himachal Pradesh, India. Chitkara University is a UGC recognized university with the right to confer degrees as per the sections 2(f) and 22(1) of the UGC Act, 1956. The university offers full courses in undergraduate and postgraduate degree programs in the fields of Engineering, Information Technology, Management, Hospitality, Hotel Administration Architecture, Pharmacy, Mass Communication & Journalism, Architecture, Pharmacy, and Teacher Training.

Data Mining: Data Mining refers to extracting or mining knowledge from large amounts of data. Data mining is a multidisciplinary field, drawing work from areas including database technology, artificial intelligence, machine learning, neural networks, statistics, pattern recognition, knowledge based systems, knowledge acquisition, information retrieval, high performance computing, and data visualization. Data mining is used to uncover hidden patterns in the underlying data which can be used for decision making process.

Educational Data Mining: Educational Data Mining is an emerging discipline, concerned with developing methods for exploring the unique types of data that come from educational settings, and using those methods to better understand students, and the settings which they learn in. Whether educational data is taken from students' use of interactive learning environments, computer-supported collaborative learning, or administrative data from schools and universities, it often has multiple levels of meaningful hierarchy, which often need to be determined by properties in the data itself, rather than in advance. Issues of time, sequence, and context also play important roles in the study of educational data.

Flipped Learning: Flipped Learning is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter. The role of the teacher in the class changes from "Sage on the stage" to Guide on the side". In flipped learning strategy the traditional educational arrangement is reversed in terms of delivery of instructional content, often online, outside of the classroom and moves activities, including those that may have traditionally been considered homework, into the classroom.

Knowledge Creation: Knowledge creation is transfer combination or conversion of different types of knowledge as users practice, interact, and learn. Knowledge creation is a product of the interplay between knowing and knowledge. Knowledge creation can only be achieved after thorough understanding of underlying concepts and application of those concepts to contribute towards a larger knowledge pool in terms of understanding, creating or converting through practice action and interaction with increased input of creativity and innovation.

Opinion Mining: Opinion mining also known as Sentiment analysis refers to the use of natural language processing, text analysis and computational linguistics to identify and extract subjective information in source materials. Sentiment analysis is widely applied to reviews and social media for a variety of applications, ranging from marketing to customer service. The aim of sentiment analysis is to determine the attitude of a speaker or a writer with respect to some topic or the overall contextual polarity of a document. The attitude may be his or her judgment or evaluation, affective state i.e. the emotional state of the author when writing, or the intended emotional communication i.e. the emotional effect the author wishes to have on the reader.

T-Test: A t-test is any statistical hypothesis test in which the test statistic follows a Student's t-distribution if the null hypothesis is supported. It can be used to determine if two sets of data are significantly different from each other, and is most commonly applied when the test statistic would follow a normal distribution if the value of a scaling term in the test statistic were known. When the scaling term is unknown and is replaced by an estimate based on the data, the test statistic (under certain conditions) follows a Student's t distribution. The t-test assesses whether the means of two groups are *statistically* different from each other. This analysis is appropriate whenever you want to compare the means of two groups, and especially appropriate as the analysis for the posttest-only two-group randomized experimental design.

Chapter 29
The Role of Computational Thinking in the Preparation of Pre-Service Teachers

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ABSTRACT

This chapter focuses on the ways computational thinking can be integrated into the curricula of educational institutions. Readers will gain knowledge of computational thinking as it is used in instructional technology, explore computational thinking in various academic fields, become familiar with computer-based, tablet-based and mobile device resources which support computational thinking, and be exposed to a variety of processes and interventions involved in the management of instructional technology.

INTRODUCTION

Thinking, playing, and learning are the occupational activities for young learners to apply in their daily lives – in school as well as outside the classroom. However, thinking, playing, and learning do not often happen in the traditional classroom (Barr & Stephenson, 2011; Papert, 2005). Programming languages make it possible for young learners to play while thinking and learning and they learn without even realizing they are learning. Learning a programming language has been shown to be one potential solution to assist students develop these skills however many pre-service teachers are not taught how to teach programming (Basawapatna, Koh, Repenning, Webb, & Marshall, 2011; Newby, & Ertmer, 2010; Ottenbreit-Leftwich, Glazewski).

Programming languages allow learners to create projects such as games, animated stories, online news shows, book reports, greeting cards, music videos, science projects, tutorials, simulations, and sensor-driven art and music projects (Maloney, Resnick, Rusk, Silverman, & Eastmond, 2010). Almost all devices are we use on a daily basis are run by programming languages. Programming languages are

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used not just for personally owned computers but also for video game systems, cell phones, and GPS devices, as well as many devices we use every day such as TVs, DVD players, ovens, and refrigerators. Additionally, programing languages are used for many essential devices outside of our home.

IMPORTANCE OF EDUCATIONAL PROGRAMMING LANGUAGE

Learning a programming language provides young learners opportunities to create while expressing their thoughts, beliefs, and feelings in digital environments (Resnick et al., 2009; Wing, 2006; Wing, 2008b). With the knowledge, skills and hands-on activities of programming languages, young learners have a freedom in creating. With work and practice, young learners build proficiency in their questioning skills and create projects with their self-expression. In the process of experimenting, learners put their ideas into action and learn from their mistakes. For example, learners are able to create individualized projects because possibilities are endless, they can create exciting things they want to program.

Much like "telling a computer what to do", young learners can help other students learn procedures by giving peer commands (Wing, 2006). With this knowledge, students use computational thinking skills via concepts (sequence, loops, etc.) practices (testing, debugging, remixing, etc.), and perspectives to help them in real life. They increase their computational thinking skills via animations, simulations, dynamic and interactive content presentations, interactive stories, and games. There is clear evidence to suggest that students learn best when they engage in design-based learning activities that focus on the design and consequential use of external representations for modeling and reasoning (Blikstein and Wilensky, 2009; Kolodner et al., 2003; Papert, 1991).

WHY PRE-SERVICE TEACHERS

Currently, there are not enough teachers available to adequately teach programming languages to students (Stephenson, 2009; Tondeur, Van, Sang, Voogt, Fisser, & Ottenbreit-Leftwich, 2012). Programming languages are a part of a Computer Science major, but Computer Science graduates often prefer not to teach programming languages since it pays more to get a job in industry than it does to teach in a K-12 environment. And while most educators recognize the importance of incorporating programming or computational thinking into K-12 curricula, most classroom teachers are not adequately prepared to implement these activities. In fact, 9 out of 10 U.S. K-12 schools don't offer programming language classes (Partovi, 2015). Proponents of computational thinking point out that while it shares elements with mathematical, engineering it also extends each of those thinking skills in a unique way (Lee et al., 2011).

Further, there is research to suggest that after learning how to program and computational thinking, pre-service teachers are more knowledgeable and have more self-confidence (Al-Bow et al., 2009). Pre-service and in-service teachers need to be better taught on how to teach programming to their students. In particular, pre-service teachers play a critical role in each of these areas as they work to maximize learning outcomes in their prospective students by motivating and engaging them in computational thinking. An exploration of the role of the teacher in promoting computational thinking and programming among students is therefore an important step towards building science literacy in our youth. If they have positive attitudes, they have the power to influence children at an early age on issues regarding computational thinking and programming.

Although students have the opportunity to learn programming and computational thinking through technology and online resources, the importance of having teachers available cannot be overstated (Utting, Cooper, Kölling, Maloney, & Resnick, 2010). Therefore, teachers, in particular pre-service teachers not only teach and reinforce the fundamentals of computer programming, but also serve as catalysts to motivate, inspire, and guide their prospective students as they begin their computer programming and computational thinking journeys. Additionally, it is important to help pre-service teachers to adopt best practices for integrating computational thinking into their teaching by having them draft hypothetical lesson plans in a variety of subject matter domains. Before teaching in their field, pre-service teachers would then be thoroughly familiar with computational thinking through hands-on activities and ready to integrate such skills into their classrooms.

WHY K-12 STUDENTS

Clearly the increasing role that computation plays in teaching and learning (Borgman et al., 2008), will assist in our understanding of how people both interact with computation as well as their ability to learn to think through the language of computation. Learning computer programming has been shown to have a positive impact on STEM education (Grover & Pea, 2013; Honey, Pearson, & Schweingruber, 2014). Children who learn computer-programming skills as part of a STEM curriculum have been shown to experience numerous benefits to their education. For example, children may not fully grasp the purpose of why they do math, when they are focused on the process of creating formulas for their projects. However, an understanding of basic computer programming logic can aid with this understanding. Additionally, children can become more familiar, knowledgeable, articulated, and sophisticated with formal systems and learn to interact with themselves by doing hands-on activities (Papert, 1980; Papert, 1993). Even for children who do not end up in STEM-related jobs, the inclusion of STEM curriculum in education allows them to develop literacy in Science, Technology, Engineering, and Math and the critical thinking skills that are demonstrated by scientists, mathematicians, and engineers (Honey, Pearson, & Schweingruber, 2014). As suggested by Barr and Stephenson (2011) the incorporation of computational thinking concepts into the K-12 curriculum requires efforts in two directions: "Educational policy must be changed, overcoming significant infrastructure hurdles, and K-12 teachers need resources, starting with a cogent definition and relevant age-appropriate examples" (p. 112).

COMPUTATIONAL THINKING IMPACTS DAILY LIVING SKILLS AND ACTIVITIES

As noted by Bundy (2007) computational thinking has permeated most disciplines in the sciences as well as the humanities. Computational thinking is the most beneficial source to give children the power to invent and carry out projects with technological devices (Papert, 1980). Computational thinking offers opportunities for students to engage in, solving problems, designing systems, and understanding human behavior through the same concepts as found in programming languages. It is impossible to not be affected by computational thinking while doing daily work (Voskoglou & Buckley, 2012; Wing, 2008a). Learning computational thinking also teaches individuals problem-solving and logical thinking skills, which can generalize to many other areas, including reading and writing. However, students who are not strong problem solvers, despite having taken algebra and pre-calculus, can improve their problem-solving abilities through engaging in coding. Engaging in computational thinking has been shown to increase the analytical and mathematical problem-solving ability of students (Wing, 2006).

Children who learn programming languages at an earlier age are better at problem solving, decision-making, and computational thinking skills (Flannery, Silverman, Kazakoff, Bers, Bontá, & Resnick, 2013). Additionally, children who learn a programming language go through a similar process as those children learning a second language, with these skills leading them to become increasingly fluent with new technology. Having achieved fluency, children will better be able to express themselves and start expressing new ideas. Learning a programming language is also in line with 21st century pedagogies that emphasize, creativity, critical thinking and problem solving (Ananiddou & Claro, 2009).

COMPUTATIONAL THINKING

The term "computational thinking" was first coined by Jeannette Wing in 2006: "computational thinking involves solving problems, designing systems, and understanding human behavior, by drawing on the concepts fundamental to computer science" (p. 33). Both Wing (2011) and Brennan and Resnick (2012a) further defined computational thinking with dimensions of computational thinking concepts and practices that incorporate *abstraction*. Specifically, abstraction is "defining patterns, generalizing from specific instances," (Wing, 2011) and forms the basis of most contemporary computational thinking pedagogies:

- Abstractions and pattern generalizations (including models and simulations);
- Systematic processing of information;
- Symbol systems and representations;
- Algorithmic notions of flow of control;
- Structured problem decomposition (modularizing);
- Iterative, recursive, and parallel thinking;
- Conditional logic;
- Efficiency and performance constraints;
- Debugging and systematic error detection.

Computational thinking is the new literacy technique of the twenty-first century to teach children the process of thinking abstractly. Aho (2012) has described this phenomenon by defining computational thinking as the thought processes involved in formulating problems so "their solutions can be represented as computational steps and algorithms" (p. 832). Computational thinking not only plays an important role as a fundamental part of computer science, but also influences problem solving in all disciplines such as economy, art, and engineering. Google for Education and has addressed how computational thinking should be approached. Google for Education has four basic steps that include decomposition, pattern recognition, abstraction, and algorithm design.

The Computers at School (CAS) organization has expanded the Google for Education approach to computational thinking steps by adding two steps. These two extra steps allow students to make a prediction of output and also review their process. For CAS, the first step of computational thinking is *decomposition*: taking a big, difficult, and complex problem and breaking it down into smaller, more manageable sub-problems. When problems are broken down into smaller pieces, the next step becomes *patterns*. This step allows people to identify common similarities and differences. The third step, *ab-*

straction, provides people with a way to create step-by-step techniques for solving problems. Next, *algorithm design* provides significant instructions with a step-by-step solution for a problem and pulling out significant details to find one solution that applies multiple similar problems. *Logical reasoning* allows students to predict what the result will look like after following four steps. In other words, the sequence of instructions will let students know the results. Finally, *Evaluation* allows students to make sure each step of computational thinking works well. If the evaluation doesn't show what students predicted, it allows students to restart process. Further, research has begun to map out how these practices might best be embedded in typical curricula. For example, intriguing work by Miller (1981) and Pane, Ratanamahatana, and Myers (CCCC) has demonstrated ways in which computer languages can best be designed for novices, that incorporate intuitive manners of thinking; a concept well-suited for visually-based languages like Scratch.

The concept of "low floor, high ceiling" as one of the foundations of programming for children has existed since the earliest days of programming. As described by Grover & Pea (2013) this concept implies that though it should be easy for a beginning programmer to cross the threshold to create working programs (low floor), however the tool should also be powerful and extensive enough to satisfy the needs of advanced programmers (high ceiling). Further, computationally rich environments and effective computational thinking tools for school children must have low thresholds and high ceiling, and be systemic and sustainable (Repenning, Webb, & Ioannidou, 2010). Visually-based experiences can then be supplemented in high school with higher level programs such as Java and Python.

COMPUTATIONAL THINKING CONCEPTS

Sequences

A sequence is a list of individual steps or instructions (code blocks) that are put in a specific order to be run by the computer. As an example, Figure 1, presents an Alice project and includes a list of code blocks. Each block code manipulates the alien based on the sequence or "instructs" him/her what to do. There are four code blocks on the list to produce the program. The first action instructs the alien to say, "Hello", and the second block code instructs the alien to turn left. After turning left, the alien turns right. The last block code has the alien disappearing.

Loops

Loops are a mechanism for running the same sequence multiple times. In Figure 2, the project is designed by Hopscotch. The C shape is the repeat block that lets the character run the same instructions or block code stack several times based on the number in the blank box. In Figure 2, the C loop has three blocks in which the instructions "Leave a trail color orange and 10 width", "Move forward", and "Turn 60 degrees repeat 6 times" occur in sequence when the play button is tapped.

Parallelism

Parallelism allows several tasks to run at the same time. Scratch and ScratchJr supports parallelism across objects as well as parallelism within a single object. For example, Figure 3 might describe the movement

Figure 1. Alice sequences program example

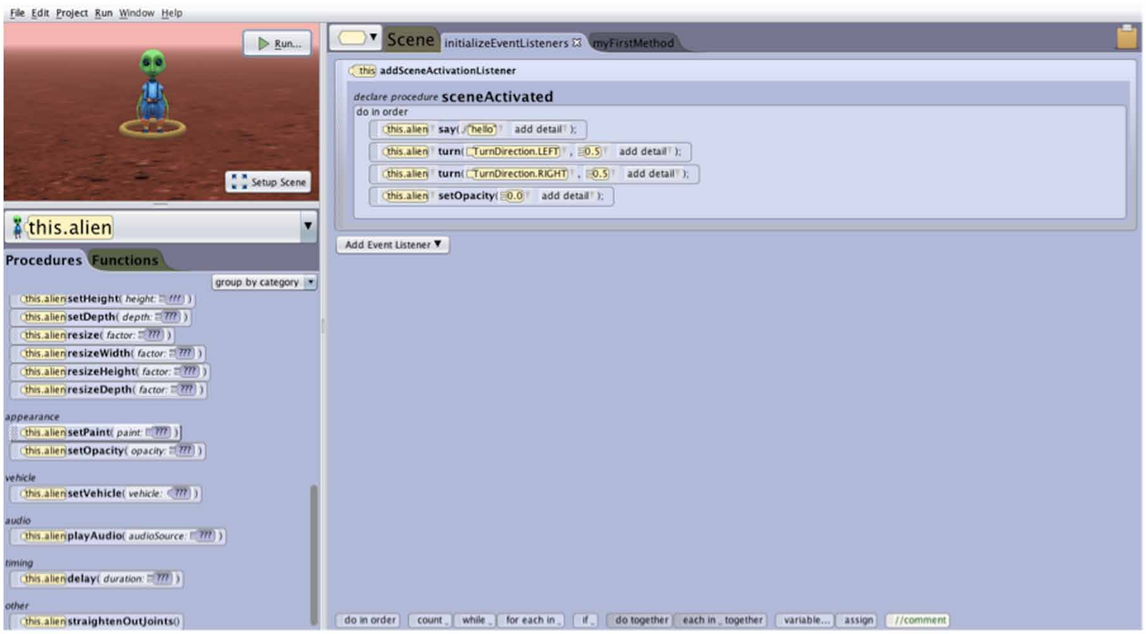
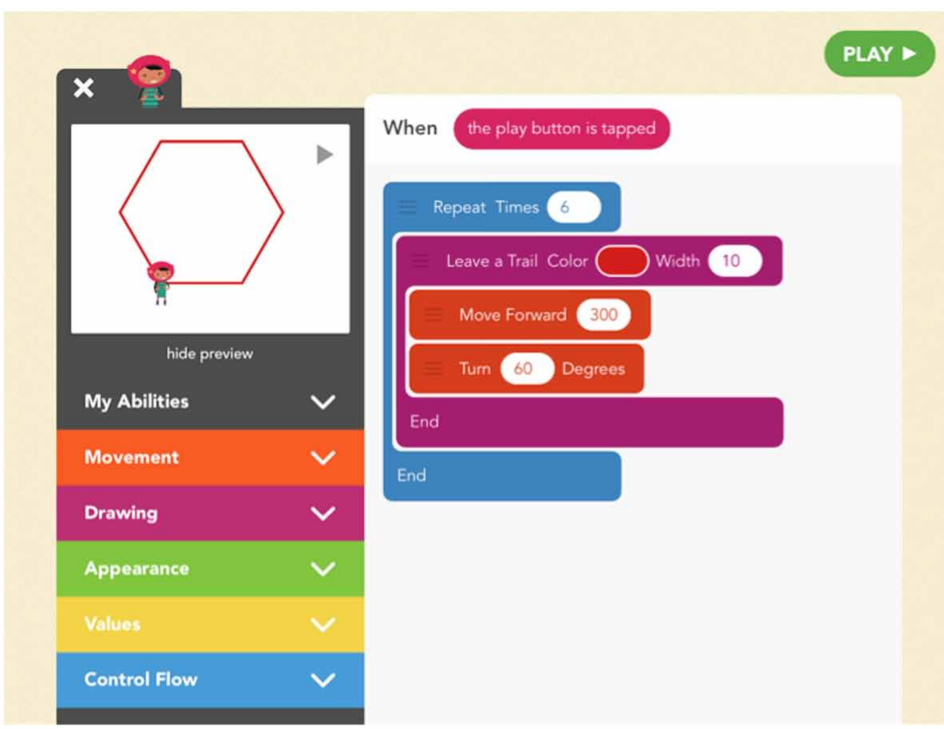


Figure 2. Hopscotch loops program example



of the giraffe and a second animal, perhaps while a third task (Music playing in the background) was occurring or, as shown, describes how the giraffe can be commanded to engage in two behaviors simultaneously. On the left, the first set of commands controls the sound that will be played in the background, while the second set of commands, on the right) controls the giraffe's movement. When the user clicks the green flag, both commands begin simultaneously.

Events

A more complex process occurs when one events stimulates or triggers a second event. Figure 4 demonstrates an underwater or aquarium scenario with many things occurring simultaneously. Fish are swimming, sunlight comes and goes, and the underwater plants move in response to currents. In this example, the user has created an event such that when the yellow fish is tapped by the user, the yellow fish says, "Hello". However, if the yellow fish is not tapped by user, there is no greeting by the yellow fish.

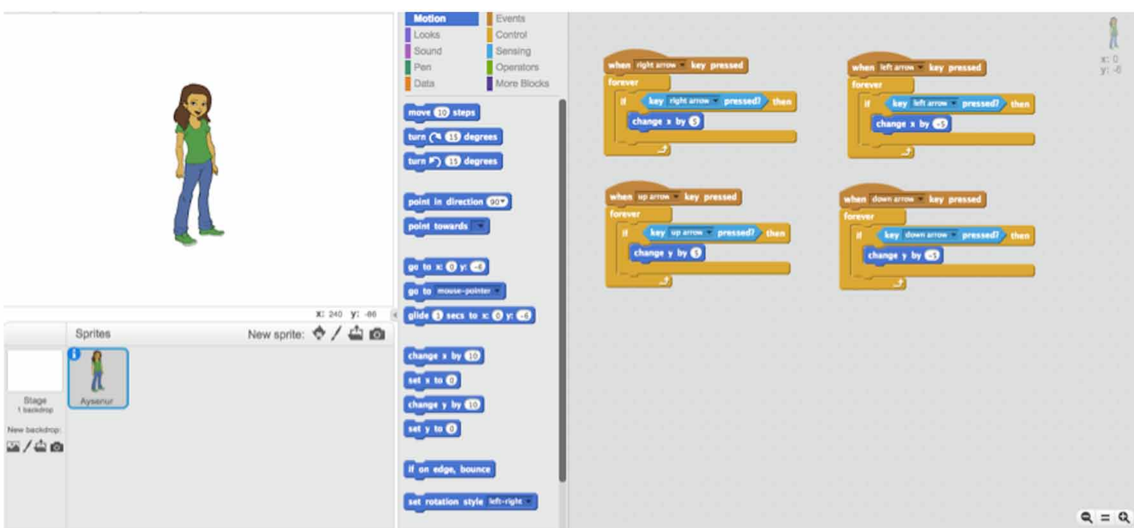
Conditionals

Conditionals utilize one of the most common programming commands – If/Then statements. That is, the ability to make a decision based on certain conditions. In Figure 5, the program contains four events; when the right arrow key is pressed, when the left arrow key is pressed, when the up arrow key

Figure 3. ScratchJr parallelism program example

Figure 4. ScratchJr events program example

Figure 5. Scratch conditionals program example



is pressed, and when the down arrow key is pressed. Each of them has a conditional statement follows an "if then" statement. If the user presses the right arrow, the character moves right. If the user presses the left arrow, the character moves left. If the user presses down, the character moves down. If the user presses up, the character moves up.

Visual Based Programming Languages

The Visual based programming language allows programmers to create projects by dragging and dropping blocks of code onto an editing center (Hundhausen and Brown 2007; Kelleher and Pausch 2005). As the name implies, visual based programming relies on GUI (graphical user interface). Its target audience is novice programmers and most visual based languages provides the first introduction to the concepts of programming using the behaviors of simple elements such as movements, turns, loops, etc. (Maloney, Peppler, Kafai, Resnick, & Rusk, 2008).

Visual based programming language provides a more suitable and simpler environment for young learners to express their interests than text-based programming languages (Cooper, Dann, & Pausch, 2003; Grover & Pea, 2013; Maloney, Peppler, Kafai, Resnick, & Rusk, 2008; Resnick, 2007). In contrast to text-based programming languages, with visual-based programming languages, users do not simply write lines of tedious code. Instead, they visually snap together graphical blocks of codes, without worrying about often unfamiliar text-based symbols such as semicolons, brackets, and parentheses. Moreover, the visualization of event-based programming is an easier way for children to understand the importance of events than text-based programming languages. For example, as a visual-based program runs, users can observe which command is being executed, because the block of code is highlighted. Additionally, text-based programming languages are often difficult to debug. In contrast, visual-based programming language is designed to be simple, because block of codes snap together in ways that make sense. Blocks of code that would create a bug or a programming error are not created in a way that allows them to visually "snap" together. Most visually-based languages utilize the three-stage "use–modify–create" progression that helps students rapidly progress from user to modifier to creator of computational artifacts (Lee et al., 2011).

The earliest exposure for children to programming languages were inspired by the Logo turtle robot, created by Seymour Papert, Daniel G. Bobrow, Wally Feurzeig, and Cynthia Solomon in the late 1960s. Using the text-based Logo Programming language, the Logo turtle encouraged children as young as 4 years old to understand the basic concepts associated with computer programming and to explore their ideas visually instead of typing (Bers et al., 2010; Papert, 1980) and was designed to be usable by both non-programmers and beginner programmers. Logo incorporated turtle graphics and offered instructions for movement and drawing line graphics either on the screen or with a small robot called a "turtle". The underlying rationale behind Logo was to understand the turtle's motion by asking users to imagine what they would do if they were a turtle.

All visual based programming languages originated from Logo, but each visual-based language has developed its own strengths and weaknesses, while still sharing some core commonalities. For example, late in the 1990s, an advanced visual based programming language was designed for novices who have little or no prior programming background by a research team at Carnegie Mellon University led by the late Randy Pausch. This program, Alice, allows novice learners to create games and animations with drag-and-drop blocks in an intuitive and user-friendly environment. Like other visual basic programs, Alice is an interactive graphical model however it incorporates three dimensional, terrain. Again, the graphical tiles consist of the statements for the programs and users have the ability to select the characters that occur on the stage, and then users add various rules to each character to build its behaviors, moves, and directions. The Alice programming environment was designed for several reasons: to teach programming concepts and theory, to support object-oriented flavor, and to encourage people to do programming with storytelling for novice programmers and to complete programming practices such as sequencing, parallelism, automation, multimedia, program logic. Functions of Alice were built and inspired by object oriented programming language (Cooper, Dann, & Pausch, 2003). Logo was a powerful and fairly advanced programming language in its time, but it was often viewed as intimidating, not kid-friendly, and partly text-based so children and novice programmers were still had to worry about syntax error since spelling. In addition, Turtle was the only character, which was not interesting for some users and didn't give them a chance to choose different characters to design various projects. However, Alice made it easier and allowed users to choose the characters they wanted. Moreover, Logo had a few activities that users were limited to and it was not connected with their interests, needs and experience; for example, drawing simple geometric shapes. In contrast, Alice allowed users to do whatever they were willing to design that related with their interest and needs.

Scratch was created shortly after Alice by the Lifelong Kindergarten group at the MIT Media Lab in 2007. Scratch was designed to foster collaborative work on a web browser platform. Accessing the platform through a web updates more projects instantly available for users so users always have the latest projects to remix. Novice programmers can use Scratch with visual block-based and drag-and-drop style to create animation stories, games, interactive presentations, music videos, and greetings.

Scratch has a similar interface to Alice, however Alice features slightly more advanced editing features and blocks of codes, so it is not easier for novice programmers and children to pick up programming concepts (Cooper, Dann, & Pausch, 2003; Resnick et al., 2009). Scratch is more widely used than Alice due to its simplified blocks, interface, and 2-D graphical environment that Scratch took from logo, and also replaced typing code style with a drag-and-drop block-based technique. Scratch is much easier to use than Alice because most novice programmers focus on 2-D, rather than 3-D graphical tools and terrain to create, import and personalize 2-D graphical tools (Burke & Kafai, 2012; Maloney, Resnick, Rusk, Silverman, & Eastmond, 2010). Moreover, Alice has not yet been translated into other languages so only English-speakers can use it, however, Scratch has been translated to around 50 different languages so that not only English speakers can learn, but non-English speakers, too (Resnick et al. 2009). Scratch allows users to share with other users, whereas Alice users can't share their projects with others since it has to be downloaded. Scratch online environment provides opportunity for users to develop sharing and socialization skills. Users can create their own projects, but also remix projects shared to the Scratch website by other users. Moreover, users make comments and answer questions to help other users.

Hopscotch is one of the first visual, tablet based programming languages. Hopscotch was designed in 2013 by Jocelyn Leavitt and was inspired by Scratch. The Hopscotch interface is very similar to Scratch, (e.g., Hopscotch works by dragging and dropping blocks of codes from the toolbox into the editing center) however, Hopscotch is specifically aimed at empowering and educating young males and females ages 8 to 12 them to teach how to create games and animation (Amer & Ibrahim, 2014). Hopscotch lets children share their projects within the Hopscotch community, which is an online environment where users connect with other users and write comments about projects. Hopscotch offers colorful blocks of code with which to execute a program on what is basically a blank slate so that it can be as easy or as difficult as users make it, but it also works under the assumption that they already know some programming basics. Hopscotch smoothed the way with its kid-friendly interface, pre-built blocks, and tapping function, unlike Scratch, teaching younger children programming is difficult with computer interface since pointing and clicking are difficult for them to manipulate (Brennan, & Resnick, 2012b). Moreover, this visual based tablet based programming languages provide value for younger beginners at various stages of the learning process. Children become familiar with dragging and dropping coding blocks via various types of input, such as shaking an iPad, tapping the screen, and tilting the tablet.

Another current tablet based programming language, ScratchJr, was developed by Tufts University as free source in 2014 (Portelance & Bers, 2015). ScrathJr allows young children between the ages of 5 to 7 to easily learn programming with a system based on Scratch. Hopscotch has many noticeable similarities to ScratchJr but also many different features. First of all, ScratchJr is highly focused on educating younger children who do not even know how to read and providing them the capability to communicate technologically in the modern world. Therefore, it is easier to use for young children with ScratchJr the basic skills for programming concepts, practices and debugging. For example, the graphic interface is very inviting and clear; the block of codes appears as colored icons that look like a jigsaw puzzle and link them together so that programs can be created. Colored icons are organized into color-coded categories such as one group of colored icons controls character looks. However, children have to know how to read in order to learn programming with Hopscotch. In addition, even though Hopscotch and ScratchJr are free to download and provide a rich selection of characters, not all characters are free in Hopscotch. For example, there are five additional characters (Mandrill, Miss Chief, Mosquito, Jeepers, and Venus) that can be purchased for $0.99 each.

Unlike ScratchJr, all objects are free so that children have more objects to use they are interested in. Moreover, Hopscotch is available on iPad tablets, while ScratchJr is available on both iPad and Android tablets. Building on other people's work has been a longstanding practice in programming, and has only been amplified by network technologies that provide access to a wide range of other people's work. One stated goal of the Scratch online community is to support young designers by helping them find ideas and code to build upon, enabling them to potentially create things much more complex than they could have created on their own (Brennan & Resnick, 2012).

Moreover, most computer science programs for older children, such as the National Robotics Challenge are designed as competitions in which robots are programmed to accomplish a given task, usually with the goal of outperforming other robots. However, research has demonstrated that females do not tend to respond well to teaching strategies that stress competition (Turbak & Berg, 2002); further, such strategies might also not be appropriate in early childhood settings (Bers, 2008). Platforms such as TangibleK Robotics, an educational robotics program that has been piloted with children and teachers in prekindergarten to second grade may offer a powerful alternative (Bers, 2010). The curriculum has been piloted in kindergarten classrooms and in summer camps and lab settings and introduces and uses six powerful ideas from computer science in a robotics context in a structured, developmentally appropriate way.

OUTLINE OF THE CHAPTER

- Importance of Educational Programming Language
- Why Pre-service teachers
- Why K-12 students
- Computational Thinking
- Computational thinking concepts:
    - Sequence
    - Loops
    - Parallelism
    - Events
    - Conditionals

- Computational thinking practices
- Visual Based Programming Languages

ISTE/NETS LEARNING OUTCOMES

1. The Chapter is designed to inspire and lead development and implementation of a shared vision for comprehensive integration of technology to promote excellence and support transformation throughout an organization (Visionary leadership);
2. The Chapter is designed to create, promote, and sustain a dynamic, digital-age learning culture that provides a rigorous, relevant, and engaging education for all students (Digital age learning culture);
3. The Chapter is designed to promote an environment of professional learning and innovation that empowers educators to enhance student learning through the infusion of contemporary technologies and digital resources (Excellence in professional practice).

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Chapter 30
Wearable Computers

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ABSTRACT

Wearable computers include a variety of body-borne sensory, communication, and computational components that may be worn on the body, under, over, or within clothing. These mechanisms have potential benefits for (a) human performance support, (b) cognitive and psychomotor learning, and (c) K-12 educational environments. This chapter begins with a historical overview of wearable computers and then provides the reader with a current and future perspective of their use across a variety of educational environments.

INTRODUCTION

The purpose of this chapter is to provide an overview of wearable computers and the potential benefits for (a) human performance support, (b) cognitive and psychomotor learning, and (c) K-12 educational environments. Wearable computers include a variety of body-borne sensory, communication, and computational components that may be worn on the body, under, over, or within clothing. Wearable computers have the potential to change the dynamics of how individuals acquire, store, and retrieve information and offer new frontiers for both researchers and users.

HISTORY OF WEARABLE COMPUTERS

The first wearable computer is attributed to Thorp and Shannon in the 1960s with their roulette wheel predictor. The roulette wheel predictor was a cigarette-sized wearable computer that was intended to predict where the ball would land. It wasn't until the work and findings were published by Thorp in 1966 that the device earned the title of the first wearable computer (McCann & Bryson, 2009). The Bell Helicopter Company experimented with head mounted display (HMD) camera-based augmented-reality systems in

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1967. Within the same year, Hubert Upton created a wearable computer with eyeglass-mounted display to aid in lip reading (Popat & Sharma, 2013). By the late 1970s, C. C. Collins developed a wearable head-mounted camera for the blind, Hewlett Packard designed an algebraic calculator watch, and Eudaemonic Enterprises created a wearable shoe computer to predict roulette wheels (Popat & Sharma, 2013).

In the early 1980s, Mann experimented with a backpack-mounted computer with smart glasses and a one-handed keying input device (Mann, 1996). Mann's photographically-mediated reality was an early attempt at augmented reality in a wearable device (Mann, 2013). By 1989 the smart glasses concept evolved into the commercially available Private Eye. Doug Platt introduced a hip-mounted computer incorporating the Private Eye and a palmtop keyboard in 1991 (Amft & Lukowitz, 2009; Rhodes, n.d..; Starner, 1994). Platt and Starner combined the functionality of the Private Eye and the Twiddler, a commercially available one-handed keyboard, into the first context aware system in 1993. This design became the basis on which the Lizzy at the MIT Media Lab was established.

In 1991, students from Carnegie Mellon University's Engineering Design Research Center developed VuMan 1, a wearable computer to view blueprints (Bass et al., 1997). BBN Technologies produced the first wearable computer with GPS, the Pathfinder system, in the Fall of 1993 (Rhodes, n.d.). Steve Feiner, Blair MacIntyre, and Dorée Seligmann presented a prototype augmented reality system called KARMA (Knowledge-based Augmented Reality for Maintenance Assistance) (Feiner, Macintyre, & Seligmann, 1993). The system used a HMD to present and explain printer maintenance for the end-user. By the end of 1994, Mik Lamming and Mike Flynn developed "Forget-Me-Not," a wearable device that records interactions with people, places, and devices (Lamming & Flynn, 1994); Edgar Matias and Mike Ruicci of the University of Toronto, built a wrist computer with a half-QWERTY keyboard (Matias, MacKenzie, & Buxton, 1994); and Mann went on to develop the Wearable Wireless Webcam, a camera he used to transmit live images to the Web (Mann, 1997).

Since the initial robust innovation in wearable computers at the MIT Media Lab, iterations have continued. A current implementation of a wearable computer is Google Glass (Norman, 2013). While smartphones may currently offer many capabilities, they do not capture reality as it happens in the moment it happens. Reducing the time between intention and action is potential benefit of wearable computing.

WEARABLE INTERACTIVE DEVICES

Electronic devices have made the transition from portable to wearable over the past 20 years (Pentland, 1998). "Wearables are more personal than traditional communications tools because they are a constant part of one's physical presence: they are not only part of what you wear but also part of who you are" (Pentland, 1998). At the time of this writing, according to Vandrico (n.d.), the wearable technology market includes 436 devices, with 253 devices used for lifestyle applications and an average cost of $290 (USD). The accelerator is currently considered the most popular component included. The database is constantly updated and has been available since 2008. Wearables range from health monitoring devices to everyday clothing. There are even wearables designed for working dogs (Valentin, Alcaidinho, & Jackson, 2015). Most wearables are still in the research and development phases but continue to make their way to the market. Wearables currently available are watches and armbands that track health and fitness statistics and eyeglasses with computer displays.

The smart textile industry is moving in a direction where the wearable devices are unobtrusive and more fashionable. Some wearables include: Ring with a bar-code reader to be used in warehouses and loading docks to identify the shipping information and contents of containers (Pentland, 1998); Sign language translator video camera placed on a hat records hand gestures and the software convert the signs into English (Pentland, 1998); Interactive clothing, uses a GesturePad, layer of sensor electrodes, transforms ordinary clothing into an interactive device (Rekimoto, 2001). Smart t-shirts, socks, and underwear have been designed to monitor fitness and health activity. The European Space Agency (ESA) has made investments in smart socks and t-shirts to monitor astronauts' vital signs and potentially reduce muscle degeneration (Dalsgaard & Sterrett, 2014). Thalmic Labs, a company founded in 2012 that specializes in wearable technologies, designed the Myo armband. The Myo armband "reads the electrical activity of your muscles to control technology with gestures and motion, hands-free" (ThalmicLabs, n.d.). The Myo armband is currently being used for prosthetics, entertainment, medical imaging, and sign language (ThalmicLabs, n.d.). By running Myo Connect in the background, the Myo armband user can control presentations, multimedia, games, and other tools available in the Myo Market (Myo, n.d.). The circuitry behind wearables starts with the Lilypad Arduino. The Lilypad Arduino main board was designed to build wearable devices (Buechley & Eisenberg, 2008). The small computer resembles a flower and conductive fibers can be sewn through the petals to make connections. The designer can program the microcontroller on the board with C using the Arduino programming environment. The Lilypad Arduino can be hand washed and sewing instructions are provided on Arduino's websire (Arduino, n.d.). Lilypad Arduino's website also provides some examples of wearables such as ballet shoes that capture the dancer's movements and a biking jacket with light up turn signals on the back (Arduino, n.d.).

Technological innovations for learning continue to evolve in the context of wearable systems. Wearable computers as learning tools may have great potential for enhancing learning but research has yet to show this efficacy and positive impact in educational contexts. An analysis of the proceedings from *The International Symposium on Wearable Computers* spanning over 16 conferences from 1997 through 2012 revealed that the number of published papers in the proceedings peaked at 47 in 2005 with 2012 being the lowest at 24 papers.

WEARABLE COMPUTERS IN EDUCATIONAL CONTEXTS

Wearable Computers for Performance Support

Advances in technology, reducing the hardware size and increasing computing speed and capability spurred on advances in wearable learning environments as tools to support performance on the job (Bowskill & Dyer, 1999; Liu, 2004; Najjar, Thompson, & Ockerman, 1999). Electronic performance support systems (EPSS) is just one example. The MetaPark environment is another example of wearable devices capable of delivering necessary information in appropriate formats at the required level of detail to employees (Bowskill & Dyer, 1999). Synchronous and asynchronous communication, information recording and retrieval, and location and context awareness including location based messaging offered wearers the ability to conference with other team members in an augmented reality environment (Bowskill & Dyer, 1999). The wearable components in MetaPark were similar to the Factory Automation Support Technology (FAST) system however FAST was more complex. FAST was able to provide workers with necessary information when and where it was needed within a factory (Najjar, Thompson, & Ockerman, 1999). Access and use of Interactive Electronic Technical Manuals (IETMs) through wearables offers users' necessary just-in-time information without referring to printed documentation (Lui, 2004). The impact of wearable IETMs on learning and productivity has not yet been established, but users generally prefer the convenience of wearables over place-bound computers.

Wearable Computers for Cognitive and Psychomotor Learning

Although challenging and costly, technological advances have reduced creation costs. Several researchers have developed a framework with the creation of a wearable computer as the foundation for middle school students learning concepts ranging from basic electricity and circuit theory to electronics and programming (Ngai, Chan, Cheung, & Lau, 2010).

Researchers exploring wearable computers in science education created and tested a two-part learning environment comprised of a Web-based portal with activities for museum and park visits (Arvanitis et al., 2009). The wearable consisted of a backpack mounted laptop and a head mounted display camera and both disabled and able bodied students participated. While there were no significant differences in pre- and post-visit tests, the researchers suggested further research to determine how this type of technology could diminish barriers for the disabled.

Wearable computers have emerged across all types of psychomotor skill development settings. The tactile interaction for kinesthetic learning (TIKL), was used to analyze users' movements in a physical rehabilitation environment and provide real-time vibrotactile feedback for motor skill learning. One study revealed real-time errors were reduced while learning rate and correct performance increased (Lieberman & Breazeal, 2007). Running form may be improved through remote real-time training via a wearable computer worn by the runner comprised of a wireless data sensor, SunSPOT, and a headset in the field environment. A remote advisor reviewed the runners form and provided feedback (Gotoda, Matsuura, Otsuka, Tanaka, & Yano, 2012).

The effectiveness of a wearable computer integrated into soldiers' equipment on training has also been evaluated. Three studies were conducted including a heuristic usability evaluation and two experiments regarding retention of declarative knowledge and transfer of procedural skills (Taylor & Barnett, 2013). The wearable system was found to be more difficult to use than a desktop interface simulation regarding the heuristic usability evaluation. No significant difference in the retention of declarative knowledge of 53 movement procedures was found among three instructional conditions including the wearable system, the desktop interface simulation, and interactive multimedia instructional videos. Significant differences were found between the wearable system, the desktop interface simulation, and live condition regarding the transfer of procedural skills, with participants in the live condition outperforming the other two categories (Taylor & Barnett, 2013).

Wearable Computers for K-12 Educational Environments

In educational settings, wearable computers are being used for participatory simulations. "Thinking Tags" which are small, customized wearable computers, are worn by students and teachers to record interactions with each other and the classroom environment (Klopfer, Yoon, Rivas, 2004). Thinking Tags have been used in simulations to teach students about how viruses are spread (Colella, 2000) and genetic inheritance (Klopfer, Yoon, Rivas, 2004). Researchers at UCLA designed "Smart Kindergarten", a system that includes an "iBadge", a wearable device composed of sensors and "Sylph", a middleware infrastructure (Park et al., 2002). The iBadge is worn to monitor the interactions between students and teachers as well. However, the data picked up by the sensors on the iBadge are sent to the Sylph to be read and interpreted. Another example of a wearable in an educational setting is the BeeSim (Peppler et al., 2010). Students wear a glove designed with the LilyPad Arduino toolkit and composed of LEDs, designed to represent a honeybee and collect nectar from flowers. LEDs on the flowers indicate how much nectar is remaining and the LEDs on the glove represent how much has been collected. Health activity trackers, like the Fitbit, have been used in studies to teach students about monitoring their physical activity. In a study conducted by Schaefer, Ching, Breen, & German (2016), middle school students were taught how to use the Fitbit device and sync the device with a computer to view the results on Fitbit.com.

Wearables can also be used to aid students with disabilities. ReWalk is the first and only FDA approved wearable exoskeleton designed to allow people with Spinal Cord Injury to stand and walk (ReWalk, 2014). The FingerReader is a finger worn device that reads the text aloud as the user's finger runs across the words (Shilkrot, Huber, Liu, Maes, & Nanayakkara, 2014). Originally designed for visually-impaired people, this wearable device can be used by students that are auditory learners or are learning to read. Wearables can keep track of glucose levels for students with diabetes and monitor students with seizures (Borthwick, Anderson, Finsness, and Foulger, 2015).

LIMITATIONS

Many wearable computers, like those mentioned in this chapter, haven't made it past the development stage due to certain limitations. Designing wearables that are machine washable and dryable is just one example. If wearables are to be embedded into everyday clothing, they should also have the same functionality as clothing (Karvonen & Parkkinen, 2001). Location, location, location, where will the device go? The user should be able to move around freely without getting entangled in wires or cracking the wearable device (Gepperth, 2012). The wearable device should be in a location where it does not interfere or cause discomfort to the user (Gepperth, 2012). In designing a wearable device, it would be ideal to have the conductive fibers and connections woven into the fabric. Researchers from the Wearable Computing Lab at ETH Zurich, Switzerland have made progress towards protecting conductive fibers from wear and tear by wrapping the fibers in a polymer coating (Gould, 2003). However, any external connecting that are made to a battery or sensor fail to withstand any excess movement or water (Gould, 2003). Depending on the application of the device, wearables should also come with pre-installed software to prevent hackers from accessing information (Gould, 2003). As with any technology device, personal information that can be shared wirelessly or through a hardwire connection should always carry a level of protection.

CONCLUSION AND FUTURE IMPLICATIONS

While empirical research on wearable computers is limited, great potential exists (Mann, 2013). The positive impact on performance support and both cognitive and psychomotor learning has been partially demonstrated. Starner and other proponents believe "on-body devices are really the next revolution in computing" (Metz, 2013, p. 26). However, more research is necessary to understand the potential of wearable computers.

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KEY TERMS AND DEFINITIONS

Arduino: An open-source electronics platform comprised of easy to use hardware, software, and microcontroller-based kits.

Augmented Reality: A view, in real-time, of the environment overlapped with computer-generated sensory components.

Conductive Fibers: Fibers that are capable of conducting electricity. Often these consist of a less conductive substrate that is coated with electrically conductive elements.

Electronic Textiles: Fabrics that can conduct electricity or have electronics embedded in them. Also referred to as e-textiles or conductive textiles.

Interactive Device: A tool that the user can communicate with to control or change the action or output of the device.

Smart Clothing: Ordinary clothing with the addition of components capable of computing and wireless communication.

Ubiquitous Computing: Computing that can occur any place, anytime, anywhere.

Wearable Computer: A device that contains a programmable circuit board, capable of computing, and power source that can be worn on the body or on/under/within clothing.

Chapter 31
RSS and Syndication for Educators

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ABSTRACT

RSS and other forms of syndication offer key opportunities for educators to engage in professional development and enrich their teaching. The use of these technologies can encourage students to become self-directed learners and provide educators with methods to leverage the content they collect and curate. This article explores the possible uses of RSS and syndication for educators and the technologies used in developing these. The current range of web services and the possibilities for integrating them has added a new level of dynamic content distribution at the educator's fingertips.

INTRODUCTION

The internet arrived with an initial promise of millions of documents within reach on our keyboards. Media was soon added to the mix but it wasn't until the advent of the social web that the internet graduated from being a more efficient and extensive source of content to changing the things we do as educators. Or at least it held that promise. Educators have always faced challenges in keeping pace with their academic fields, the specific curriculum that guides their instruction, the pedagogies that support the delivery of that curriculum and the technology that supports all of this.

In a world where every facet of online technology grows more complex, it is difficult to know which will make a real impact on teaching and learning. One technology with great promise for educators is RSS (Rich Site Summary) which offers the ability to control, filter, distribute and aggregate content (Pilgrim, 2002). The investment of time in learning how to use RSS in education is returned many times in the richness it can bring to student learning. The fact that RSS can be used in many ways by educators and students, and in ways that the initial developers never predicted, is evidence that this technology has matured in its application to education.

This chapter will introduce many ways to use RSS in education and provide general directions for educators and resources for further exploration.

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BACKGROUND

RSS, Rich Site Summary but often called Real Simple Syndication, was one of the early technologies that enabled the growth of the world wide web as a site for communication and learning. It was, and continues to be, one of the most important technologies on the internet that most people have never heard of.

The original purpose of RSS was to provide dynamically updated summaries of the newest content available on a web site. Obviously the greatest early application of RSS was on blogs and news sites. These summaries are created by the platform that hosts the web site, like WordPress or Drupal (popular content management systems), and are delivered in a standardized, structured format called XML (Pilgrim, 2002). This means that the author of a blog post doesn't need to create an RSS entry to match a blog post, the blog platform does this automatically. The standardized structure used in these RSS feeds allows the end user or 'subscriber' to configure their view to see their choice of titles, links, author names, an opening snippet of text, or the whole article.

RSS has evolved with newer standards and it has been used to syndicate and aggregate various types of media, including audio and video as well as the more traditional text and graphics (2016, What is Classroom Podcasting/Vodcasting).

Syndication in this context refers to the process of distributing content from one place to many. If you think of a syndicated column in the world of newspapers the same principle is followed. RSS is one technology that supports syndication, and the most easily manipulated by educators, but this chapter will cover many methods of syndicating content for educational purposes.

Web services are applications that function on the internet and are accessed by users through a web browser. Where the early internet featured content displayed online, the modern web has social networking sites like Facebook™ and applications like Google Docs™. These web services are becoming the main location for the work we do on the web. Web services offer educators the opportunity to distribute and aggregate media for learning.

In this article there are many technologies described and the methods for using these technologies are detailed in as useful a way as possible. In every instance there are multiple choices of software and web service to accomplish the described tasks and, as time progresses each of these will be modified, improved or abandoned by their makers. For this reason, technical descriptions here will be general and use the principles involved rather than the names and steps specific to individual applications. It is hoped that these descriptions will help you use these tools effectively but if you are stuck these tools typically provide tutorials, a help section or FAQ (frequently asked questions) service. Additionally, Google™ will usually provide links to good tutorials if you can phrase the right search term, like "RSS feed in Flickr".

LITERATURE REVIEW

Most topics within the field of educational technology present clear connections between with their practical application in the classroom and online, leading to research, analysis and exposition on the field's impact on teaching and learning. In the case of RSS and other tools used to syndicate content, the technologies exist out of sight. When they are working their best, they are invisible to the teaching and learning taking place. This means that direct searches for research and academic literature on RSS and syndication do not reveal many direct hits. Instead one has to search for academic works that explore learning that uses technology where RSS is a significant functional component.

Many works that take a higher level approach to the description and analysis of educational technology make conclusions that point to qualities of RSS just beneath the surface. References to such affordances as accessibility, connectedness and dynamic content infer the existence of RSS as a basic component of the technology environment. The problem then is where is research about the use of RSS and other syndication technologies found? Searches for research featuring keywords like RSS, PLE, and Blogging present plenty of results but many have little direct relevance to RSS. The net collects hundreds of studies buy only a fraction offer insights on RSS. Some literature presents an introduction to RSS and offers elementary advice on its application to teaching and learning. Other works explore imaginative uses of RSS and related technologies to support more effective learning in an online environment. In many cases surveys were used to explore the adoption of RSS and perceptions around its effectiveness.

Earlier works on RSS presented a case for RSS and guidelines for its use. As a core tool RSS was described by Will Richardson (2006) and subsequently in the three editions of his book on teaching with web tools (Richardson, 2010). A few years later a similar introduction to RSS was presented by Chris Bigenho (2009). These works combined an introduction to RSS and how it might be used in a personal or classroom setting with some elementary instruction on what tools might be used to implement this technology and how they should be configured.

More detail in how RSS can be used for teaching and learning is presented by Lee, Miller and Newnham (2008) who argue that while other technologies have greater initial appeal, RSS can be more transformative in its effect. Ferriter and Provenzano (2013) argue that, even as younger teachers have adopted social media in the pursuit of professional development, RSS is the final ingredient in efficiently managing many social media connections for professional development. The use of blogs is one of the first examples of Web 2.0 in education. Marino and Angotti (2011) explain that this tool is more easily managed and its impact magnified with RSS feeds, and Karrer (2007) describes educational blogging in private sector learning.

The use of RSS for professional development is a topic discussed in the context of post-secondary libraries (Wu, 2007; Kern & Mu, 2011). The key affordance of RSS is described as its ability to help busy faculty and staff members curate current information on specific topics. Bridging the disconnect between faculty and emerging tools to support their professional development is described as an important role for librarians.

There are non-teaching applications of RSS in educational institutions. An automated and dynamic course announcement system at Purdue University combines RSS with their learning management system (LMS) to provide students customized announcements whenever they log into their course (Glotzback, Mohler & Radwan, 2009). Similarly, university communications stand to be revolutionized by RSS, as Karine Joly (2006) described how it can combine and re-purpose tools like email and newsletters.

These works are all expositions on how RSS has been used and how it might be used in the future. They do not include experimental or survey based research. The largest portion of works in this category is illustrative of the way RSS is often perceived as a technical tool to be employed in solving a problem, and one that requires a primer for wider use.

Many investigators of RSS have provided deeper analysis of its effectiveness in supporting teaching and learning. While several of these accounts are case studies of specific projects emplying RSS in education, some of them also include survey results that shed light on the use of RSS and other technologies by students, faculty and librarians.

Cases that provided a deeper insight of the utility and impact of RSS included explorations of the use of podcasts as a medium for distributing course content (Gorra, 2009), the use of student blogs for reflective journaling (Derntl, 2010), online courses that combined an LMS and Web 2.0 tools (Cifuentes, Xochihua & Edwards, 2011; Tu et al., 2012), the use of blogs and RSS to support interaction of English language learners in different countries (Stevens et al., 2008) and support for informal learning (Gu, 2014). Each of these concentrated on a single endeavour, typically a course supported by educational technology, or an application created to support learning. Each includes a deeper examination of the objective for the use of RSS-supported technology, a description of the intention and design of this use of technology, and a reflection on how it was used and what results were achieved. While these reports are anecdotal in nature, they provide useful points of information from which others might begin their own exploration.

Deeper explorations into the use of RSS within educational technologies are provided from several points of view, with a number of research questions in mind. Simple surveys on the level of technology adoption by students, faculty and librarians have been conducted (Cassidy, Griffin & Shen, 2011; Coelho, 2011; Tyagi, 2012). Cassidy, Griffin and Shen (2011, pp. 384-386) surveyed over seven hundred students to find that while 30% of students knew what RSS was, only 16.4% of them used RSS feeds. On the other hand, Coelho (2011, p. 254) found that RSS was the most common Web 2.0 tool adopted by Porteguese post-secondary libraries, rising from 17% adoption in 2008 to 40% in 2010. Tyagi (2012, pp. 33-34) found that most professors at universities in the National Capital Region of India were aware of RSS, with 90.5% of assistant professors, 85.4% of associate professors and 79% of full professors indicating they knew about RSS. These tools were used by 33.3% of assistant professors, 36.6% of associate professors and 30.2% of full professors. Tarhini (2015) found that national differences in perceptions of RSS could explain differences in its adoption.

Student perception of RSS supported activities have been measured in an experiment that compared jigsaw learning activities supported by blogging to standard jigsaw activities. A survey of blogging participants found that 92% agreed or strongly agreed that materials were easily found using RSS (Huang, Huang & Yu, 2011).

Future research into the impact RSS can have on education will have to be focused to inform educators and students. A great opportunity lies in exploring and explaining how RSS can support the implementation and effectiveness of personal learning environments. While blogging has a long history in education research into the use of RSS with blogging and with newer social media tools is a further area for future study.

EDUCATIONAL USE OF RSS

Educators have busy lives and can often be slaves to the immediate demands of their teaching. The best educators are able to stay current on their subject, learning about the developments in their field as well as emerging innovations in teaching it. Making a concerted effort to find materials relating to these developments can be difficult to do consistently. RSS can be used to set up a reading list of current writing in your field that constantly refreshes with the latest work.

The original users of RSS set up feed readers to collect what they wanted to read (and hopefully they were realistic in how much actually could read). These tools aren't as commonly used today but they can form the first layer of a system that will curate content at an appropriate rate for a busy educator.

Feed readers come in two hosting formats. Originally they were typically software that you installed on your computer and then configured to gather your favorite feeds. Today feed readers are more likely to be web services that still allow this configuration but are accessible from any computer or mobile device you use. Feedly™ is a popular web-based feed reader while FeedReader™ can be installed on your computer or accessed via the web (http://feedly.com; http://feedreader.com/).

Personal Learning Environments

Once you have a feed reader selected you need to consider an organization structure for your feeds. Will you collect articles and posts on your academic discipline, as well as teaching at the middle school level, and on your personal interests? The feed reader will allow you to create categories and place feeds within them to keep your reader organized. When you use your feed reader you will be able to concentrate on one topic.

Selecting sites and authors to follow is a matter of personal preference. If you prefer informal and topical pieces, then you will subscribe to more blogs and news sites. If you prefer academic writing, then you will subscribe to open source journals or academic bloggers. You should also consider organizations or institutions involved in your subject area or your mode and grade level of teaching. Many news sites will offer an RSS feed based on a category so that you can subscribe to articles on a specific topic. For example, education articles in The Guardian™ can be found at https://www.theguardian.com/education/rss. On a blog any category or tag you find associated with a post will likely have its own feed available as well.

Any feed reader is going to require the URL (uniform resource locater found in your browser address bar) of an RSS feed to get started. Go to your favorite blog or news site and look for an 'RSS' link or a square icon with a dot in the lower left corner wrapped in two semi-circles. If you select this link your browser will display a simple web page with the title of the RSS feed at the top and a number of items included within the feed below. Copy the URL of this page and then, on your feed reader paste the URL into the new feeds portal of your reader. You will be asked to place your feed within a category and you may have a few options around how to display the feed content. Once you save your new feed the title will appear on your feed reader, within its category and with a number indicating the unread items it includes.

Adding feeds to a feed reader is easier than keeping up with your professional development reading. Once you have used your feed reader for a while you should consider which feeds provided the most useful information, which delivered content at a rate you could keep up with, and whether the breadth of information you needed is covered by your collection. Prune your feeds accordingly but also be aware of new and emerging sources that you might want to include.

This process of developing your own personal learning environment begs the question of student personal learning environments. In most ways, modeling your own learning processes and habits is a good way to transfer learning as a life-long skill rather than an academic requirement. The same tools and processes you use to set up a personal learning environment can be adapted for students with specific projects or units taking the place of academic areas of interest. As feed readers are easily configured and reconfigured, students can change their feeds as they move from one project or unit to the next, or they can continue to learn about an interesting topic long after the classroom work has been completed.

Syndication in Learning Design

The essential nature of RSS and syndication is that it brings something (or many things) from one place on the internet into another in a dynamic manner. Dynamic means that once this RSS connection is set up, it will continue (if so configured) to bring new content or the new version of existing content into your site.

The nature of what is brought to your site can vary. Typically, RSS feeds are used to display the title and some initial information (date, author etc.) of a text item and have that link to the original publication. RSS can bring images, video, audio and complete texts into your site as well. This means that you can design a learning environment that will present a rich, multi-media collection of resources that are also current.

The design and configuration of tools that bring content into a course site are important in determining how effective the final product will be. There are several strategies for bringing content into a site:

- Bring in a feed from a trusted source;
- Bring in a feed on a specific topic from a trusted source;
- Combine feeds from several sources into one display;
- Bring in a feed that pulls the content of a 'category' from a trusted source;
- Bring in a feed that pulls the content of a 'tag' from a trusted source;
- Bring in a feed that pulls the results of a search from a trusted source;
- Bring in a feed that pulls the results of a search from an open-ended source (ie. Yahoo news);
- Bring in a feed that pulls one static page from a source.

A major difference between categories and tags is that categories are planned ahead of time in a structure that makes sense for the organization hosting the site. This is frequently called a taxonomy. Tags are added at the time of writing and the list of tags is typically open-ended. In sites with multiple authors there may be no guidance on the creation or overlap of tags. This is often called a folksonomy (Karch, 2016, What is folksonomy?).

There are also two typical choices around how your students will read, hear or watch the content you are collecting:

- Display links and have students access content at the original site;
- Display content and have students access content on the course site (this is not possible with all RSS feeds - the feed author can limit the amount of content included).

In all these choices, the technical setup is a small part of the learning design problem. Decisions about what you will bring into your site and the context in which it will be placed have a greater impact on learning. Sometimes, having seen all that is available, there is a desire to bring it all to the students. This can result in an overwhelming flow of content that for students is like trying to drink from a fire-hose. The selection of content to bring into a site via RSS should align with the goal of the unit, activity or assignment.

The web site that you develop for your learners will likely be a learning management system (LMS) like Moodle™ or Blackboard Learn™, or a content management system (CMS) like WordPress™ or Drupal™ (http://moodle.org; http://www.blackboard.com/; https://wordpress.org; https://www.drupal.org/). These will have integrated displays for RSS that you can configure and place on your site. For example, in Moodle these are called 'Remote RSS feeds', in WordPress they are called 'RSS' within the widgets section. These RSS displays will typically take the form of a block on the margin, or placed within a page. There are also third party 'widgets', like RSSinclude™ or FeedWind™ (https://www.rssinclude.com/; https://feed.mikle.com/), that will display an RSS feed (or multiple feeds), and can typically be placed anywhere you have editing permissions.

Just as important is the design of the web page or pages that will host your syndicated content. Remember that the titles or full articles that come to your site via RSS will have been written primarily for their original location, they may not make sense without some context for your students. At a minimum, your RSS display should state the source and/or the general subject matter of the content in the feed. Frequently this is provided by the tool you use to display an RSS feed on your site. For more complex uses you should design a web page that introduces the unit of learning, explains the activity the students will engage in, and how the RSS delivered materials will be used.

Another effective use of RSS for learning is to bring together student created content in one space for sharing, discussion or dissemination to a wider community. Some blocks designed to display RSS feeds in your site can be set to display entire articles or posts. In other instances you may need to use a third party widget, or there may be plugins, like FeedWordPress© (http://feedwordpress.radgeek.com/), that will 'republish' content from an RSS feed into your course site.

In the context of a classroom with a website, and students, each with their own blog, a decision has to be made about how much should be shared, how often, and how students should access this material. In a large class with many online writing opportunities an aggregation of all student posts in one place will overflow very quickly. In most blogging systems you can generate an RSS feed by category or tag. This means that you can have student blog posts aggregated in one spot on the course website, but only for those posts the student placed in the 'quickwrite' category or gave the 'science9' tag.

Another design question is whether you want the entire text of these student posts to be republished on your course site, or just limited data like title and name, linking back to the original. Along with this question you need to decide where you want any discussion to take place. Blogs (and other types of social media) are designed to support discussion on the same page as the published content. When you use RSS to bring this content into a course site you need to consider where any discussion you plan to support should occur. Typically, if you are encouraging students to visit each other's blogs then you would want discussion related to student posts to occur on the student blog sites. On the other hand, if you are designing a discussion as part of a unit of learning, you likely want this to happen on the course site. Either way this is a consideration that must be resolved before students start posting.

The structure presented by this sort of design is a decentralized series of individual environments for students to create and learn, combined with a pulling together of key course activities from all participants into one space.

This structure is optimized for social constructivist and connectivist approaches to learning (Lee, Miller & Newnham, 2008, p. 316; Anderson & Dron, 2012). The ability to create digital artefacts in various forms or combinations of media means that many activities and assignments can result in a digital deliverable. An online ecosystem of course and student web sites allows the design of multiple opportunities for sharing and feedback among students over the course of a project. Learning together while creating artefacts as part of a group, or while exchanging feedback on individual projects is an effective implementation of social learning. Finally, the online ecosystem allows the instructor to monitor student interactions to ensure that discussion is at a high level, that there is rough equality in contribution, and that behavioral norms have been observed.

RSS for Static Content

Sometimes RSS can be used to display or republish content form one place into one or many course sites. In this use, RSS ensures that each time a page is accessed in the course site, it brings the current version of the content from the RSS feed. This is accomplished in its simplest form by using an RSS display block or a third party widget and setting the number of items to display at ‘one’. Tools that republish the content on the course site can be even more effective for this use.

There are many possible reasons to use RSS to bring single items into your course site. If you have one resource that is shared by several teachers or used in many course sites this system makes it easy to have one resource appear in many places. If you have a piece of content that must be updated by people that will not have editing access to your course site, then RSS can bring this content from a simple blog page into your site.

If you are bringing a single page of content directly onto your web page, you should also provide a link to that page in case this integration fails.

Advanced Integration

Aggregation of content into a course site is not limited to text. Images, audio and video content can also be brought in using RSS.

The original concept of the ‘podcast’ was a regularly produced audio file that could be accessed via RSS. Tools that enable you to generate audio files typically provide feeds that will place an embedded audio player in your site or a download link. These tools include VoiceThread™, Audioboom™, iPadio™ and Soundcloud™ (https://voicethread.com/; https://audioboom.com/; https://www.ipadio.com/; https://soundcloud.com/) just to name a few. Of course, you can also include an audio file, embedded or linked within a regular text-based blog post. If this blog post is collected via RSS then so is the audio file.

Video can also be aggregated via RSS, but the problem of whether to display links or an embedded video player is more pressing. While text snippets or audio players can take relatively little room in a display of five or ten recent items, five video players will take substantially more room on a page and take more time to display. If you set up an RSS display to show just the latest video from a source, then having it appear within a player is reasonable. Otherwise just links are a more reasonable approach. Most video hosting services offer RSS feeds including Vimeo™, Dailymotion™ and TeacherTube™ (https://vimeo.com/; http://www.dailymotion.com/; http://www.teachertube.com/). YouTube RSS (http://www.youtube.com/). Feeds are available if you search for the most recent method. Photo sites like Flickr™ can also provide RSS feeds for collections.

Other Methods of Syndication

Many modern social networking and media sites do not present an obvious link for an RSS feed. In many cases they have developed other methods for their content to be presented or at least linked from other sites and web services. In some cases this is because, as services are bought and included within larger companies, they hope to encourage the integration of their services. So as Google™ has bought services like YouTube™ and developed its own services, RSS has become less important to Google™ as integration is designed right into these tools.

New social media tools frequently do not include an RSS feed as one of their features. In both established and new services, the lack of an obvious RSS feed should not deter you. You can look for an RSS feed that suits your purpose by searching the site's help menu and FAQ. If that does not produce results, try a Google™ search. The result of these searches could be a page with links to the appropriate RSS feed, or it could be a more complex set of instructions to obtain your feed. A common solution offered by other users will be a description of the pattern or syntax of RSS feeds for the service in question. So in a simple example, WordPress™ blogs typically will deliver an RSS feed of the content displayed on a page if you just add '/feed' to the end of the URL. If you change 'http://www.mywordpressblog.com' to 'http://www.mywordpressblog.com/feed' you will have the RSS feed for all the posts in that blog. But the same principle applies to any collection of posts, comments or even a single page in WordPress. If you select a category link to arrive at http://www.mywordpressblog.com/category/cat-pics/'then'http://www.mywordpressblog.com/category/cat-pics/feed/' will give you the RSS feed for that category.

This is a simple syntax for getting an RSS feed in WordPress (which typically still displays RSS links anyway) but many other services will follow a logical syntax for their RSS feeds and, even if they don't promote it, you can easily syndicate the content you want if you know their syntax.

Web-based services like Instagram™ or Twitter™ often provide methods (sometimes called widgets) to integrate their content into other sites and services using techniques other than RSS. In the end these methods may accomplish the same result for you as a dynamic flow of content from one site will be displayed on your course site. One option that you will not have in these instances is the ability to combine content from several services into one display on your site. If you have the RSS feed for a Flickr™ account, and another for an iPadio™ account, you could combine these to display one dynamic list of photographs and audio files, but if you just use widgets provided by two services, you will have two separate displays.

In almost every application of each of the methods below, you must be able to edit your course site using HTML, the markup language that is the basic language of most websites. This means that as you edit your course site to add their widget, you will need to look for the HTML editing option. Commonly this will be a button on your editing window marked 'HTML' or with angle brackets '< >'. In each case the web service will offer the code for their widget (it will be a long string of characters that make little sense) for you to copy and then you will paste this into the HTML editing window on your site.

Embed

This technique was commonly used in the past for adding video or audio directly into a web page. It is less suited to dynamic content but may still be used by some services.

iFrame

An iFrame takes a web page from one place and displays it in another within a specified rectangle or 'frame'. This common method of distributing content retrieves the syndicated content each time your course site is opened.

JavaScript

JavaScript is used to make applications that work within a web page. A widget may include a link to a JavaScript file or JavaScript may be part of content brought to your site via an iFrame or with embed code. JavaScript can actually add content to your web page remotely and dynamically.

Each of these techniques are used widely on the internet but you will need to verify that the settings for your course site allow you to add them to a web page. Each technique can also be used to bring malicious code into your site so it is possible that the system at the core of your site (Moodle™, WordPress™ etc.) may preclude their addition. If this happens you should discuss the matter with the IT staff responsible for your site and see if an exception can be made. That said, web services are conscious of this and strive to ensure their widgets are considered acceptable in the widest number of environments.

Advanced Syndication

As important as RSS has been for the distribution and integration of content on the web, most services today offer more options for interaction. Using APIs (application protocol interfaces) web developers can make their service accept data from another service to create a new application with new features. This technology is fairly complex but there are web services like IFTTT™, WorkFlow™, CloudPipes™ and Zapier™ (https://ifttt.com/; https://workflow.is/; https://www.cloudpipes.com/; https://zapier.com/) that will provide simple systems for making your own integrations that can be useful for teaching and learning. Here are some examples.

A teacher uses the social bookmarking tool Diigo™ (https://www.diigo.com/) to collect and categorize all the great resources she finds on the internet. She wants to share the resources suitable for her Grade 9 social studies class on her class blog. Using the tool IFTTT™ (If This Then That) she sets up a ‘recipe’. Any time she saves a Delicious™ bookmark with the tag ‘ss9’, IFTTT™ creates a post on the Tumbler™ micro-blog she uses for the course.

Throughout the year a science teacher produces files (documents and spreadsheets) to support lessons in the classroom and for assignments and activities set as homework. To make it easier to share these files he sets up a ‘task’ on Zapier™ so that any time he saves a file to his shared ‘physics11’ folder in DropBox™ (https://www.dropbox.com/), a link is added in an RSS feed that is displayed on his Moodle™ site.

These tools offer a range of abilities to work with the online services you use limited only by the features of each service that are accessible via the API. One caution with these advanced syndication tools is that they require you to set permissions to access each of your services. You may also need to consider what services you use for your private life and whether the ways you may want to use them in support of your teaching indicate an additional account is needed.

These advanced syndication tools have invested their resources in researching the APIs for most of the popular social networking site, media distribution sites and many other web services with unique purposes. This makes it possible to bring content from all kinds of services into your learning environment on your own terms.

CONCLUSION

Even at its simplest implementation, RSS offers a rich and immediate advantage to educators that make use of it. The longevity of RSS and its relatively simple structure mean that there are many online tutorials to help educators make use of it. It is a technology that can be learned as needed, in the chunks that have immediate application and, despite occasional challenges, it isn't disappearing without similar features taking its place. Connectivity on the web is the future that we don't really understand yet. Teaching with RSS is one way to give students an experiential introduction to this future.

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KEY TERMS AND DEFINITIONS

API: The application programming interface is a set of standards and protocols for designing the way software and web-based applications interact with each other.

Connectivism: A learning theory and theory of knowledge that argues that knowledge is found across networks of connections and that learning must develop the ability to exploit these networks.

Content Management System: A type of website platform designed to allow typical administrative staff to maintain a complex website. Examples of a content management system (CMS) would include Drupal™ and WordPress™.

Learning Management System: A website platform for the creation of educational websites with various activities and media types supported. Examples of a learning management system (LMS) would include Moodle™ and Blackboard Learn™.

Personal Learning Environment: Also called a PLE, the personal learning environment is a collection of web based communication services and tools that enable an individual to engage in professional development. A typical PLE might include following influential colleagues on Twitter and subscribing to key journals and blogs via RSS.

Podcast: A regularly produced series of audio files that can be accessed via RSS. A similar series in video is often called a vodcast.

RSS: Rich Site Summary but often called Real Simple Syndication today. RSS is a standardized system for describing each of a series of content items presented by a website.

Social Constructivism: A learning theory that argues effective learning is promoted by constructing knowledge in groups.

Syndication: The process of making content in one place available in many places. This can be accomplished using RSS or other technologies.

Web Services: The provision of communication, media production, distribution and other applications on the web, access through a browser, without the requirement for users to install software on their own computer. Examples would include Google Docs™ or Flickr™.

Widget: A small piece of web functionality that can be placed on a web site. A widget might display items from an RSS feed or the current weather for a location.

Chapter 32
Visiting Technological Pedagogical and Content Knowledge (TPACK):
Issues and Challenges for Teachers' Professional Development

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ABSTRACT

The TPACK framework has been widely discussed for effective technology integration, and the literature has also indicated TPACK has significant implications for teacher education and professional development. The purpose of this chapter is to examine interconnectedness of TPACK and teacher professional development. This chapter reviews the research on TPACK and the extensive literature on quality professional development for teachers. In addition, the chapter highlights how various content areas have addressed pedagogical content knowledge and implications for practice in technology and teacher development. The chapter seeks to contribute knowledge about the structure of professional development initiatives that involve instructional technology and integration into various content knowledge disciplines.

INTRODUCTION

Teaching is a complicated practice that needs an interweaving of many kinds of specialized knowledge (Koehler et al., 2013) and therefore requires teachers to apply complex knowledge structures across different cases and contexts (Mishra et al., 1996). Teachers practice their craft in highly complex, dynamic classroom contexts (Leinhardt & Greeno, 1986) that require them to constantly shift and evolve their understanding. Thus, effective teaching depends on flexible access to rich, well-organized, and integrated

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knowledge from different domains (Putnam & Borko, 2000), including knowledge of student thinking and learning; knowledge of subject matter; and increasingly, knowledge of technology.

Technology plays an important role in enhancing educational quality and therefore, current reforms in education have placed significant emphasis on the integration of technology into the curriculum and the use of it to improve teaching and learning. However, teaching with technology is not an easy task and hard to do well. With the dramatic advances in technologies, the need increasingly arose for teachers to understand the impact of technology and respond to technological changes. Faced with these challenges, how can our teachers integrate technology into their teaching?

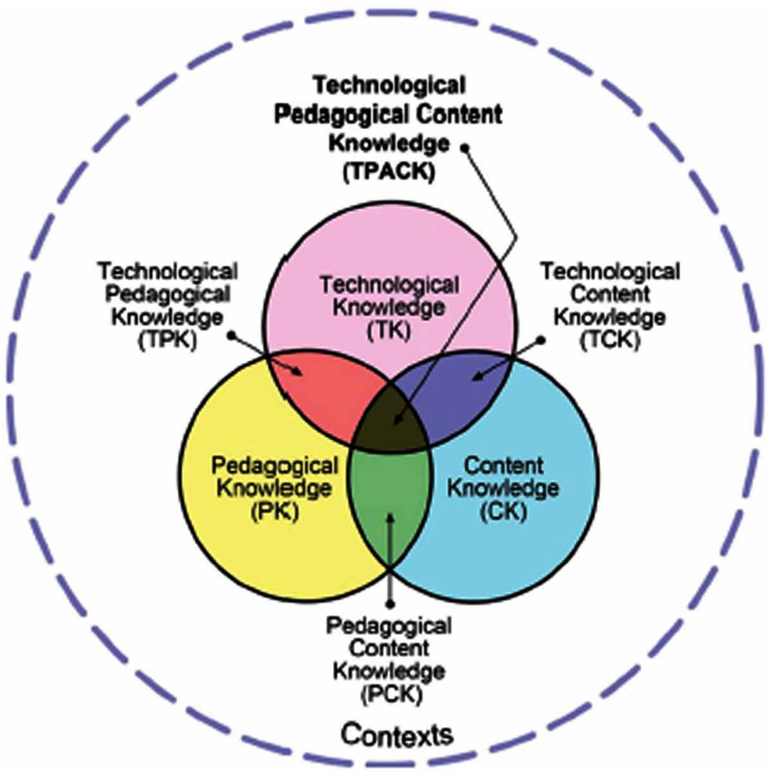
As instructional technology and teacher development continue to emerge and evolve, teachers often have inadequate or inappropriate experience with using technologies for teaching. The technology integration barriers include not only the lack of specific technology knowledge and skills but also the lack of technology-supported pedagogical and technology-related-classroom management knowledge and skills (Hew & Brush, 2007). Many approaches to teachers' professional development offer a one-size-fits-all approach to technology integration when, in fact, teachers operate in diverse contexts of teaching and learning. According to Koehler et al. (2013), there is no "one best way" to integrate technology into curriculum, but the idea of good teaching with technology requires three core components: content, pedagogy, and technology. These three knowledge bases form the core of the Technology, Pedagogy, and Content Knowledge (TPACK) framework (Koehler et al., 2013). Currently, the notion of TPACK has been widely used for effective technology integration, and the TPACK framework has had a significant impact on research and practice around instructional technology as well (Koehler et al., 2011). Many researchers and teacher educators have adopted TPACK as a tool for understanding and advancing preservice and in-service teachers' abilities to integrate technology into their instruction (Graham et al., 2009). As a result, TPACK has significant implications for teacher education and teachers' professional development also (Koehler & Mishra, 2005).

The purpose of this chapter is to examine interconnectedness of TPACK and teacher professional development. This chapter reviews the research on TPACK and the extensive literature on quality professional development for teachers. In addition, the chapter highlights how various content areas have addressed pedagogical content knowledge and implications for practice in technology and teacher development. The chapter seeks to contribute knowledge about the structure of professional development initiatives that involve instructional technology and integration into various content knowledge disciplines.

WHAT IS TPACK?

As shown in Figure 1, TPACK contains three main components of teachers' knowledge: content, pedagogy, and technology. The TPACK framework builds on Shulman's (1986, 1987) descriptions of PCK (pedagogical content knowledge). Shulman developed the idea of pedagogical content knowledge (PCK) to describe the relationship between the amount and organization of knowledge of a particular subject-matter (content) and knowledge related to how to teach various content (pedagogy). The interactions of these three forms of knowledge are interacted and developed to be other secondary forms of knowledge that include pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), and technological content knowledge (TCK). Ultimately, emerging from interactions among different combination of the six forms of knowledge, the integrated form of knowledge, TPACK (technology, pedagogy, and content knowledge), is formed (Cox & Graham, 2009).

Figure 1. Technological Pedagogical Content Knowledge (TPACK)



According to Mishra and Koehler (2006), seven components can be defined as:

- **Pedagogical Knowledge (PK):** "Pedagogical knowledge (PK) is deep knowledge about the processes and practices or methods of teaching and learning and how it encompasses, among other things, overall educational purposes, values, and aims." (p. 1026–1027)
- **Content Knowledge (CK):** "Content knowledge (CK) is knowledge about the actual subject matter that is to be learned or taught, including knowledge of central facts, concepts, theories, and procedures within a given field; knowledge of explanatory frameworks that organize and connect ideas; and knowledge of the rules of evidence and proof (Shulman, 1986)." (p. 1026)
- **Technology Knowledge (TK):** "In the case of digital technologies, this includes knowledge of operating systems and computer hardware, and the ability to use standard sets of software tools such as word processors, spreadsheets, browsers, and e-mail. TK includes knowledge of how to install and remove peripheral devices, install and remove software programs, and create and archive documents." (p. 1027)
- **Pedagogy and Content Knowledge (PCK):** "PCK exists at the intersection of content and pedagogy. Thus, it goes beyond a simple consideration of content and pedagogy in isolation from one another. PCK represents the blending of content and pedagogy into an understanding of how particular aspects of subject matter are organized, adapted, and represented for instruction." (p. 1021)
- **Technological Pedagogical Knowledge (TPK):** "TPK is knowledge of the existence, components, and capabilities of various technologies as they are used in teaching and learning settings,

and conversely, knowing how teaching might change as the result of using particular technologies." (p. 1028)

- **Technological Content Knowledge (TCK):** "TCK is knowledge about the manner in which technology and content are reciprocally related. Although technology constrains the kinds of representation possible, newer technologies often afford newer and more varied representation and greater flexibility in navigating across these representations." (p. 1028)
- **Technological Pedagogical Content Knowledge (TPACK):** "TPCK 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." (p. 1029)

In general, TPACK framework is one of the technology integration models that focus on effective technology integration in the teaching process with respect to teacher competencies. Teachers have to not only know a content-specific technological tool but also understand how that tool could be properly used in lessons, how to operate the tool, how to troubleshoot the tool, and how to modify the tool to fit the intended purpose. Thus, the TPACK framework provides a model for the integration of technology into classroom instruction, grounded on the idea that proper technology integration should account for the nuances present across various content areas, pedagogical practices, and technologies.

TPACK RESEARCH FOR TEACHERS' PROFESSIONAL DEVELOPMENT

Teacher professional development is essential for implementing quality technology across all academic domains. While teacher knowledge is important, understanding how what they are learning fits into the course and the goals of the district make more of an impact on the teacher. Professional development must attend to the relevance to the work in order for the teachers to learn. Thus, as the field engages in infusing technology across all academic areas and defines courses specifically for the teaching of technology, careful consideration must be paid to the development of teacher knowledge and pedagogy. Thus, the TPACK framework should be useful for planning professional development.

Matherson et al. (2014) described that "teachers should be presented with and educated upon the TPACK model of instruction because it provides a framework—a guide—that allows teachers to take into consideration pedagogy, content, and technology when making epistemological decisions for the curriculum" (p. 49). As Koehler et al. (2013) stated, "TPACK is the basis of effective teaching with technology, requiring 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 to develop new epistemologies or strengthen old ones" (p. 16). Teachers need to develop the pedagogical thinking that builds towards TPACK. This is not a linear process nor is it just a series of learned skills. According to Doering et al. (2009), professional development often relates to advancing one knowledge domain, but the TPACK framework can push trainers and researchers to rethink the knowledge that teachers should have. They suggested rather than viewing professional development as a way to allow teachers to expand on a specific knowledge base, perhaps it is better to view professional development programs as an opportunity to bring the areas of technology, pedagogy, and content knowledge together, as one knowledge base; rather than separating knowledge related to three areas, it may be more valuable to transform professional development programs into modern interventions aimed at enhancing the intersection of knowledge domains that guide effective teaching.

In general, existing research data offer substantive promise that the TPACK model improves teacher professional development to support productive technology integration in their classroom. For example, Doering et al. (2009) studied on a specific professional development opportunity for social studies teachers and how this program impacted their TPACK. They found that in-service teachers who went through the TPACK-based program experienced considerable movement within the TPACK diagrammatic knowledge domains and expressed positive and encouraging comments regarding their knowledge domains portrayed within the TPACK framework. In addition, Voogt et al. (2009) established a series of TPACK-based workshop activities aimed at preparing upper-secondary physics teachers for the integration of Microcomputer Based Laboratories (MBL) in a student-centered teaching approach. Niess (2005) discussed how a particular science and mathematics teachers' training program was designed to foster the development of TPACK in an integrated manner, encompassing pedagogy courses, subject specific technology courses, and student teaching. In a study of evaluating EcoScienceWorks ITEST project as TPACK professional development, Allan et al. (2010) found that partner teachers have transitioned their classrooms to more learning-centered environments through the use of technology and have become teacher leaders. Data presented in this paper also suggested that a collaborative curriculum development project may be an excellent model for TPACK teacher professional development. Therefore, Niess (2011) concluded, "Today's teachers must utilize TPACK strategic thinking as they plan and prepare to guide students in exploring content topics with technologies" (p. 308).

ISSUES AND CHALLENGES OF TPACK

TPACK framework focuses on technology integration not only with respect to the teachers' knowledge about technology use but also with respect to the interaction and combination of teachers' knowledge in the field of technology, pedagogy and content. However, there have been several critiques of the notion that TPACK is the integration of separate component knowledge as well as mutually integrated knowledge. This section will describe several issues and challenges that literature presents in researching TPACK model and constructs.

Confusing Dimensions and Boundaries

The origins of the TPACK framework is based on Shulman's pedagogical content knowledge (PCK). However, Shulman's separation of PCK into three distinctive categories of knowledge has been difficult to validate (McEwan & Bull, 1991; Segall, 2004). Even experienced in-service teachers may feel puzzled when trying to figure out the differences between content and pedagogy (Archambault & Crippen, 2009). Segall (2004) pointed out, "Yet while it [pedagogical content knowledge] has often been cited, much used, seldom has the term or the lens it provides for the educative endeavor been questioned, engaged critically" (p. 490). Archambault and Barnett (2010) also stated, "While the teacher education community acknowledges the usefulness of the [pedagogical content knowledge] framework, especially with examining what teachers know and how that might impact the ways in which they teach, there are some valid concerns, especially concerning the distinct nature of each of the domains, pedagogy and content" (p. 1657). According to McEwan and Bull (1991), "We are concerned, however, that his [Shulman's] distinction between content knowledge and pedagogical content knowledge introduces an unnecessary and untenable complication to the conceptual framework on which the research is based." (p. 318). Many authors discussed that content cannot exist without pedagogy, and that explanations of concepts are inherently pedagogical in nature (McEwan & Bull, 1991; Segall, 2004). This confusion has made it difficult to validate pedagogical content knowledge as a framework, to define what constitutes knowledge from each of the domains of pedagogy, content, and the complex notion of pedagogical content knowledge (Archambault & Barnett, 2010).

Apart from the concerns related to the original framework of Shulman's PCK, Mishra and Koehler (2006) added technology as a key component to the framework, creating technological pedagogical content knowledge (TPACK). Likewise, Graham (2011) pointed out that the boundaries between the different dimensions of TPACK lacked clarity. Archambault and Barnett (2010) noted that introducing technological knowledge to the PCK framework created additional confusion among the already unclear boundaries between pedagogy and content knowledge. Besides the framework is not yet fully understood as stated by Angeli and Valanides (2009), Cox and Graham (2009) also described, "the explanations of technological pedagogical content knowledge and its associated constructs that have been provided are not clear enough for researchers to agree on what is and is not an example of each construct… the boundaries between them are still quite fuzzy, thus making it difficult to categorize borderline cases" (p. 60). Furthermore, Cavanagh and Koehler (2013) pointed out additional complexities contain contextual dependency on situational variables (e.g., subject discipline), which needs to be accommodated in both the unified and the multi-component representations, and the possibility of perhaps as few as three components (Archambult & Barnett, 2010) or more than seven components.

In addition to unclear dimensions, other researchers (Angeli & Valanides, 2009; Brantley-Dias & Ertmer, 2013) have criticized the model for being too complex for practical use in research or teaching. For example, Graham (2011) stated, "TPACK is easy to understand at a surface conceptual level. One intuitively recognizes the importance of integrating knowledge domains related to pedagogy, subject matter, and technology. However, the simplicity of the model hides a deep underlying level of complexity, in part because all of the constructs being integrated are broad and ill-defined" (p. 1955). Brantley-Dias and Ertmer (2013) criticized the framework, noting that by dividing the knowledge construct into seven different pieces, it becomes practically impossible to describe each fully or distinctively. Archambault and Barnett (2010) concluded, "Although the TPACK framework is helpful from an organizational standpoint, the data from this study suggest that it faces the same problems as that of pedagogical content knowledge in that it is difficult to separate out each of the domains, calling into question their existence in practice" (p. 1659). As a result, Graham (2011) emphasized, "Researchers must clearly understand PCK before they can productively understand and effectively measure TPACK constructs" (p. 1955). He further pointed out, " it is clear that in order for the model to be viable long term, it must lead researchers and practitioners to understand the constructs in more depth without becoming so complicated that it is inaccessible to all but a few elite researchers" (p. 1955).

Developing Various Measures of TPACK and New Measurement Tools

Graham (2011) and Abbitt (2011) have urged another critical issue regarding the validity and predictability of the model. Several TPACK surveys (e.g., Archambault & Barnett, 2010; Sahin, 2011; Schmidt et al., 2009) have been developed and validated through different methods and analyses in literature. Although existing TPACK surveys have been generally used to examine for internal reliability (Schmidt et al., 2009; Lee & Tsai, 2010), construct validation of several surveys are still in progress (e.g. Archambault & Crippen, 2009; Schmidt et al., 2009), and there is still a lack of understanding about the relationships amongst the seven TPACK constructs during teachers' TPACK development process.

In addition to using self-reported survey for teachers' TPACK knowledge, the other most common approach for measuring is to observe teacher performance through planning and decision-making documents or actual practice (Abbitt, 2011; Koehler et al., 2012). Although many scholars (Abbitt, 2011; Cavanagh & Koehler, 2013; Graham, 2011) suggested that employing both measures can improve the validity associated with studies of TPACK, those who have used multiple measures of TPACK to study technology integration have found that these measures often disagreed with each other (Hofer & Grandgenett, 2012; So & Kim, 2009). These issues and concerns continually challenge researchers to develop various measures of TPACK.

While researchers reported their studies for developing various measures of TPACK, some (Archambault & Barnett, 2010; Harris et al., 2010) also presented the difficulties they encountered when creating measurement tools to distinctly capture all seven TPACK constructs. As Koehler et al. (2012) reported, out of 141 different TPACK measures, less than 10% of the studies provided evidence of validity and only 31% provided evidence of reliability. The authors concluded that this "ought to be a concern to all researchers in this area" (p. 24). These issues associated with the clarity of the TPACK constructs support the need to critically evaluate the framework and the measures associated with it. As a result, it becomes more and more important that researchers need to continuously create new measurement tools or methodologies that are best suited for TPACK research.

Conceptualizing Technological Knowledge (TK)

Although technological knowledge (TK) is added to TPACK as a third knowledge domain to the PCK framework, the definition of TK is one major concern of the current lack of clarity in the TPACK framework. As Graham (2011) stated, "the definition of technology has failed to clearly delineate the scope of TPACK and designate its meaningful additions to the PCK framework" (p. 1956).

According to Graham et al. (2012), Koehler and Mishra (2008) did not distinguish between the types of technology encompassed within technological knowledge (including older technologies such as the pencil as well as newer digital technologies). However, most researchers currently using TPACK as a theoretical framework would be investigating teachers' integration of digital technologies (Graham, 2011) to make this explicit by identifying a particular flavor of TPACK. For example, Angeli and Valanides (2009) used the term ICT-TPCK to represent a focus on the use of ICTs; Lee and Tsai (2010) used the term TPCK-W to represent a focus on web technologies; and Doering and Veletsianos (2007) and Doering et al. (2009) used the term G-TPACK to represent a focus on geospatial (geography) technologies.

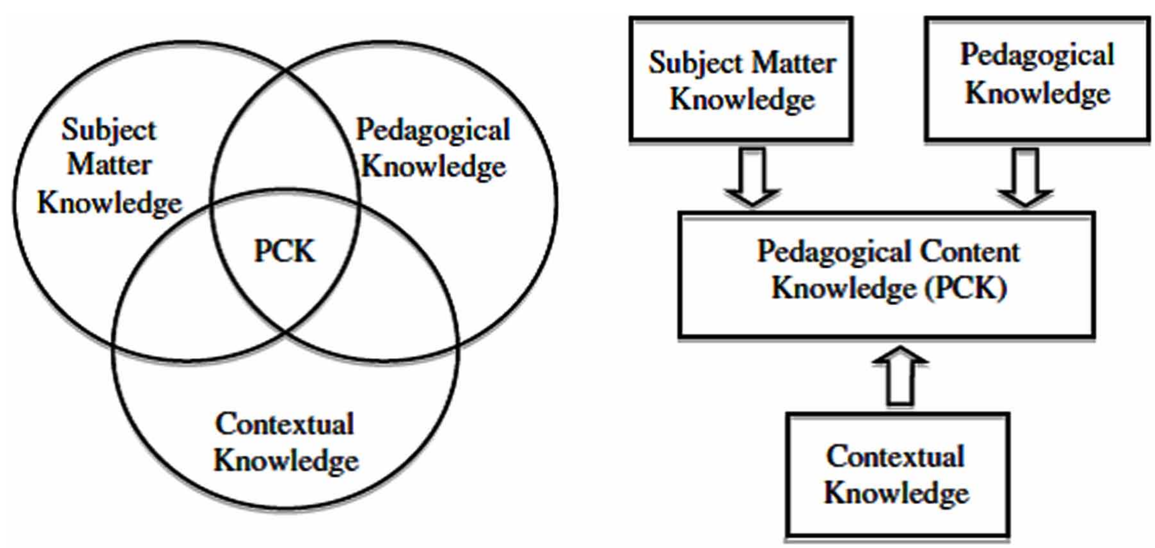
When TPACK is being conceptualized how the affordances of technology might be leveraged to improve teaching and learning, it requires additional examination to understand if technology can blend together with content and pedagogy to form the unique domains described by framework. Therefore, defining and limiting the scope of how technological knowledge is perceived has become important for clarity of the framework (Graham, 2011), because many people may have broad conceptions of what technology is, or consider technology to be not only physical devices but also processes applied to solving problems (Smaldino et al., 2005). For instance, Jonassen (2004) distinguished “hard technologies” (e.g., tools, devices, hardware, etc.) and “soft technologies” (e.g., methods, processes, etc.). Cox (as cited in Graham, 2011) addressed the technology definitions by making a distinction between transparent technologies and emerging technologies. She defined transparent technologies as technologies (e.g., the pencil, the chalkboard, the book, etc.) that are commonly used in a particular classroom context, and emerging technologies as new technologies (typically digital technologies) that are being investigated or introduced into a learning environment. In Cox’s interpretation of the TPACK framework, the use of the transparent technologies is part of the PCK construct, and the use of the emerging technologies is made explicit in the four additional TPACK constructs: TK, TPK, TCK, and TPACK (Graham, 2011).

Depending on the Integrative or Transformative Relationship

Gess-Newsome (2002) defined PCK as the combination or mixture of different types of knowledge. Based on the relationship between the constructs, she identified the “integrative” or “transformative” perspectives. As shown in Figure 2, the “integrative” perspective, using a Venn diagram, emphasizes areas where different categories of knowledge overlap, and the “transformative” perspective, using a block diagram with arrows, views PCK as a new synthesized form of knowledge that cannot be explained by the sum of its parts.

According to Graham (2011), one potential confusion with the current dominant representations of the TPACK framework would be “use of the Venn diagram representing an integrative model while the language outlined by Mishra and Koehler (2006) implies a more transformative understanding of the constructs” (p. 1957). Therefore, understanding whether the constructs within the TPACK model

Figure 2. Visual representations from Gess-Newsome (2002) of integrative (left) and transformative (right) models of Pedagogical Content Knowledge (PCK)



are integrative or transformative is particularly vital to establish construct validity for instruments that measure TPACK. A wide range of integrative to transformative perspectives can be found in the current research literature. Some researchers have also outlined the integrative versus transformative issues. For example, Doering et al. (2009), and Koehler, Mishra, and Yahya (2007) have taken an integrative approach by collecting evidence of TK, PK, and CK and using that data to infer existence of TPACK and other constructs. However, Mouza and Wong (2009) combined the integrative and transformative perspectives by searching for evidence of six TPACK constructs (i.e., PK, CK, PCK, TK, TPK, & TCK) as if they were distinct constructs and then claiming the combination of the six elements indicate the existence of TPACK. This uncertainty about the nature of TPACK has derived from the uncertain perspectives in the theoretical model (Graham, 2011).

CONCLUSION

The TPACK framework has presented a way of thinking about effective technology integration, specifically knowledge associated with integrating technology effectively into learning environments (Polly & Brantley-Dias, 2009). The literature of TPACK have also shown the potential to shape the way teacher educators and professional developers prepare teachers to integrate technology. However, teacher's TPACK is a complex process. Some teachers never fully develop their TPACK despite the use of technology on a daily basis, while other teachers embrace technology and quickly become effect teachers capitalizing on how technology enhances the learning environment (Ivy & Franz, 2013).

The TPACK model provides a framework for understanding teachers technology content, pedagogy, and understanding of how to us technology in a given subject. Extending and enhancing the TPACK framework may be a better way to realize the potential of technology in the real-world classroom (Doering et al., 2009). However, there is a strong need for future study to understand what TPACK looks like in practice, specifically examining components related to pedagogical knowledge. As a result, research is needed to examine how teacher educators and professional developers can best develop activities to further develop the TPACK of K-12 teachers (Polly & Brantley-Dias, 2009), since only as researchers understand the interconnectedness of TPACK, technology, and professional development will teacher practice be able to further improve.

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Chapter 33
Strategies to Support the Faculty Adoption of Technology for Student Success Initiatives

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ABSTRACT

Faculty members have a key role in helping students to navigate through the academic requirements for their chosen degree program. As the call for more institutional accountability increases across the higher education landscape, retaining and graduating students becomes critical for institutions. Technology has been touted as the solution to alleviate the problem by adopting more efficient ways of improving and monitoring student success. Historically, the faculty's primary focus was to teach, engage in research and service with limited oversight and full autonomy. This chapter will examine strategies to facilitate and support the faculty adoption of technology as it pertains to student success initiatives. The author will discuss the types of faculty and their responsibilities, the barriers institutions face to faculty participation and how to motivate faculty to adopt technology to support student success. Finally, selected strategies for successful faculty adoptions that will support student success initiatives and programs will be reviewed.

INTRODUCTION

Academic Robert Diamond noted "An institution's greatest asset is its faculty," who goes on to state, "faculty members bring creative, culturally sensitive ideas to the planning process, and as key change agents, they ultimately must participate in any sustainable institutional change."(Diamond, 2002) Today, faculty members face increasing pressure to perform at ever-higher levels with extensive research experience and publications needed to simply land an academic job, let alone achieve tenure. In their work on the status of faculty and the academic profession in America, Schuster and Finkelstein (2007) discuss many of the shifts that have occurred in the later part of the 20th century. Over time, these shifts have caused a substantial transformation of the American academic profession and a restructuring of

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the academy. One of the most promising shifts and intriguing discussions concerns the faculty adoption of technology to improve student success outcomes. Many believe the key to transforming our institutions is to involve and engage faculty early in any technology adoption process. Much of the research concerning these theories has already occurred through grant-funded initiatives sponsored and supported by organizations such as EDUCAUSE, Achieving the Dream, Lumina, and the Bill and Melinda Gates Foundation.

Student success initiatives and programs take on many forms in higher education so we must be clear to define what constitutes these activities. It is important for institutions to engage all members of the campus community to create a culture of student success that is appropriate and inclusive for each institution. We know that faculty often serve as the primary interface between students and the institution, and any inclusive student success initiative requires faculty input to achieve a timely or holistic interpretation of student status in the academic enterprise. But most schools still struggle to implement technologies that can support faculty in executing on these items. In fact, faculty members are often viewed as the missing link when it comes to using campus technology solutions. How can an institution ensure that valuable faculty insight into student behavior isn't lost – how do we harness the faculty point of view?

KNOWING "WHO ARE YOUR FACULTY"

This may seem elementary, but knowing the faculty at your institution is critical to understanding how to help them to engage in adopting student success technologies and programs. Being cognizant of the types of faculty who work at higher education institutions and the type of institutions where they work are crucial to improving student success. While the workload may have changed, the role of the faculty member has remained consistent over the years in terms of their functions and responsibilities. The faculty responsibilities generally encompass three functional areas or components: *teaching, research, and service*. The proportion of time a faculty member spends (or is expected to spend) in each area varies generally by institution type and more specifically from institution to institution.

Teaching

This generally includes actual in-class time working with students, as well as time spent mentoring and directing research by students and preparing for class. Depending on the specific institution, such time could also include office hours as well as time spent revising old or creating new courses. Technology has changed the way faculty engages students in the learning process through the delivery of active learning and pedagogies. Most technologies aimed at supporting student success are applicable to this area.

Research

The area of research broadly refers to the inquiry and/or discovery activities of the faculty member. Faculty members in all institution types engage in some form of intellectual inquiry that demands a significant portion of their time and energy and should also be valued as research.

Service

This component of faculty work in the context of academia generally refers to service to the institution, the external community, and the larger academic community. Smaller colleges often require faculty to be active in shared governance through active engagement in faculty senate meetings, exercise of control over the curriculum, and involvement in advising students or similar activities that support the mission of the institution. Faculty activities that qualify as service can vary among institutions and may include leadership in community service activities in the institution's city or state, professional societies, or other national organizations. For the most part, faculty members are granted promotion and or tenure based upon each institution prescribed requirements in these areas.

Faculty Rank

Understanding rank and length of employment terms would be another consideration when looking to engage faculty in technology adoption initiatives. Faculty rank is used to differentiate seniority among professors. The typical structure in ascending order is assistant, associate, and full, with full professor being the highest rank that a faculty member can receive. In addition to assistant, associate, and full professors, institutions also have positions called lecturers.

Generally speaking, the job responsibilities for a faculty member do not change based on rank. Senior faculty may have special responsibilities based on their rank. For example, full professors play a significant role in the tenure and promotion process. In addition, many senior administrative positions such as dean or provost require a rank of full professor.

Faculty contracts vary tremendously in their length from lifetime appointments to one semester. One of the key differences in faculty positions is if the position is tenure-track, tenure-earning, or tenure-eligible which means mean the same thing— that someone can earn tenure. For tenure-track positions, the initial time frame for assistant professors is typically 6 years. If successful, the person will be granted tenure (lifetime contract) and promotion to associate professor. It is the one of the main reasons why individuals chose the academy as a profession in the first place. Part-time or adjunct faculty, which is notably the largest growing faculty category, represents approximately 40% of the institutional staff in a degree seeking institutions. They are considered temporary, part-time workers with little to no influence in the institutional decision-making process.

BARRIERS TO FACULTY PARTICIPATION

Understanding the barriers to faculty participation in technology adoption is not as straightforward as one might imagine. In 2009, the Achieve the Dream (ATD) organization reported findings based on the work of Public Agenda's research on the most promising practices for engaging full-time and adjunct faculty change efforts to increase student success at community colleges. Twenty-six community colleges participated in the first round of ATD's study between 2004 and 2009. The report found the colleges that succeeded in establishing a strong culture of evidence shared several key features and listed common barriers to engagement both for faculty and institutions. The common challenges faculty face in participating in activities such as technology adoption is not always understood by administrators. Faculty are constantly asked to participate in new initiatives that they view as additional duties above regular job responsibilities. They may be hesitant to participate and invest in new activities without assurance from the administration that it won't become the "flavor of the month" which can breed mistrust from what may feel like "top-down" directives.

The ATD report provides several institutional challenges that reinforce barriers to participation; for example, a reward structure that includes compensation, tenure and promotion policies which are not always congruent with newer practices. Faculty autonomy and governance can often insulate instructors from the pressure to adopt new technologies or take on new responsibilities. Many institutions experience frequent change in leadership that often threatens the stability and level of support for any initiatives that are not yet institutionalized. Finally, lack of communication between faculty, staff and administration can reinforce the silos that exist between departments and undermine efforts to engage faculty in new initiatives.

Student Success, Analytics, and the Faculty

In the last decade, the term "student success" has come to be synonymous with student retention and completion of postsecondary work. Vincent Tinto, professor emeritus at Syracuse University, provided clarification of the difference between the two terms. Student retention implies that the student is successful when they stay and eventually graduate from the same institution. The term student success allows us to include the notion of a student being successful even if they do not finish their program of study at the same institution but transfer and complete elsewhere. Student success can also mean learning and success in individual courses. Currently, we still measure student success by degree completion, which is an important metric for institutions that must answer to regional accreditation bodies, government funders, and alumni on how well they meet their prescribed goals. As the call for more institutional accountability increases across the higher education landscape, retaining and graduating students becomes increasingly critical for institutions.

According to Campbell and Oblinger (2007), these calls to action are forcing institutions to adopt modern and efficient ways of improving and monitoring student success. In recent years there has been an increase in the use of business intelligence to collect and analyze vast amounts of student and institutional data. The analytics process involves gathering and organizing multi-source information, analyzing and manipulating data, and using the results to answer inquiries that go beyond traditional reporting systems by providing decision-support and intervention or engagement capabilities. Academic analytics can be thought of as an engine to make or guide actions by capturing data, analyzing, and reporting on the data, and also supports the development of predictive models and actions based on predictions and probabilities. These predictions can be used by the institution to provide information, or at the other end of the spectrum, to inform interventions to influence a change in student behavior (Campbell and Oblinger, 2007).

The use of analytics is now poised to be a key strategy to improve student success outcomes and faculty involvement will have a critical role in developing and contributing to measures and planning actions to address at-risk students. Depending on the role, faculty may be involved in facilitating interventions such as inviting students to office hours, providing additional practice quizzes or encouraging participation in tutorial programs. In order to receive full cooperation, it is essential to inform faculty well in advance before initiating any new project. Since academic analytics are relativity new tools for student retention and success, faculty may need several opportunities to learn about the practice before becoming receptive to participation (Campbell and Oblinger, 2007). Institutions can help faculty have a better understanding of new practices for student success by developing an orientation program that clarifies the roles and responsibilities for faculty and students.

Motivating Faculty to Participate

We can take cues from past studies on faculty efforts to adopt educational technology when trying to understand how to better motivate faculty to participate in utilizing technology to enhance student success initiatives. Franziska Zellweger Moser conducted research on the adoption of educational technology and developed a model to describe how faculty integrates educational technology into their teaching. As discussed above, the adoption of new technologies whether for instructional, planning and/or advising purposes are scrutinized by faculty to determine if the activity fits into existing promotion and tenure requirements. In other words, would adopting a new technology result in measurable productivity outcomes as it relates to faculty work?

Moser's model, entitled the *Faculty Educational Technology Adoption Cycle,* includes five behavioral characteristics of faculty that are observed when implementing educational technology. They are time commitment, competence development, course redesign, teaching/learning experience and reflection. At the core of the model is the amount of time the instructor invests in integrating an educational technology into their courses. The time invested frequently depends upon the organizational incentives and on individual variables of the faculty member such as personal values and goals. The model has several steps in the technology adoption cycle that may hinder or increase faculty willingness to engage in the processes. Since time is a scarce resource for faculty, it may be difficult for them to commit to any type of technology adoption. It is critical for institutions to ensure the technology support units are responsive to the needs of the faculty during each phase of the technology implementation process (Moser, 2007). However, some of the same strategies that are enlisted to encourage faculty to engage in instructional technologies in teaching may be used to engage them in adopting technologies for student success. The strategies taken from Moser (2007) faculty adoption model are what the institution can provide to support faculty: engage in continual need analysis; provide a well-rehearsed supply of scalable services that reflect the priorities and skills of the individual technology support groups; implement a solid and efficient process for consulting with individual faculty; get involved with a number of larger projects that foster overarching collaboration and finally, conduct multifaceted evaluation activities.

A 2010 Public Agenda report frames the conversation for faculty and relates to them as partners in the productivity agenda. The *Education Productivity Initiative* centers on the Lumina Foundation's goal to increase the percentage of Americans with high-quality degrees and credentials to 60 percent by the year 2025. The key to achieving this ambitious goal is engaging faculty who, as "frontline" stakeholders in higher education, are critical to the success of any productivity agenda. "Student success" is a framework that resonates with faculty concerns around teaching and learning and is a natural vehicle for beginning conversations about the role faculty can and should play in helping more students complete degrees in a timely fashion. As noted by a university president in the Public Agenda report, "For faculty, student success is the cognitive framework that makes the most sense to them, and it's something that most do care deeply about despite their griping." The report identified several ideas on how to engage faculty in new initiatives. However, two strategies in particular resonated as promising strategies to get faculty involved in any new initiatives: 1) target younger faculty as early adopters and 2) engage faculty outside of their departments.

Younger faculty members are more likely to be "early adopters" and are willing to experiment and participate in new uses technology that will enhance student success. This does not mean faculty members who have been in the trenches are not, but at four-year institutions especially, faculty members seem to be more involved in the disciplinary structure of their profession and the corresponding research agenda. Working with younger faculty is a positive way to build consensus for your student success initiatives. Faculty members may be eager to attend meetings and conferences outside the institution as it allows them to engage with faculty members from other disciplines and institutions and exposes them to the national conversations around student success and completion.

In an article on faculty engagement and support, Paul R. Hagner shared the ideas of David S. Brown and Elson S. Floyd, from Wake Forest and Western Michigan respectively, on faculty development in the area of enhanced, computer-based technology techniques and the learning environment. They noted one of the best practices is an "enabling environment" which is a pre-condition to institutional and transformational change (Hagner, 2000). This means the institution provides the necessary support, incentives and rewards for innovation and change to take place. In the article, the faculty "early adopters" were entrepreneurial in nature, as they sought out resources and expertise to implement their own personal commitment to incorporate technology into their learning environment. The second stage of successful development is the conditioning of the second-wave of faculty who are committed to innovation and change but who are skeptical of the new technology. This group tends to have less technical capabilities than the entrepreneurial faculty. He goes on to caution administrators not to commit additional resources allocations based solely on the early adopters since they are more likely to persist in the use of technology over time.

STRATEGIES FOR SUCCESSFUL FACULTY ADOPTIONS

We continue to see a shift in the division of labor especially as it relates to the mission and work of the academy. It is important to understand role and impact technology has on how work is being accomplished, signaling a change in the way faculty conduct their work. As stated previously, some faculty view their role as solely to deliver instruction, mentor and advise students, and conduct research, as it has been done for the past century. However, the impetus for change has come from several unlikely places, the Millennials who are "digital natives" have grown up in the world filled with technology. This is not the experience for many of the faculty members who are digital immigrants and who had to be introduced to technology and innovation after working in a mostly non-technological environment. It is vital to engage faculty directly and early to participate in technology adoption for student success, provide training to assist in the adoption and implementation of student success innovation into their course and advising workload, and to additionally offer ongoing personal and tech-based resources to help faculty conceptualize the work (Pirani, 2014).

According to a series produced by Tyton Partners, an advisory consulting firm, the delivery of analytical data to student success staff, faculty and administrators are often facilitated through integrated software solutions that can help to bridge some of the communication gaps between student success stakeholders. Some solution programs serve as a central hub for connecting stakeholders, including students, to all the resources available to them. In addition, these technology solutions can serve as monitoring systems that allow any participant in a student's success plan to easily review the history of the student's engagement with the institution and other stakeholders. (Bryant, 2015).

The Tyton Partners' article outlined several effective practices for implementing technology to ensure a successful deployment based on the level of institutional commitment to student success and retention efforts across all stakeholders, including faculty, at the institution. The first, or highest of commitment is retention as a strategic priority, characterized by "a clearly defined strategic direction with backing from leadership, extensive financial support, and commitment of resources to student success and retention initiatives. Strategies that are successful at this type of institutions are: 1) creating cross-departmental committees to operationalize efforts to ensure that processes and workflows are adopted consistently throughout the institution; 2) auditing of advising model and capacity to ensure buy-in by faculty, advising and counseling functions; be aware that adopting tools like alerts and degree planning systems in many cases can increase advisors' workload; 3) investing in reporting capabilities which institutions should think of data as an input that continuously informs and improves strategic direction.

A second or lower level of institutional commitment views retention as an institutional initiative, meaning the commitment to student success and retention may not practically align with resources or leadership attitude. The effective practices that are proven more successful at this type of institution are as follows: 1) leveraging well-respected departments as to partner with a highly regarded department on campus when implementing a new program, in order to gain traction and credibility within the institution; 2) building end-user adoption by equipping faculty, students, and advisors with the knowledge to efficiently use new technology 3) ensuring communication loops are closed meaning after initial use of the system, ensuring a positive experience that encourages continuation of use; 4) using pilot groups for a gradual rollout serves several purposes; this approach limits financial risk and overcomes the ROI hurdle. 5) adopting intuitive technology that is easy to use; if an early-alert system requires a complicated sequence of actions, faculty members are less likely to engage with it. Similarly, reporting tools that create dashboards that are difficult to interpret are unlikely to be successful in transforming data into action.

Retention as a grassroots initiative is the final or third level of institutional commitment where there is a demonstrated lack of leadership or resource commitment and a student success and retention effort that is largely driven by individual departments rather than a top-down mandate. Effective practices that are successful at grassroots institution are: 1) identifying influential champions who can sway the thinking of others regarding the adoption; 2) pursuing external grants as alternate sources of funding from federal government and foundations; 3) limiting the number of new technology solutions introduced as implementing a new technology can take up a large amount of institutional resources; 4) managing expectations around the expected return on investment and the timing of those returns (Byrant, 2015).

CONCLUSION

Faculty will continue to be on the frontline of the student retention and completion initiatives at institutions. Developing strategies to make them full partners and advocates in the adoption of technology solutions to support student success is an attainable goal. However, it will take a shift in both faculty attitudes and perceptions and also an increase in the level of institutional commitment to retention outcomes to provide the necessary support, incentives and rewards for innovation and positive change to take place.

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Chapter 34
The Impact of Emerging Technology on Leadership Development

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ABSTRACT

Through an exploration of research and practical literature, this chapter examines the impact of emerging technologies on leadership development. First the authors discuss how technology has changed organizational approaches to training and development. Next, the authors address the benefits of leveraging technology for organizational learning and leadership growth. Then simulation and gaming, social media, and blogs are discussed for their particular strengths as key options for leadership development.

INTRODUCTION

Digital and technology disruption necessitates shifts in planning and execution of leadership development. Workforce needs have changed, and more importantly, technology has stimulated, and in certain cases, created new, or eliminated industries. The culmination of these factors establishes the business case for new skills and new strategies to meet market demands. This means that well-trained leaders must exist. Without properly developed leadership competencies to meet the current, and constantly shifting market demands, organizations risk market decline or shrinking market share. Many organizations have embraced the need for structured leadership development training and experiences with formal leadership and career development programs. Technological advances have helped organizations reduce costs through electronic processing, increase collaboration through virtual teams, and enhance work-life balance through expanded telework opportunities. However, technology shifts are not always considered in the implementation of leadership development initiatives.

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BACKGROUND

Organizational learning professionals are adjusting to the emergence of technology as a dominant factor in training and development (Ladyshewsky, Geoghegan, Jones, & Oliver, 2008). Early research identified the limited integration of technology into training and development, with most technology infusion focused on sales, marketing, or technology content. It was a time when integration of advanced technological approaches into training and development mainly focused on sales, marketing or technology content (Webber, 2003) and the landscape was too new to draw any real conclusions about its impact (Arbaugh, 2000; Cini, 1998; Vicere, 2000). Over time delivery models shifted to account for technology's larger organizational significance and calls for more dynamic training and development needs (Riha & Robels-Pina, 2009). While organizations have begun leveraging technology for more skill-based needs, the full impact of learning technologies as a key to leadership development have not been fully explored.

Slow adoption of technological advances into leadership development is not surprising. Technical utility often outpaces non-technological organization practices. In recent times, organizations leveraging technological advances have redefined how we share photos, raise money (crowdsource funding), access transportation (ride share networks), and secure travel accommodations (peer-to-peer short term rentals) while multiple, previously long-standing business models became obsolete (McCafferty, 2016). The disruptive nature of technology has led to consistent calls for its further integration into routine practices of developing leadership, management and other critical soft skills for organizational success (Adams, 2007; Shelley, 2015). Potentially the most challenging obstacle of technology disruption to leadership development is the people factor. Developing clear objectives, adopting appropriate strategies, effective deployment, and routine evaluation pose considerable challenges for organizations as they scramble to simultaneously manage emerging technologies and evolving leadership needs. With those considerations in mind, the authors recognize much attention has been given to the theoretical considerations at the intersection of technology and leadership. However, even researchers who delved into this area concede it warrants more consideration for implementation and execution rather than theory (Standifer, Thiault, & Pin, 2010). This chapter explores the impact of emerging technologies on leadership development, with specific discussions of organizational learning and effectiveness, leveraging technology for leadership growth, and promising strategies for leadership development.

SOLUTIONS AND RECOMMENDATIONS

Leveraging Technology

Leadership Growth

Training and development has continuously evolved as a critical driver of organizational growth. Research has shown digital advances technology disruptions spawn new expectations for learning experiences (Boyce, LaVoie, Streeter, Lochbaum, & Psotka, 2008; Cercone, 2008; Ladyshewsky, Geoghegan, Jones, & Oliver, 2008). Numerous factors must be considered to fully embrace a more digital, technologically savvy model for leadership development. Primarily, organizations need to address their strategy to design and deliver leadership training to decrease the likelihood of failure (Beer, Finnstrom, & Schrader, 2016). Specifically, organizations need to consider new workforce dynamics and the continual technology disruption affecting individual industries and organizations (Ladyshewsky, Geoghegan, Jones, & Oliver, 2008). For some organizations, this likely means embracing an open-source mentality and approach toward leadership training (Jesuthasan & Holmstrom, 2016). Additionally, organizations must strive to maximize the alignment between new technologies and desired outcomes. Strong alignment of this areas has been linked to productivity gains of up to 70 percent (Colfax, Santosa, & Diego, 2009).

Widespread technology adoption into leadership development must also include clear digital learning strategies. There is a consistent message in research leadership and education literature that it is not enough to simply apply traditional strategies to virtual environments (Al-Ani, Horspool, & Bligh, 2011; Riha & Robels-Pina, 2009). It is critical for organizations to leverage technology to offer more functionally-driven, just-in-time training to meet employee leadership development needs (Younger, 2016). Human resources leaders play critical roles in cultivating leadership in organizational members; thus, these same leaders must give the pertinent attention to digital learning strategies and leadership development. Researchers and practitioners alike have called for more strategic learning development approaches that shift away from transactional experiences and administrative services (Kerfoot, 2010; Lawler, III & Boudreau, 2012). This is underscored by findings indicating that nearly 90 percent of respondents indicated and affirmed the importance of leadership training in their organization, while less than half of survey respondents indicated a lack of clarity around who is definitively responsible for leadership development within their organization (Fulmer & Hanson, 2010).

Leadership training may also require a more effective use, and application of technology. Web 2.0 technologies represent a significant shift in the maturity, and interactivity of web-based technology platforms (Sasidharan, 2015). Taking advantage of faster, and more improved network infrastructure, dynamic hypertext markup language (HTML), asynchronous web development languages (JavaScript and extensible markup language (XML)), Web 2.0 technologies (such as Twitter, Facebook, Instagram, WordPress, and others) offer more collaborate, real-time digital communication platforms (Marchille, 2009; Sasidharan, 2015) Studies on learning web 2.0 usage and learning effectiveness suggest popularity of these technologies stems from ease of deployment and growing familiarity. Additionally, when these platforms have been strategically incorporated into development activities, user response has been positive when measures against stated learning objectives (Do-Hong, Wilkins, & Dunaway, 2011).

Organizational Learning and Effectiveness

Leveraging technology to drive productivity is essential to maximizing team and organizational effectiveness. This concept of organizational effectiveness is key to promoting strong, and successful leadership (Conceicao & Altman, 2011). Successful leaders thrive in organizations where their systems clearly define roles, responsibilities and relationships. Said organizations are prone to more malleable structures (Beer, Finnstrom, & Schrader, 2016) and continuous learning cultures (Conceicao & Altman, 2011). It is within these organizations that technology and technology leaders are accepted as a constant, yet evolving partners critical to the organizational system. Organizations that embrace the standing technology partnership experience greater levels of trust, open communication, and leadership coaching (Brookes, 2009; Colfax et al., 2009; Kerfoot, 2010).

Promising Approaches for Leadership Development

Simulation and Gaming

Multiple researchers have explored the impact of simulation via experiential software and multiple, online game environments as a catalyst for leadership development. Researchers, practitioners, and corporate educators agree simulation is a valid learning experience. They credit gaming simulations for providing critical insight to leadership practices for distributed teams (Lisk, Kaplancali, & Riggio, 2012), enhancing the pedagogical experience when paired with appropriate instructional materials (Standifer, Thiault, & Pin, 2010), expanding the capacity for meaningful data collection about leadership development and leadership education (Showanasai, Lu, & Hallinger, 2013). Simulation explorations have also shown that participants who were less likely to self-identify for leader roles in real life environments excelled in gamification leadership experiences (Hemp, 2008). Findings from human resource professionals and learning executives show simulation and gaming are being used to promote behavior change, reinforce skills, practice execution and increase exposure to content (Roberts, 2014). Organizational and education researchers found the collective awareness nature of simulation and gaming environments positively impacts leadership relationships (and hence leadership development) by reinforcing accountability and trust (Goh & Wasko, 2012; Hemp, 2008). Although simulation and gaming experiences foster the previously mentioned benefits, these approaches may not yet provide full insight to particular leadership approaches. For example, in Kaplancali's 2008 unpublished doctoral dissertation (as cited in Lisk et al., 2012) on multiplayer online gaming, no consistent links were found between transformational leadership behaviors and leader motivation to lead or leader self-efficacy.

Social Media

The relevance, and magnitude of social media must also be considered in relation to leadership training. While social media has become a regular context for exploring leadership behavior (Chang & Kim, 2011; Hwang, 2012; Park, 2013) and learning (Burzynska & Krajka, 2015; Roberts, 2014), executive leaders have been slow to fully embrace the tools for leadership development. The identified benefits of low cost and flexibility (Bertoncini & Schmalz, 2013) may be at odds with empirical findings and practical discoveries that the highly facilitative, deep listening leadership skills that can be developed with social media approaches require mutli-channel, asynchronous, unfiltered engagement (Traeger, 2012). Further adoption of social media into leadership development and organizational learning strategies requires clear alignment with learning objectives and further evidence of learning effectiveness from its use.

Blogs

Practitioners and researchers continue to explore the leadership development impact of online journals, commonly known as blogs. The ease of publication and integration of blogs propels its growth in use (Gonzales, Vodicka, & White, 2011). The personal, reflective nature of blog activity appeals to learning professionals as a medium for building community (Palloff & Pratt, 2007) and deepening leadership understanding (Raffo, 2012). Empirical investigations of blog activity suggest it prompts spikes in knowledge transfer (Ladyshewsky, Geoghegan, Jones, & Oliver, 2008), but may not necessarily lead to significant differences of analysis between related leadership constructs (Raffo, 2012). While blogs may provide a unique medium for leadership reflection, full leverage of its utility for organizational learning and leadership development may require more detailed strategy, rigorous instruction and structured frameworks (Cercone, 2008; Lawler, III & Boudreau, 2012).

FUTURE RESEARCH DIRECTIONS

Research identified in this study highlights the value and impact of technology on leadership training and leadership development. Future research on this topic should consider multiple areas. First, more data is needed to fully understand how technology advances impact the alignment of organizational needs and training objectives. Additional information is needed to understand the relationship between the experiences of organizational learning professionals and advanced technology adoption. Further research is needed to understand how specific technology platforms support specific learning objectives. Lastly, researchers and practitioners must respond to the industry call to show empirical evidence of the effectiveness of advanced technology tools and approaches on leadership knowledge transfer.

CONCLUSION

This research focused on the impact of emerging technologies on leadership development. While technology disruption will continue to outpace technology adoption, organizational leaders must identify strategic ways to integrate technology advancements into leadership development. Learner-centric and leader-centric approaches will enable organizations to withstand some shifts in workforce demographics. Since there is no single learning approach to satisfy all the leadership development needs, training and development professionals must continually revisit organizational learning objectives, desired organizational outcomes, and contemporary technology offerings. Focused attention on aligning these three items will support long-term organizational success in far more meaningful ways than accommodating simulation & gaming, social media, blogging or any other technology disruption. Proper alignment of learning objectives and desired outcomes enables organizational learning professionals to develop lasting partnerships with internal and external technology specialists for proper identification, evaluation, and selection of appropriate technology tools to support leadership development needs.

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KEY TERMS AND DEFINITIONS

Blog: Web-based personal journal or diary.

Leadership Development: Teaching and training of leadership skills to members of an organization.

Simulation: Technology-based imitation of real life system or process.

Social Media: Software applications and websites that enable users to create and share content across expansive networks of users.

Technology Adoption: The process of integrating technology-based functions and utility into organizational processes.

Technology Disruption: Technology applications that significantly alter status quo business operations.

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