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And
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Las Vegas, NV

Editor: Michael Simonson

Nova Southeastern University
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And
Volume 2: Selected Papers
On the Practice of Educational Communications and Technology

Presented at
The Annual Convention of the Association for Educational Communications and Technology
Sponsored by the Research and Theory Division
And
The Division of Instructional Design
Las Vegas, NV
2016

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Preface

For the thirty-eighth time, the Research and Theory Division of the Association for Educational Communications and Technology (AECT) is sponsoring the publication of these Proceedings. Papers published in this volume were presented at the annual AECT Convention in Las Vegas, NV. A limited quantity of these Proceedings were printed and sold in both hardcopy and electronic versions. Volumes 1 and 2 are available through the Educational Resources Clearinghouse (ERIC) System. Proceedings volumes are available to members at AECT.ORG. Proceedings copies are also available at:

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The Proceedings of AECT's Convention are published in two volumes. Volume #1 contains papers dealing primarily with research and development topics. Papers dealing with the practice of instructional technology including instruction and training issues are contained in Volume #2. This year, both volumes are included in one document.

REFEREEING PROCESS: Papers selected for presentation at the AECT Convention and included in these Proceedings were subjected to a reviewing process. All references to authorship were removed from proposals before they were submitted to referees for review. Approximately sixty percent of the manuscripts submitted for consideration were selected for presentation at the convention and for publication in these Proceedings. The papers contained in this document represent some of the most current thinking in educational communications and technology.

Michael R. Simonson
Editor

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VOLUME 1 – SELECTED RESEARCH AND DEVELOPMENT PAPERS

New Definition of Educational Technology

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Abstract

Throughout the history of educational technology, a variety of accounts have been provided in this subject matter. In the beginning, it was introduced as use of instruments, and then as process of design, implementation, and evaluation of educational situations, and then as study and moral action on facilitation of learning and improvement of performance through creation (building), use and management of technology processes and appropriate resources. In the end, with regard to the accounts, a new account of educational technology is provided.

Keywords: Technology, Education, Educational Technology, Definitions

Introduction

Definitions of educational technology, to understand the term educational or instructional technology, we address each of the words namely technology and education.

Definition of technology

Paul Saettler, a famous educational technology historian, says the word technology (in Latin "texere" refers to finding or building), does not necessarily refer to the use of machineries as many believe it is the case, but instead it is referred to as any arts and scientific skill tapping scientific knowledge (Saettler 1968). James Finn defines technology as technology plus machineries including processes, systems, management, mechanisms for human and inhuman control, as well as a method for dealing with problems by considering their importance and attraction, applicative feature of technical solutions and economic values (Finn 1960).

To recognize technology thoroughly, we approach the words incorporating the term; the word is derived from technologia in Greek which means performing an art or career systematically. The first part of the word techno is a mix of art and technique consisting of related knowledge on principles and ability to achieve intended results. In other words, technique refers to practical skills such as knowing and performing. The root of the word logos also refers to argument, explanation, principle and reason. Therefore, technology refers to arguable or logical application of knowledge (Fardanesh 2015, P. 10).

Definition of education

The term education refers to process of interaction between learner and resources of his learning. In other words, conceptual learning consists of process of teaching someone, learning from someone and learning from something. Teaching someone occurs in teaching in the most obvious manner, so learning from someone refers to interaction of learner with human resources and learning from something consists of interaction with inhuman resources (materials, resources, environment, and media) in the process of learning. Once defined by this structure for situation of particular learning, the nature of education is achieved (Pakpur 2011, P 20). Dubois defined education as thorough arrangement of learner's environment in the face of quite a general definition of education in definite circumstances (Fardanesh 2015, P. 12). The definition, though it is a very general definition of education and addresses a variety of points such as environment, results, and particular situations, has failed to pay attention to important points including learners' needs, prior knowledge, and motivation,

Bruner believes that four important questions should be answered in education
1- what are learners' assumptions and prior knowledge?
2- to learn more, what should structure and combination of learning topic like?

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3- how are learning materials arranged and ordered to facilitate learning?
4- in what way do encouragement, punishment, and feedback apply in achieving educational goals?

Bruner is among the first people who call on educational practitioners to pay attention to learners' prior knowledge, structure of topic, order and sequence, time and circumstance, and highlighted the application of factors such as encouragement, punishment, feedback, and question (ibid).

Silverman came up with two concepts of educational technology; relative educational technology, which lays emphasis both on methods and instrument; structural educational technology, which lays emphasis on analysis of educational issues, production and choice of evaluation instruments and means of production with regard to reaching optimal educational returns (Silverman 1968). An account of educational technology has been issued by Association of Educational Communication and Technology. According to this, definition of educational technology includes theory and practice of design, production, application, management and evaluation of learning processes and resources (Seels and Richey 1994). This account was generally approved by educational technology experts until recent technologies changed once again the theory, practice and method, and duties of experts in this field in their workplace. In a more recent definition of educational technology, this was defined as follows;

Educational technology is the art and study of building a learning system as well as setting up a feedback mechanism for learning system. In such a method, the system is sensitive to every individual's dynamics, in the sense that each individual should be active in the process of learning.

AECT also works to redefine the field of educational technology and offers more recent accounts so that it accounts for the latest changes of this field. In January 2008, ACET organization approved its results which allowed for amore updated definition of educational technology. It suggests that educational technology includes study and moral action on facilitation of learning, and improvement of performance through creation (building), use and management of technology processes and appropriate resources (Januszeski and Molenda 2008). Another definition of this field is as follows;

Educational technology: it involves analysis, design, production, evaluation, implementation, and management of educational systems and other learning environment which leads to learning and development of mind, body and spirit (Song and Kidd 2010). Spread of industry and influence of technology across societies and fundamental changes in living method and people's attitude as well as the importance of time have brought about changes in human's needs, as previous theories fail to account for these needs. Thus, change in requirements requires theories to induce change and development; one of the realms is education that people's updated needs have brought about fundamental changes in its goal, audience, content, design, organization, presentation, management, evaluation and methods. Educational technology is required to provide easier and more effective learning in relation to audiences and their interests and characteristics in the convenient time in an effective manner, in accordance with audiences' requirements and change and developments spurred in education system.

Conclusions

Given the definitions and explanations provided, this field can be defined as follows; educational technology includes a dynamic system of study and moral action with the aim of specifying and providing an interactive environment for learners' activity for their fast, easy, durable education and learning in harmony with their interests and characteristics. This account includes concepts that entail other fields, which are briefly explained in what follows; above all, educational technology is a system. According to the definition, systems includes a set of interrelated components interacting together for a specific goal. According to this, educational technology can also be defined as interrelated components interacting together for a specific purpose. Another concept embedded in this definition of educational technology is dynamics that makes it get rid of stability. Passage of time and change of attitudes, technology and societies' exclusive changes call for new techniques that require us to adjust our educational technology for the changes and utilize knowledge on the basis of technology. Study thus includes concepts, theories and design methods, production, application, management and evaluation as well as use of theories and findings of other sciences on educational technology. Action involves subcategories including design, production, management and evaluation of the whole process. As a matter of fact, this area is the application of study area. Moral: in any of stages of the process, the process of human morality and individual rights should be observed. Definitions of educational technology specify the areas of this filed.

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Using Concept Mapping as Note Taking Strategies in Undergraduate Science Courses

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Descriptors: Concept mapping, Note taking strategies, Undergraduate science courses, Visual literacy

Abstract

Most undergraduate students take an introductory science course during their first two years. One of the challenges of teaching an introductory science course is the reality that many undergraduate students are not prepared to be self-directed learners. Many students expect to earn a grade of A or B just like in high school. However, the failing results of the first exam can be a shocker to the students. Not only the students do not know the science content they studied, they had difficulties retaining and recalling the information.

During the fall 2015 semester, the researchers assigned approximately 139 students within a Principles of Biology I (BIOL 1107) lecture course to one of the specific note taking category identified for this study -- Traditional note taking, Concept mapping, and Visual mapping. Students were asked to demonstrate their assigned note taking strategy in notebooks that were collected at the day of each unit exam. The notebooks were collected and reviewed based on demonstrated understanding of detailed content based on major concepts within a given unit. Demographic information (prior GPA, gender, earned credit hours, declared major) was used to check for correlation with the note taking strategy and exam averages.

Findings, based on quantitative data, showed no significance among note taking strategies and exam averages; however, students with a GPA of <3.0 following the traditional note taking strategy were not performing well on unit exams. Qualitative data, overall, suggests that the students found their specific note taking strategy to be beneficial, especially when it came to preparing for the cumulative final exam.

Introduction

Science education in general is heavily teacher centered (Brinkerhoff & Booth, 2013). It often relies on repetition and rote learning as well as exam averages as an indicator of knowledge learned. The problem lies within the fact that students do not know *how to take notes*; they often have difficulty recognizing key ideas or concepts.

Students also do not know *how to study*. It is easy for students to get overwhelmed when studying simply due to the amount of information written and documented in their notebooks. Without the proper organization of the amount of information collected could be daunting to even the most prestigious of scholars. Lastly, students lack the needed critical thinking skills especially in science courses (Hager, Sleet, Logan & Hooper, 2003; Rowe, Gillespie, Harris, Koether, Shannon & Rose, 2015). It is difficult for many students, especially, at the freshmen level, to apply what they are learning to the real world.

Purpose and Research Questions

The idea of concept or visual mapping as a note taking strategy was implemented to help students identify major concepts within a given unit and to easily make connections between or among major concepts. The researchers wanted to find out if implementing concept or visual mapping as a note taking strategy would help students retain and recall information throughout an entire semester of instruction.

Methodology

Concept maps are graphical tools for organizing and representing knowledge (Hay, Kinchin, Lygo-Baker, 2008; Novak, 2010; Sakiyo & Waziri, 2015). Major concepts are enclosed within circles or boxes and connections in the form of lines or arrows are used to demonstrate a connection between two related concepts. Along with the lines or arrows, one must include a descriptive linking relationship, further demonstrating the relationship between or among major concepts. Novak (2010) stated that concept maps are represented with a hierarchal or pyramidal structure with broad concepts located at the top and less general, or more specific, concepts located on the bottom. It is most helpful to construct concept maps n reference to a question. This allows organization of ideas and knowledge. A major goal of concept map construction is to reorganize existing knowledge with already acquired knowledge (Briscoe & LaMaster, 1991; Nesbit & Adesope, 2006; Patrick, 2011).

Visual maps are similar to concept maps; however, they are represented in a web format: broad concepts in the center and less general concepts branch from central concept (Hay, Kinchin, Lygo-Baker, 2008). Also, with visual mapping, very little text is involved. Rather than have a word or concept enclosed within a box or circle, visual maps require an image or drawing. The only text within a visual map should be the descriptive linking relationship between or among concepts.

Throughout the fall 2015 semester, 139 students, enrolled in two sections of BIOL 1107 from a southeastern state university, were asked to choose a note taking strategy to follow during the entire semester. About a third of the student population from each section were aligned with a note taking strategy. Color-coded, spiral-bound notebooks were provided to the students based on their specified note taking category: blue (traditional note taking), yellow (concept mapping), and green (visual mapping). The students were required to keep up with and update their notebooks all semester by organizing lecture notes based on their assigned note taking category.

On the day of each unit exam covering one or two chapters from the assigned textbook, notebooks were collected and graded. The total points awarded for the notebooks contributed 10% to the final grade. An undergraduate student research assistant was responsible for the task of reviewing all notebooks for content accuracy, awarding points using specified guidelines, and returning the notebooks to their respective student owners by the next lecture meeting. It should be noted that the research assistant is a biology undergraduate; therefore, she has extensive knowledge in the material she was reviewing.

Demographic data for all 139 students was also collected. Data considered included the student's gender, major, and earned credits that were used later for data analysis.

Participants

BIOL 1107 is freshmen level course required by pre-nursing majors as well as science majors, in general. The course is worth a total of three credit hours plus an additional credit hour for the co-requisite lab. Of the 139 students, more than fifty percent were pre-nursing majors, followed by science majors (i.e. chemistry, geology, physics, or computer science). The remaining participants were non-science majors or undeclared majors.

Data Collection and Strategies

The fall 2015 semester of this course included four unit exams and a comprehensive final exam. On the day of each unit exams every student was required to turn in his/her notebook in order for it to be graded. The notebook

grading was completed by an undergraduate biology student with extensive knowledge in the material covered in the notebooks. She was responsible for ensuring that the information within the notebooks was accurate, making sure connections among major concepts were correct and relevant, and also ensured that the students followed the specific guidelines outlined by theirs specific note taking strategy. The research assistant then assigned a grade out of a possible 10 points and communicated this information to the instructor. Notebooks were then placed outside the instructor's office door in order for the students to pick them up prior to the next scheduled lecture.

The student research assistant also compiled demographic information with the help of the lecture instructor. This way, it was easier to monitor any correlations among the students, their demographics, their exam scores, as well as their notebook grades. The student assistant kept track of all this information within Excel spreadsheets.

For the third and final exam, survey questions were included in order to generate honest, qualitative data. The responses were coded in order to ensure anonymity.

Results

At the end of the semester, the researchers found that there was no significant relationship among gender, major, prior credits earned with any of the note taking strategies. There was also no significant relationship for students who are freshmen or have GPAs above a B average in all note taking categories. However, the researchers did find a significant relationship between students following the traditional note taking strategy and have a GPA less than a B. It appears that students with less than a B average are not benefitting from the traditional note taking strategy based on their final average for the course (Table 1). Perhaps, as the researchers recommend, students with a GPA lower than a 3.0 should follow either the concept mapping strategy or visual mapping strategy in order to improve not only their exam averages, but also their overall knowledge of the material.

Table 1. Prior GPA and note taking strategies.

Prior GPA	Note Taking Strategies			95% Confidence Interval	
		Mean	Standard Error	Lower Bound	Upper Bound
Freshmen, First Semester	Concept Mapping	83.894	1.678	80.573	87.214
	Visual Mapping	81.617	2.056	77.550	85.684
	Traditional Note Taking	86.902	1.625	83.687	90.117
Prior GPA Below B	Concept Mapping	83.490	3.064	77.428	89.552
	Visual Mapping	80.802	3.064	74.740	86.864
	Traditional Note Taking	70.811	2.772	65.327	76.294
Prior GPA Above B	Concept Mapping	83.687	3.475	76.813	90.561
	Visual Mapping	87.066	3.475	80.192	93.940
	Traditional Note Taking	86.959	2.457	82.098	91.819

Conclusion

Incorporating concept or visual mapping as note taking strategies does make a difference in student performance, especially with students having a GPA of a 3.0 or higher. In future semesters, the researchers plan design a better study that will demonstrate how the use of concept or visual mapping impacts comprehension, retention, and recall of relevant information.

For future semester, the researchers plan to make some changes in implementing similar research studies on note taking strategies. They plan to have more information available to the students on what is expected from them. They believe that this enhancement would improve students' understanding of the research activities. They plan to provide a detailed rubric for students to follow whether they are using concept mapping or visual mapping strategies. These rubrics would be discussed in detail on how the notebook submissions will be graded.

In rethinking the study for future implementation, the researchers had also decided to remove the traditional note taking as a submission option since it was learned that this strategy did not benefit students --- primarily those with below a B average. Lastly, the researchers plan to continue implementing other lessons learned from the past semesters in order to hone in on aspects of the study that were genuinely beneficial to the students. They believe in continuing the use of concept or visual mapping to find out more how these strategies benefit the students in comprehending, retaining, and recalling information from course texts and lectures.

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An eLearning Strategy for New Media Literacy Within a Participatory Culture

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Descriptors: New Media Literacy, Participatory eLearning Culture

Overview

With the developments of new communication technologies, the need for new media literacy is increasing. The importance of media literacy is growing as more individuals are accessing new media tools. New media includes ever growing communication areas such as computers, the internet, and mobile tools. These evolving resources necessitates a transformation from traditional literacy. Technological transformations and developments change the way people use media. New media literacy requires individuals to develop their understanding of dynamic contexts, the ability to increase perception in this new environment and enhanced analyzing skills. In new media areas, users not only consume information but also they produce new knowledge. Besides tool based usage, new media has social and structural features that includes: socio cultural aspects, the democratic participatory process, citizenship, and critical thinking. In the light of these particularities, users need to have knowledge acquisition and become skilllful about new media in areas of usage and production. The fact that new media technologies evolve and transform rapidly makes it necessary for indivuals to use new media platfroms on a day-to-day basis. Not all indivuals know how to use these platforms and for what appropriate purposes. Yet, not all new media users become instant new media literates through application.

This study represents a new media literacy centered exploration beyond theoretical discussions. It was conducted to evaluate new media implementations in different socio cultural structures and pilot projects. Furthermore, it brings a new approach to new media literacy training. This study aimed to develop a new media literacy curriculum with regard to assisting individuals to gain related essential liteacy skills. This study was focused on a new media participatory culture and interactivity discussed by Jenkins (2006). Jenkins, defines new media participatory culture as a culture is emerging as the culture absorbs and responds to the explosion of new media technologies that make it possible for average consumers to archive, annotate, appropriate, and recirculate media content in powerful new ways. In addition to this, this study aimed to make a significant contribution to a new media literacy syllabus by suggesting eLearning methods instead of traditional classroom learning models.

New Media and Literacy Transformation

Mutlu Binark and Mine Gencel Bek (2010, p. 211) determined that new media pratices can become natural and routine parts of daily life. With this premise, descriptions such as *new media literacy*, *computer literacy, internet literacy*, *electronic literacy*, *digital literacy,* and *multitasking literacy* have evolved into daily language. These terms show the importance of literacy related tasks. Kress (2004, p.1-5) pays attention to transformation in traditional literacy and claims that a driving force is changing from writing to visuality. Kress points out that context based writing gives place to screen based visual and represented forms. This research study is important with regards to focusing on screen-based literacy development.

New media brings structural transformations to traditional media and converts it to digital representations. The internet allows individuals to reach information at the same speed, to copy digital coded information effortless, and show a diversity of media types. According to Manovich (2001, p. 49) , all new media objects, whether they are created from scratch on computers or converted from analog media sources, are composed of digital code; they are

numerical representations. This has two key consequences: 1) new media objects can be described formally (mathematically) an image or a shape can be described using a mathematical function and 2) new media objects are a subject to algorithmic manipulation. For instance, by applying appropriate algorithms, we can automatically remove *noise* from a photograph, improve its contrast, locate the edges of the shapes, or change its proportions. In short, media becomes programmable and flexible. Monavich summerized:

> In contrast to analog media where each successive copy loses quality, digitally encoded media can be copied endlessly without degradation. An other one Digitization involves inevitable loss of information. In contrast to an analog representation, a digitally encoded representation contains a fixed amount of information. (2001, p. 66)

New media is also interactive. In contrast to traditional media where the order of presentation was fixed, the user can now interact with a media object. In the process of interaction the user can choose which elements to display or which paths to follow, thus generating a unique work. Thus the user becomes the co-author of the work. According to Rene Hobbs (2010, p.53), media professionals in news and journalism, digital media, advertising, and cable and broadcast television are beginning to recognize that everybody wins when consumers are more active, engaged, intentional, and strategic about their media use habits. When people have high expectations for the quality of news and entertainment, there will be more opportunities to produce quality products. By working together to build coalitions and partnerships, we must support digital and media literacy as a community education movement for all people.

One way of evaluating new media if to focus on its use in practice. It can be regarded as the biggest global flow of information. Castells (2004, p. 185-203) underlined this new network organization. New media technologies networks have changed individualistic and social interaction within a new form of time and space. In order to understand and define this process, the most acceptable definition is "*Network Society."* Castells used the term to signify individuals who live within a global and local network society connected with each other.

Siemens (2006, p. 7-9) developed a theory for the digital age, called *connectivism*, denouncing the boundaries of behaviorism, cognitivism, and constructivism. His learning theory has resulted in a debate over whether it is a learning theory or instructional theory or merely a pedagogical view. Siemens claims that instead of knowledge residing only in the mind of an individual, knowledge resides in a distributed manner across a network. Instead of approaching learning as schematic formation structures, learning is the act of recognizing patterns shaped by complex networks. According to Siemens the networked act of learning exists on two levels:

- Internally as neural networks (where knowledge is distributed across our brain, not held in its entirety in one location).
- Externally as networks we actively form (each node represents an element of specialization and the aggregate represents our ability to be aware of, learn, and adapt to the world around). (2006, p. 9).

This study was focused on various theorically analyses of new media literacy. Further more, this study points out new media literacy's various advantanges, abilitites, and sufficiency as well as various jeopardies, dangers, and risks. Livingstone (2006, p. 106-112) underlines that internet literacy is different from traditional literacy in terms of related skills, experiments, contexts, and institutions. Internet literacy allows individuals to take advantage of online oppurtunities and to protect themselves from online risks (refer to Figure 1). Livingstone (2008, p.110-112) mentioned that historians identify an institutional history of regulatory interventions that manage the dissemination and use of these skills, resulting in critical scholarship on how the state intervenes—generally through educational institutions, though also the law and other agencies—in what might otherwise seem the private activities and pleasures of private individuals or private businesses.

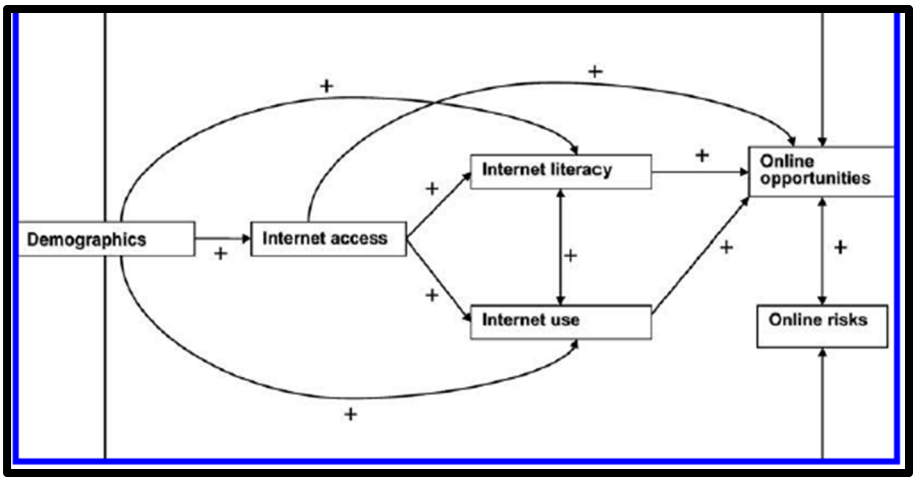

Figure 1. Explaining online opportunities and risks among teenagers

Binark and Löker claimed that new technologies create alternative areas for objective exploitative approaches. They also help us to develop strategies to enhance urban planing, economy, society, and the enviroment. New technologies have the capacity to increase democratic behaviours and make individuals stronger (Kellner, 2004, p. 723).

Interactivity Speciality of New Media and Participitory Literacy

Tranformations in media structures change literacy habit: cultural and cognitinal processes. What is new is neither the tool itself nor its implementations. Binark and Löker (2011, p. 9) listed the features which identidy new media. These features are digitalization, interactivity, multimedia formation, user based content generation, hypertextuality, dissemination, and virtuality. Likewise, Kress (2004, p. 5) claimed that the most prominent feature of new media is interactivity. Binark (2007, p. 21-22) also claimed that new media has the oppurtunity to trasmit high volume data simultaneously and accept feedbacks from users.This feature of new media shows, not only are media products consumed as media messages, but also media products are produced. In this context, literacys have changed. Conventional literacy that focused on practical new communication technologies have been replaced. New literacy can be evaluated with a focus on producerism.

The way information is transfered is no longer linear; it becomes hypertextual. The feature of interactivity brings multiple levels to the communication process. This same feature paves the way for concurrent communications. Simultaneous communication affects the role of users and participation levels. Dewdney and Ride (2009, p. 10) listed mutiple features that interactivity brings to new media platforms. Interactivity is the key concept of the interface capabilites, it happens between connected links and software allowing many people to act bilaterally. The attainment of new media literacy needs to use all these oppurtunities effectively. These features not only show that messages are consumed but they are produced. In this context, literacy has changed and evolves into new technology centered literacy. İnal (2009, p.36) provides examples of how to demonstrate this new literacy: reading written symbols, understanding, and transmission are considered a general skill. İnal determined that today's literacy should be analyzed in two sections. The first one is the new profile user who chooses to read instead of writing the communication text. Secondary is the computer based literacy. Through the internet and computer users, now get the chance of becoming both areader and writer by using various forms such as blog, msn , e-mail, facebook etc.

In this changing communication area, internet users get involved in contentdesign and production. This triggers more activity in a variety of new media platforms and encourages a participatory culture. Jenkins (2006, p. 93) claims new media convergence creates a new folk culture because ordinary people participate in the process. This situation can be advantageous to companies by gaining low cost context and exploiting amateur or entreprenurial media products.

On the other hand, individuals have the opportunity to learn how to use a diversity of media. These may include technologies to control context flow and to establish interactivty. New media platforms raise expectations about distibuting liberal thoughts into circulation and in support of power struggles. Social media became especially popular with the rise of network connectivity for users throught the introduction of Web 2.0 technologies. The

reason many believe social media is so popular is because it lets users generate content for a global audience (Jenkins, 2009, p. 13-14). Jenkins' reseach indicated that schools and after-school programs need to devote more attention to fostering what he calls the *new media literacies:* a set of cultural competencies and social skills that young people need in the new media landscape. A participatory culture shifts the focus of literacy from individual expression to community involvement. The new literacies almost all involve social skills developed through collaboration and networking. These skills build on the foundation of traditional literacy and traditional research, technical, and critical-analysis skills learned in the classroom. According to Jenkins (2009, p.13-14), the new media literacy skills include:

- *Play* The capacity to experiment with the surroundings as a form of problem solving.
- *Performance* The ability to adopt alternative identities for the purpose of improvisation and discovery.
- *Simulation* The ability to interpret and construct dynamic models of real-world processes.
- *Appropriation* The ability to meaningfully sample and remix media content.
- *Multitasking* The ability to scan the environment and shift focus onto salient details.
- *Distributed cognition* The ability to interact meaningfully with tools that expand mental capacities.
- *Collective intelligence* The ability to pool knowledge and compare notes with others toward a common goal.
- *Judgment* The ability to evaluate the reliability and credibility of different information sources.
- *Transmedia navigation* The ability to follow the flow of stories and information across multiple modalities.
- *Networking* The ability to search for, synthesize, and disseminate information.
- *Negotiation* The ability to travel across diverse communities, discerning and respecting multiple perspectives, and grasping and following alternative norms.

Jenkins (2009) has stated that this list provides a broad sense of which competencies are most likely to matter as young people move from the realms of play and education (informal and formal learning) into the adult world of work and society. The above provisional list of eleven core skills are needed for effective participation within the new media landscape. These skills were identified both by reviewing the existing body of scholarship on new media literacies and by surveying the forms of informal learning taking place in the emerging participatory culture. Mastering these skills remains a key step in preparing young people as active participatents in a culture's public, community, and economic lives. In short, these are skills some youths are learning through participatory culture, but they are also skills that all youth will need to learn if they are going to be equal participants and contributors in the world of tomorrow. Further, Jenkins stated: "We identify a range of activities that might be deployed in schools or afterschool programs, across a range of disciplines and subject matter, to foster these social skills and cultural competencies" (2009, p.14). These activities are by no means an exhaustive list but rather are simply illustrations of the kind of work already being done in each area. One goal of this report is to challenge those who have responsibility for teaching our young people to think more systematically and creatively about the many different ways they might build students' skills into day-to-day activities in ways that are aligned to he content they are teaching.

Jenkins created a list that indicates eleven basic skills to be integrated in new media ecology. The definition of these skills were formed by reviewing the current educationsl research literature. These skills are aimed to encourage an environment for the establishment of a participatory culture. It is Jenkins belief that young people will be more active in social, public and economic spaces if they internalize these skills. In a nutshell, Jenksins claims that these skills will support young individuals to be equipped for being equal participants. In addition to this, the list includes events which will encourage learners to use these skills. This report supports an alternative way for young people to expand their creative and systematic thinking.

New Media Literacy; Suggestions on Curriculum for eLearning Strategies

As the new media technology usage is increasing day by day, students are getting more involved with this process. New media technologies increasingly become an important part of their daily lives. Being a media literate individual is a skill that requires engagement and active participation. As an individual gains this critical skill, they are a more productive person through the use of many social products. Acording to İnal (2009, p.21), media education needs to be improved to help students gain a capacity for critical thinking. This emerging educational strategy helps to improve a student;s critical thinking capacity and enlarge their knowledge about effective and practical implementation. This cyclic process (refer to Figure 2) indicates steps necessary to enhance learning through analyzing, , and critical thinking in the framework of new media. It is importatnt for ndividuals to

understand what is innovative in new media and how information in social media platforms is organized and by whom. New media literacy can also introduce individuals to online risks. The risks need to be balanced with the advantages of online oppurtunities and critical thinking improvement.

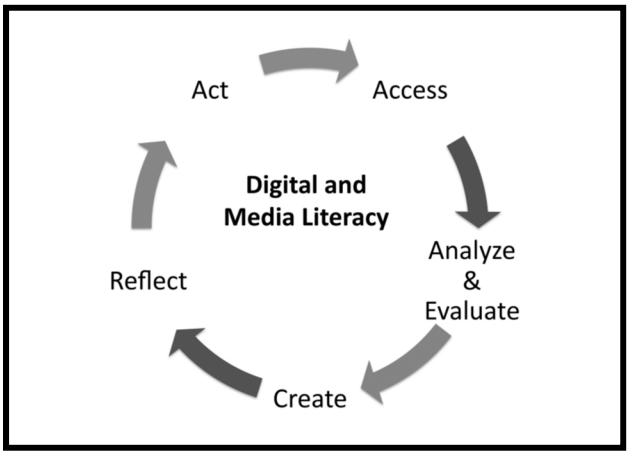

Figure 2. Essential competencies of Digital and Media Literacy

Some government educational organizations try to inform indivualds about new media oppurtunities by integrating these topics into instructional strategies. To achieve this critical goal, platforms which support new media literacy need to have the neccessary technical substructure. These supportive platforms need to be organized in terms of technical needs. Where users can produce and share content others. The users need to realize that they sare sharing socially connected messages. Besides the technical issues, some academics and govermens are stating interest in implementiong essential conpetencies of new media. One of which academics is Rene Hobbs.

According to Hobbs (2010, p.18) these five elements of competencies work together in an upper spiral of empowerment, supporting active participation in lifelong learning through the processes of consuming and creating messages. This approach is consistent with constructivist education, which, as Brazilian education scholar Paolo Freire described, adopts "a concept of women and men as conscious beings…and with the posing of the problems of human beings in their relations with the world" (Freire, 1968, p. 51). The five digital and media literacy competencies shown above represent a synthesis of the full complement of scholarship and thinking about new literacies. These ideas have been acknowledged by major groups and professional associations including the International Reading Association (IRA), the National Council of Teachers of English (NCTE) and the National Council for Accreditation. In Hobbs' report; (2010, p. 19), Rene defines digital and media literacy as a constellation of life skills that are necessary for full participation in our media-saturated, information-rich society. These include the ability to do the following:

1. *Access:* Finding and using media and technology tools skillfully and sharing appropriate and relevant information with others.
2. *Analyze & Evaluate:* Comprehending messages and using critical thinking to analyze message quality, veracity, credibility, and point of view, while considering potential effects or consequences of messages.
3. *Create:* Composing or generating content using creativity and confidence in self-expression, with awareness of purpose, audience, and composition techniques.
4. *Reflect* **:**Applying social responsibility and ethical principles to one's own identity and lived experience, communication behavior and conduct.
5. *Act:* Working individually and collaboratively to share knowledge and solve problems in the family, the workplace and the community, and participating as a member of a community at local, regional, national and international levels. (2010, p. 19)

This study aimed to develop a cirriculum which familarizes students with new media by experiencing a diversity of sound, image, and text channels. The study developed an educational program which teachs students a range of information; from basic data processing literacy to interactive interface usage. Each class week is seperated in terms of related skills. In the end of each week there will be examples which shows how to use the related new media channels and which explains the process of media consumption to production. After the theoratical framework is given, practice and exercise will be experienced by students through the learning enviornment.

The five weekly new media literacy training curriculum is stuctured as follows:

Week	Course Subjects of New Media Literacy	New Media Medium	Acquired Sufficiency
1	What is new media and new media medium? Web 2.0, mobile devices What is the difference between new media and conventional media? Digitallity, hypertextuality, multimedia, virtuallity	Google	Access
2	Virtual identity, socialization, virtual sociaety, presentation of personality, networked society, virtual body, avatar, anonymous identity	Facebook	Analyze & Evaluate
3	Participitory culture in the new media, user-derived content, phenomenon of "consumer"	Webblog	Create
4	Public sphere in the new media, civic journalism, alternative media, civic participitory, video Activism	Twitter	Reflect
5	Digital/online games, gamer, player culture, similarty, building of identitiy on digital game	Digital Games, Online Games	Act

The goal of the curriculum is to analyze, evaluate, and develop critical thinking in the frame work of new media. Beside the fact that individuals learn what is *new,* they also learn what is the approprtiate information in social media and by whom the artifact is produced. New media literacy not only lets individuals to pay more attention to the online risks but also allows them to take the advantage of online oppurtunities.

New concepts and enrivonments need to be developed and supported by governments for emerging media educational strategies. This innovative instructtional support needs to raise consciousness among educators and learner. Institutions that choose tto proved training for new media literacy should be equipped with the appropriate technology. Users should produce content and share them through the vehicle of Open Educational Resources. There needs to be conscious effort to remind individuals that they share socially connected messages with a diversity of other users in a local and global context. The outcomes of this study analyzed various online contents, the reliability of the writer, the focus point, and evaluatedd the digital language of the new media tools, images, audio, and production content.

Conclusion and Recommendations

New media literacy should not depend on one's intention or solo within an elective course. It shoud be intigrated into the concept of teaching students about citizenship within and beyond the primary educational level. Media literacy should be integrated into a life-long learning model. Media literate ndividuals are the ones who can approach existing facts and use resources to critically improve themselves and and to benefit society. In this context, students with a critical media literacy education are provided the ability to evaluate and interpret new media content. There is also an integral benefit in terms of qualitative messages to increase their awareness. However, these qualifications should not be restricted to young people and children, on the contrary, this must be take a part of *lifelong learning* programs and various *adult learning* programs.

Education for today's digital-world youth should not be limited to digital skills. It should present a model which also recognizes and integrates a participatory culture. Also, indicated in this five week course (refer to Figure 2) of instruction on new media capabilities and achievements conducted various private and government agencies, there is an opportunity to implement the five stage Hobbs (2010) model. An interdisiplinary approach by instructional designers and eudcator should be the recommended future of new media literacy.

It is important to focus on new media litaracy in the current atmosphere of hate speechs, racism, cyber bullying, digital surveillance, prejudice, and online ethics if we ever hope for a reduction in these risk elements. As our students of today are being prepated for the innovative positions of tomorrow, they need to have the benefit of possessing digial skill s that will allow them to flourish and benefit society at a local and global level.

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Turning passive watching to active learning: Engaging online learners through interactive video assessment tools

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Abstract

Research in cognitive science has shown us that deep learning requires active knowledge construction; just passively watching videos will not lead to engagement in active learning. Using interactive video assessment tools enables instructors to rapidly create interactive video content and track students' participations, engagements, and even catch misconceptions through the viewing data. By surveying instructors and collecting students' viewing data from Zaption in online courses, the features of Zaption along with its analytic tools were explored; and the implications for practice of interactive video tools have also been discussed in this study.

Introduction

Learning happens in a dynamic and creative process that involves learners' active knowledge construction. Learners feel connected when engaged in highly motivated activities and thus experienced the 'flow'. Over decades, instructors have tried to move away from the passive lecturing to more active learning practices (Giannakos, Krogstie, & Aalberg, 2016), especially for online education. The cost of time and money to create highly engaging content have been dramatically dropped by the invention of dynamic visual media, such as interactive video, hyper-video, and virtual reality. Studies of interactive video have been tested on the cognitive benefits (Schwan & Riempp, 2004); learning effectiveness (Zhang, Zhou, Briggs, & Nunamaker, 2006); students' perceptions (O'Rourke, Western, & Main, 2014), and learning analytics for data mining purposes (Kleftodimos & Evangelidis, 2015). However, with limited resources and skill sets, many instructors still faced the challenges in creating interactive and engaging content for their online learners. Without an effective and engaging tool, online students have to replicate what they did in traditional classrooms, reading textbook chapters, watching narrated lecture recordings, and submitting assignments. It was difficult for instructors and instructional designers to track whether students really watched all course lectures, did they really understand the delivered content, and how reliable are the assessments. Although some learning management systems (LMSs) already have the built-in functions to track learner activities through viewing data, whether active learning occurred remains unknown.

The purpose of the study was to identify the major benefits, explore the features, and discuss the key challenges of using interactive video assessment tool in online learning, addressing the following research questions:

- What are the major benefits of using interactive video assessment tool in online learning?
- What are the key challenges in using interactive video assessment tool in online learning?

Zaption as the Interactive Video Assessment Tool in online learning

Zaption is an interactive video platform that allows video content uploaded to open video hosting sites such as YouTube, TED Talk, Vimeo, etc. to be embedded on Zaption's videos, and then engaging interactivities such as questions, discussion, images, or text, to be built on top of the videos. By integrating Zaption as the interactive video assessment tool into an online course, instructors and instructional designers can set the interactive questions within any video, and allows learners to view, re-view, skip forward, skip backward, and pause for questions. Students' viewing and response data could also be collected for further analysis. The lecture video called "Tour" in Zaption can be easily created with limited technical skills, and video links can be generated and embedded into LMS for students to interact and learn from.

An attracting feature of using Zaption is its Analytic reports for evaluation. Zaption Analytic provides formative feedback that helps identify misconceptions in the early stage or areas that needs to be clarified for further instructions. Stigler, Geller, & Givvin proposed a Zaption Implementation Model in authentic educational settings

including online courses in 2015. The implementation is guided by instructors' learning goals for students followed the circle of steps:

1. Instructor creates Tour
2. Students view and respond to Tour
3. Instructor views Analytics
4. Instructor leads follow-up activities
5. Instructor sets next learning goal

This model was implemented into our online courses with a modification: the instructional designers helped create Zaption Tours and shared permissions with the instructors for Analytic access.

Method

This study adopted a combination of a qualitative and quantitative research method to collect data from the participants. Two instructors and four students from a summer 2016 undergraduate online course, *Industrial Psychology* (3 credits), participated in the study. Interactive video content with embedded quiz questions was provided in each lecture presentation. A total of 64 videos were created during the late spring and early summer of 2016. At the conclusion of the course, two instructors were surveyed by questionnaires that designed by the instructional designers. Enrolled students' viewing data were collected from Zaption Analytic reports.

Survey Instruments

The instructor survey was created using MS Word and delivered by email. The survey provided 6 Likert questions regarding to instructors' knowledge and experience with Zaption, using the 5-point Likert Scale including "1" (Strongly disagree), "2" (Disagree), "3" (Neither agree nor disagree), "4" (Agree), to "5" (Strongly agree). Six open-ended questions regarding to instructors' perceptions of content presentation and analytic reports.

Students' data were collected from their viewing data, included viewers by date, viewing time, question completion, average score, average skips forward, and average rating of each lesson.

Results

Zaption's analytic tool provided three reports: Viewers, Responses, and Stats. The analytic reports can be exported as CSV and PDF formats. A total of 64 videos' viewing data were collected with the three different views in Zaption:

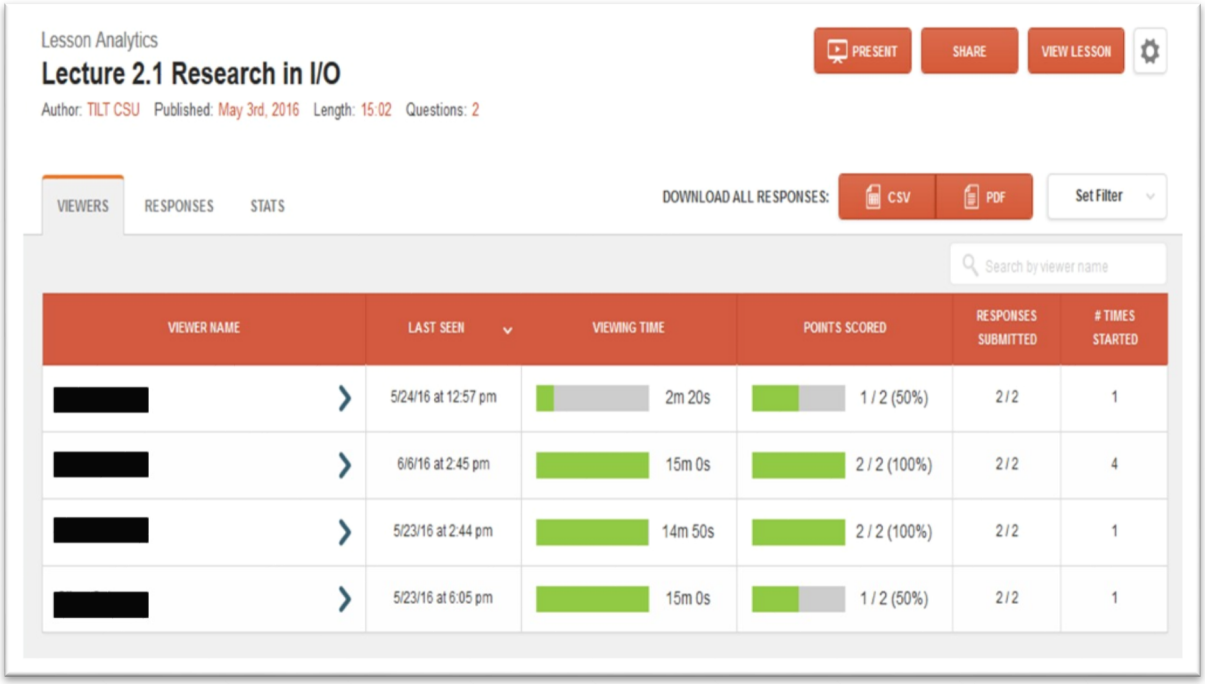

Figure 1. Zaption screenshot: The Viewers tab

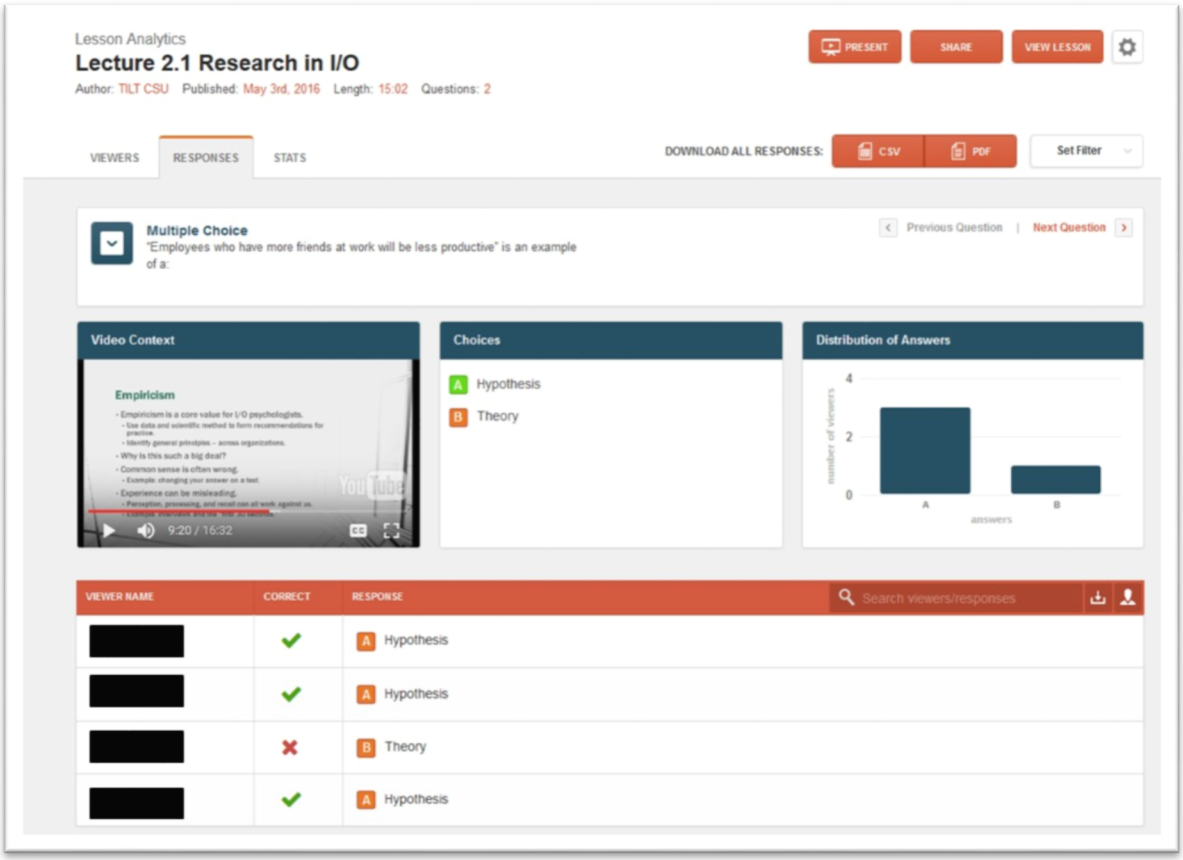

Figure 2. Zaption screenshot: The Responses tab

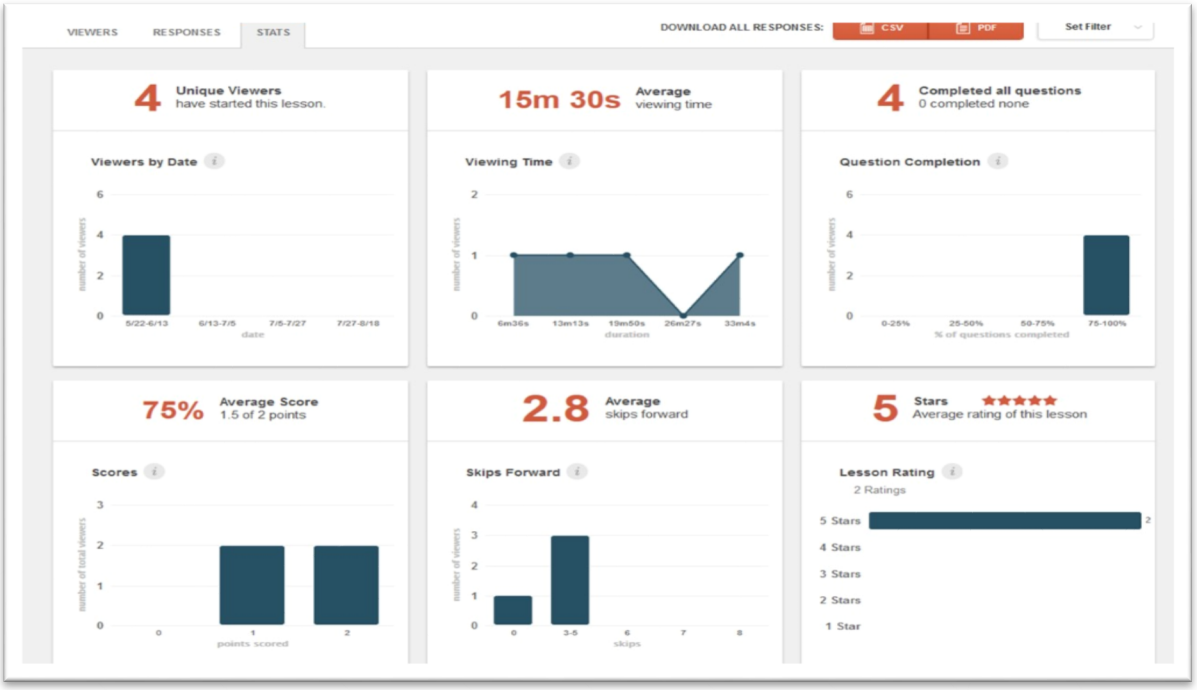

Figure 3. Zaption screenshot: The Stats tab

It is very helpful for instructors to see how many students watched modular videos every week, and the instructors could post announcements in LMS to remind students who haven't watched. As one of the instructors reported:

> *"I'm noticing that some students don't appear to be viewing the videos at all, others seem to be skipping through to the questions... but the Zaption data correlates perfectly with their exam grades... so although it's disappointing it's quite informative!"*

Discussions

Although Zaption went away by September 30th, 2016, the features of it as interactive video did appear and continued as found in other alternative video tools. By examining users' experiences of using Zaption in this online course, it provided evidences of the advantages of interactive videos in facilitating online learning, turning passive learning into active knowledge construction, and receiving learning data from learners which would be quite important for enhancing online courses. Those features and challenges exist not only in Zaption, but can also be generalized to a wider world, that is bringing more interactivity to online education.

Major benefits of using interactive video assessment tool in online learning

Benefit 1: Students were able to interact with lessons. The viewing data strongly suggested the embedded interactions of Zaption, such as open responses, numerical responses, multiple choice, check boxes, discussion, replay and jump, the participants were able to interact with lessons and course content.

Benefit 2: Students were able to use embedded questions to check understanding. Participants checked their understanding periodically by answering questions that set by the instructor at certain time points, and review video to prepare exams.

Benefit 3: Instructor was able to use Zaption Analytic to track students' viewing data. The tracking feature of Zaption allows instructor to master each students' progress of reviewing the lectures. For instance, when students were late of reviewing video lectures, instructors would be able to send friendly late reminder and announcements to students.

Benefit 4: Instructor was able to use Zaption Analytic to check students' responses to questions. And modify questions as needed. The Zaption Analytic reports allowed instructors to compare students' responses with

their reflections of the entire course, relative feedback of discussion topics, and exam results, which helped instructors to adjust the questions, revise course content, and enhance the teaching and learning experience in the future time.

Key challenges in using interactive video assessment tool in online learning

Challenge 1: additional time and energy required for course preparation. Instructors indicated lacking time to create lessons in Zaption. Although Zaption offered step-by-step guides for beginners, it still costed instructor extra time and energy to design questions in addition to the preparation of the lecture.

Challenge 2: identify types of interactions for video lectures. Instructors struggled with the proper interactivity for each question in Zaption. The most chosen type of interaction was multiple choice, followed by true and false type. Although Zaption offered other options, such as open responses, numerical responses, check boxes, discussion, replay, and jump, instructors had very limited attempts on using them.

Challenge 3: challenge of technology skills. Instructors indicated not having strong technical skills to create lessons in Zaption. Without the assistance of instructional designers, instructors felt difficult to insert questions in Zaption, and needed support in embedding the created Zaption lesson within LMS.

Challenge 4: alternative tool needed for replacement of Zaption. With Zaption went away, more time was spent on downloading analytic data and re-creating lessons using Office Mix. It happens quite often in online education that a certain tool becomes no longer available and the instructors and instructional designers need to search for alternatives. The biggest issue is to find the solution to retain the analytic data from Zaption. Office Mix was the one that served as emergency measure.

Limitations

There are some limitations of this study. First, since this online course was offered first time online, the very low enrollment resulted in a lower response rate of the study, which made it difficult for collecting students' self-report data for analysis. One other unexpected limitation was Zaption went away by the end of September 2016; we were unable to provide implications of practice in this study.

Conclusion

Our research showed that interactive video lecture as an assessment tool helped instructors to track students' viewing data in order to master each students' progress of reviewing the lectures, to use analytical data modifying questions as needed, and to turn passive learning into active engagement.

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Strengthening Learner Participation in Online Courses: The Role of Digital Content Curation

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Abstract

Digital Content Curation in online learning environments offers learners the opportunity to become learner-curators, and instructors to evolve into educator-curator. In this study the learners were 27 graduate student at a large Midwestern research-intensive university majoring in educational technology. A preliminary content of analysis of students' end-of-course reflections shows that students value their role as learner-curator. Some light is shed on the role of digital content curation as an alternative to online course participation.

Introduction

Much has been investigated on how to support learners to be successful in online learning environments (e.g., Hew & Cheung, 2008; Salmon, 2011; Wang, 2008). Research has identified several problems related to online discussions, such as limited student participation (Hewitt, 2005), inadequate critical analysis of peers' ideas (Rourke & Anderson, 2002), lack of motivation, commitment, and time, and failure to communicate effectively (Brooks & Jeong, 2006).

The purpose of this study is to introduce digital content curation as a strategy to overcome much of the lack of motivation, commitment and communication among online learners and offer an alternative way to participate online that builds on the rise of "share the sharing" culture. Following are the research issues that guided this study:

- What types of resources learners find suitable for exploring specific topics?
- How can the quality of curated artifacts be evaluated?
- What are learners' perceptions of the benefits for engaging in content curation?

Digital Content Curation

The word "curation" in Latin comes from "curare," which means, to take care of or to preserve. In today's world curation leads to a re-interpretation of the use of digital resources. Content curation was mentioned for the first time in 2009 and 2011 in Bhargava's blog. At that time, this concept was more focused on online marketing than on education. He defined content curation as: "the act of finding, grouping, organizing or sharing the best and most relevant content on a specific issue" (Bhargava, 2011, para 4). Different from content creation, curation refers to finding and providing a link to the content one has not created. Curated content is meaningful, filtered and directed toward a specific target or topic. The power of collaborative content curation emanates from the fact that it is filtered and organized by humans.

Methods and Data Sources

In this study, the focus is on the learner-curator. The learner being a graduate student in educational technology at a large Midwestern research-intensive university. Twenty-seven students participated in this study between January and May 2015. They were enrolled in an online graduate course on program evaluation and usability and most of them were part-time students working in a multitude of related professions ranging from teachers to user experience designers. A part of students' graded course participation consisted on curating specific theme-related artifacts using Scoop.it (http://www.scoop.it/).

Data was directly collected using Scoop.it by analyzing the artifacts curated. Students were expected to curate at least one resource related to a specific theme and to react to at least two other artifacts curated by one of their peers and/or instructors. Content from students' end-of-course reflections was also gathered and analyzed.

Results and Discussion

Quantitative Analysis – Types of digital resources curated by learners

Students curated different types of artifacts. They included: a) illustrations, infographics or any other visual, b) videos, c) articles published in online journals, or websites, d) websites or blogs, and e) resources or tools for immediate application or use (e.g. PowerPoint slides, software applications, and others). The most common type of artifact curated in all three themes was websites/blogs with a total number of 44. Following was articles with a total number of 18 articles. And the third most common artifact was videos with a total number of 7. Two resources/tools were also curated.

Seventy-five was the total number of artifacts curated for the class topics: 1) Formative and Summative Evaluation vs. Usability Testing, 2) Collecting Evaluative Information, and 3) Politics, Ethics and Standards of Evaluation. From this total, 28 artifacts were curated under topic 1 (including three illustrations, four videos, four articles, sixteen websites/blogs, and one resource/tool); a total of 27 artifacts on topic 2 were curated (including one illustration, two videos, five articles, and nineteen websites/blogs); and topic 3 elicited 20 curations (including one video, nine articles, nine websites/blogs, and one resource/tool).

The 28 artifacts curated regarding topic 1 generated 32 insights and 57 reactions. Topic 2 led to 27 curations, 28 insights and 40 reactions and finally the last topic created 20 artifacts, 19 insights and 24 reactions.

Qualitative Analysis – Quality of the curated artifacts

A set of criteria for establishing quality of each curated artifact was developed: "Contemporary" (e.g., does the artifact reflect emergent trends in the topic being discussed?), "Relevance" (e.g., is the artifact content supported by evidence provided by the course readings?), "Value Added" (e.g., does the artifact content add details about the topic?), "Independent" (e.g., is the artifact free from advertisement?), "Accuracy" (e.g., is the information about the topic primary or secondary?), and "Authorship" (e.g., is the author of the artifact's professional and contact information provided?).

Each artifact was analyzed using the criteria defined above. If there was a match to a criterion regarding the artifact under analysis, points were assigned. The quality of the curated artifacts would range from 0 to 16, being 16 points the maximum of quality. Curated artifacts under topic 1 (Formative and Summative Evaluation vs. Usability Testing) exhibited an average of 11.86 points regarding quality; artifacts on topic 2 (Collecting Evaluative Information) showed an average of 12.37 points; and finally artifacts on topic 3 (Politics, Ethics and Standards of Evaluation) presented an average of 11.30 points. Quality of all the curated artifacts was definitely above 8 points, which would correspond to an average of quality (See Table 1). These results show that illustration, videos, articles, and websites/blogs on methods of collecting evaluative data exhibit the highest quality in terms of relevance, added value, accuracy, etc.

Table 1- Quality of the curated artifacts. It ranges from 0 to 16, being 16 points the maximum of quality.

Topics	Quality of the curated artifact	Percentage
Topic 1: Formative and Summative Evaluation vs. Usability Testing	11.86	76.44%
Topic 2: Collecting Evaluative Information	12.37	80.28%
Topic 3: Politics, Ethics and Standards of Evaluation	11.30	75.86%

Content Analysis - Learners' perceptions of content curation benefits

A preliminary content of analysis of students' end-of-course reflections showed the majority of the 27 students valuing their role as learner-curator. One of the students mentioned: "Alternating reading and assignments that required contributing to the Learner-Curated Knowledge Base made the course bright and exciting. [this activity] is a very powerful tool for engaging students. At first sight it seemed to me like a simple task … to share some articles or other sources related to a particular topic. However, I changed my mind when I spent more than two hours finding a good article or informative video to curate. I went through several articles and chapters from different textbooks. I watched many YouTube videos related to the topic. As a result, I got familiar with the entire topic and introduced myself to many opinions from different sources regarding this topic." Another student emphasized that the learner-curated knowledge activity in Scoop.it "was a necessary complement to discussion board in Blackboard [the LMS used in class] by integrating more multimedia resources, enriching online interactions, and better accommodating different learning styles." A few students reported that in the beginning it was hard to work with Scoop.it because of usability and navigation issues.

Conclusions

In sum, today's learners have a myriad of content sources at their disposal for refinement and mash-up. Being able to compile, scrutinize and recommend content is as important as creating it. This study preliminary results demonstrated that Scoop.it commenting and curating features supported information exchange and learners' curiosity and willingness to discuss with their peers.

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Cognitive Load as an Inhibitor to Technology Adoption in P-12 Schools

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Introduction

When allocating dollars to new technology programs, public school district administrators naturally wish to ensure those funds are well spent. Not only do they desire technology initiatives to positively impact student learning, but they expect to see the technology appropriately utilized in every classroom for which it is intended. However, do the processes by which school districts disseminate a new technology necessarily facilitate its widespread adoption?

In order to explore the import of this question, let us first consider the following scenario which takes place at an urban school district in the southwest United States. In a conference room crammed with long utilitarian tables, teachers new to a school district sit side by side, each equipped with his or her newly acquired, district-issued laptop. One of the district's technology coordinators takes the podium and calls everyone's attention to the large screen showing the School Center home page. School Center is the district's web page program of choice, and all teachers are expected to utilize the program to maintain an updated class web page. The teachers follow the coordinator's instructions to set up a login and password to their accounts. Once everyone is logged in, they see a row of tabs

along the top of the page leading to different menu options for editing web site navigation, formatting design elements, adding media, adjusting the page settings, and other features. The trainer at the head of the room guides them swiftly through a demonstration of the program's features. At some point, most teachers dutifully record their login and password information on a handout they had received that morning with the words "Password Paradise" at the top. On this handout is an extensive table with empty fields waiting for the account login information of every web based program on which the teachers would be trained during their two-day district orientation. These programs include Power School and Power Teacher, Discovery United Streaming, Aesop, Outlook, Employee Self-Service, School Center, Achieve 3000 and several other programs the district requires all their teachers to use. The coordinator devotes about an hour to the general functionality of School Center before she moves on to another topic. Before the transition, the teachers receive assurance that the program is not too difficult. They will just need to take the time to play with it.

Interestingly, by the end of the school year, grumbling trickles down from central administration about the majority of teachers in the district either not having a web page or not updating their page regularly. They discuss the possibility of including an updated web page as an item on the teachers' evaluations. The video streaming program Discovery United Streaming, for which the new teachers also received training during that orientation, disappears the following year as the district IT department notices the district's user statistics do not reflect sufficient use to merit the expensive yearly subscription fees. The district had ensured that every teacher received United Streaming training including the teachers described previously, but in spite of this and despite the appeal of having a ready database of educational videos to stream in the classroom, the teachers as a whole do not make use of it. As each school year goes by, this district allocates funds to new technology programs and introduces them to every one of its teachers. Many of the programs follow the same fate as School Center and Discovery United Streaming: they have their brief moment in the sun, some teachers try them and some do not, the expense becomes too much if the programs are used by only a few, and the district administration throws up its hands and moves on. The cycle perpetuates, and many ask why.

Rogers' diffusion of innovations theory (DoI) supplies the theoretical framework for a large body of research investigating technology diffusion in various domains including schools. The components of the theory seek to explain how, when and by whom innovations diffuse or fail to diffuse in a population (Rogers, 2003). Rogers (2003) defines diffusion as the process by which new ideas and technologies spread throughout a population, such as a faculty of public school teachers. Within the context of a faculty presented with an innovation, researchers use his theory to label or group teachers according to when and whether they choose to adopt an innovation (Rogers, 2003; Rogers & Svenning, 1969; Bitan-Friedlander, Dreyfus, & Milgrom, 2004; & Rogers, 1975). While identifying common attributes among teachers who are quicker to adopt an innovation versus those who are slower to or choose not to adopt, the research seems not to look beyond those attributes to investigate potential underlying factors related to dissemination practices. In terms of this paper's emphasis on presenting public school teachers with new technology, prior diffusion research on this topic does not appear to address the possibility that the method by which an innovation's technological interface is presented to a population could be beyond the common capacity of human cognition.

When technology diffusion is under investigation, Sweller's cognitive load theory (CLT) can provide valuable insights. CLT is an instructional design theory describing how learners cognitively process the mental loads inherent to learning (Sweller, Ayres, & Kalyuga, 2011). For insights into exactly what a teacher must process and accomplish in order to successfully learn, adopt, and implement a new technology program or tool, Sweller's theory paints a compelling picture that may deepen our understanding of what district administrators ask of teachers during the process of implementing a technology initiative.

In order to come to a better understanding of this issue, this literature review delves into the works of Everett Rogers, the acknowledged father of DoI, and the works of John Sweller who authored CLT. In addition, this paper looks to research which focuses on the areas of technology integration, professional development, and/or instructional design practices which utilize technology. Through evidence collected from this literature, an investigation will be made into whether CLT as a lens for understanding factors determining the extent of technology diffusion in schools is worthy of further inquiry. This paper proposes that attention to the limitations of human cognition, as defined by CLT (Sweller, 2008), when introducing teachers to a new technology will result in a more successful diffusion of that technology. Further, this paper posits that the failure of many technology diffusions in schools can be explained through CLT.

Findings of Diffusion Research

In the following section, the review of literature focuses on diffusion of innovations in schools, particularly as related to technology integration. As seen in the following synthesis, the research provides evidence on the importance of allowing teachers time to learn how to use the innovation and integrate it into instruction, helping teachers achieve self-efficacy in using technology in the classroom, providing sustained professional development and continuous guidance from experts, encouraging peer support, collaboration and modeling, and having adequate technical support. This consistency in the research on DoI will provide support for the claim that attention to CLT may improve technology integration.

Teachers must have time to learn about a new innovation and achieve sufficient self-efficacy in order to confidently utilize the innovation with students (Bitan-Friedlander, Dreyfus, & Milgrom, 2004; Wright & Wilson, 2007; Brinkerhoff, 2006; Davis, Preston, & Sahin, 2009; Rogers & Svenning, 1969; Rogers, 1975). Bitan-Friedlander, Dreyfus, and Milgrom (2004) find in their study on the diffusion of an innovative method of science instruction in Israeli primary schools that teachers did not fully adopt the innovation until after two years of professional development. Likewise, Brinkerhoff (2006) endeavors in his study to depart from traditional one to two-day teacher training methods in favor of long-term professional development and finds that his participants did not show significant gains in technology self-efficacy until the end of the two-year technology academy program. In their account of the Master Teacher Technology professional development initiative at the University of Alabama, Wright and Wilson (2007) provide strongly positive feedback from teachers on the opportunity to develop expertise integrating technology in the classroom through participation in a five-year program. In their study on England's national initiative to elevate the technology prowess of its school teachers, Davis, Preston and Sahin (2009) refer to the school as an "educational ecosystem" in which teacher technology training must have a profound influence over a prolonged period of time (p. 875.) Unfortunately, time is not a commodity usually afforded to teachers, even when expected to master an unfamiliar computer program interface for use during instruction (Rogers, 1969).

Even veteran teachers would be reluctant to use a new technology with students before they have reached an adequate level of self-efficacy. Diffusion research and studies on professional development have shown the importance of teachers' self-efficacy in technology to their decisions whether to integrate technology in the classroom (Bower, Dalgarno, Kennedy, Lee, & Kenney, 2015; Davis, Preston, & Sahin, 2009; Kao, Tsai, & Shih, 2014). Technology training which continues throughout the course of a school year and beyond has been found to be consistently effective in raising teachers' self-efficacy in technology (Ching & Hursh, 2013; Brinkerhoff, 2006; Davis, Preston, & Sahin, 2009; Wright & Wilson, 2007). Developing self-efficacy in teachers is essential to ensuring an innovation will be fully adopted by a faculty.

One of the most common themes in the literature on integrating technology in schools is the importance of peer support and modeling. Every successful technology training program in the research studies reviewed in this paper reports positive feedback from participants on the opportunities to collaborate with peers on the new technology and benefit from their developing expertise (Ching & Hursh, 2013; Kim, Kim, Lee, Spector, & DeMeester, 2012; Davis, Preston, & Sahin, 2009; Vavasseur & MacGregor, 2008; Frank, Zhao, Penuel, Ellefson, & Porter, 2011; Goktas, Yildirim, & Yildirim, 2009; Overbaugh & Lu, 2008). John Sweller (2008) shares in his discussion on education technology that one's primary source of new information is the long term memory of others in acknowledgement of the importance of modeling and imitation during the learning process. It is clear in the literature that encouraging and allowing time for peer collaboration benefits a faculty's climate and better enables the teachers to adopt a new innovation.

In addition to support from peers, teachers commonly express the need for continued technical support when they go through the process of implementing a new technology into their instructional practices (Bitan-Friedlander, Dreyfus, & Milgrom, 2004; Bower, Dalgarno, Kennedy, Lee, & Kenney, 2015; Brinkerhoff, 2006; Goktas, Yildirim, & Yildirim, 2009; Overbaugh & Lu, 2008). In fact, in the literature reviewed by this paper, inadequate technical support is one of the most commonly expressed reasons teachers and other professionals elect not to adopt a technology innovation (Bitan-Friedlander, Dreyfus, & Milgrom, 2004; Davis, Preston, & Sahin, 2009; Goktas, Yildirim, & Yildirim, 2009; Mahler & Rogers, 1999; Rogers & Svenning, 1969; Rogers, 1975). Continued support in the technical use as well as the instructional applications of technology will increase the likelihood that an innovation will successfully diffuse in a school.

Methodology Trends in Diffusion Research

In the fifth edition of his book *Diffusion of Innovations,* Rogers (2003) cites several shortcomings he perceives in diffusion research prior to that time. He identifies areas of bias or short-sightedness in the interpretation of his theory, the application of research methods in diffusion studies, and in the data analysis.

Rogers (2003) observes that much of existing diffusion research tends toward a diffusion-favored bias which casts blame on individuals who are late adopters or non-adopters. His terminology of choice for the last portion of a population to accept and utilize an innovation, namely the late majority and laggards (Rogers, 2003), seems to initiate a self-fulfilling prophecy which manifests in researchers looking to the attributes of the adopters and non-adopters for reasons explaining the success of a diffusion or the lack thereof. Rogers (2003) acknowledges that one should also look to the innovation itself as well as the change agents when searching for the factors affecting diffusion. The innovation may impose obstacles to its own adoption, or the methods of diffusion may be counterproductive. For example, a poorly designed interface for an educational computer program may deter teachers with less technical self-efficacy from attempting to use it with their students, and if the teachers did not receive more than a one-time training on the program without supplemental support, the integration of the program may be more likely to fail. In this case, when identifying the teachers reluctant to adopt the technology, the term laggards appears to be a misnomer and applies a connotation that is inappropriate to the circumstances.

In terms of research methods, Rogers (2003) criticizes the emphasis on correlational studies pervading diffusion research saying insufficient effort has been made towards experimental methods for investigating potential causal relationships. He further states that diffusion studies claiming to use independent and dependent variables are not actually investigating variables that have clear causal relationships (Rogers, 2003). Innovativeness is the variable most often under examination in these studies, but Rogers (2003) claims that the independent variables researchers use do not have a direct cause-effect association with innovativeness. The emphasis on correlational studies may be a reason why diffusion research on technology integration seems to offer only a superficial survey of the characteristics and attitudes of adopters and non-adopters and their environments without seeking further inquiry into potential factors causing the success or failure of diffusion, such as attributes of a digital interface that may prevent users from learning about the technology.

Rogers (2003) also notes that many studies on his theory do not give sufficient consideration to the effects of time when collecting data, the studies usually being designed with post-survey instruments assessing the extent of adoption only a limited time after the innovation has been disseminated. According to his theory and numerous studies on technology integration, it can take years for the full extent and benefits of technology diffusion to become evident (Rogers, 2003; Bitan-Friedlander, Dreyfus, & Milgrom, 2004; Brinkerhoff, 2006; Ching & Hursh, 2013; Hegedus et al., 2014; Kim, Kim, Lee, Spector, & DeMeester, 2012; Rogers & Svenning, 1969). In addition, researchers have acknowledged this in their diffusion studies when they find that their data does not reflect strongly significant changes in attitudes or beliefs toward adopting an innovation (Kim, Kim, Lee, Spector, & DeMeester, 2012; Brinkerhoff, 2006; Ching & Hursh, 2013).

As far as future diffusion research, Rogers (2003) recommends a departure from the commonly used pre- and post-survey instruments and subject interviews. He argues that personal interviews seeking information and post-surveys about the point of adoption are unreliable since they depend upon the accuracy of the subjects' recall (Rogers, 2003). He recommends collecting data at multiple points during the study to mitigate this possibility (Rogers, 2003). He further recommends using more longitudinal studies and instruments due to the amount of time required to fully observe the extent and effects of technology diffusion (Rogers, 2003). The latter recommendation is interesting when one considers how quickly many institutions including schools dispense with innovations adopted to alleviate a problem, such as adopting an online reading program to raise low reading scores, when results are not evident in a timely manner.

Complexity of Innovations

Rogers (2003) identifies the complexity of an innovation as a potential obstacle to adoption by users. Complexity is one of five attributes of innovations defined by Rogers (2003): relative advantage, compatibility, complexity, trialability, and observability. In terms of his theory, he defines complexity as the degree of difficulty an innovation is to understand and use and suggests that innovations can be rated along a continuum between complexity and simplicity (Rogers, 2003). Complexity is negatively related to an innovation's rate of diffusion (Rogers, 2003). This principle is particularly applicable to technology integration. The unfamiliarity and complexity of digital program interfaces adopted by school districts for teacher use are a deterrent to successful diffusion, particularly when training, technical support, and time resources are inadequate. As this paper transitions to address

the role of cognitive load in the success or failure of diffusion, Rogers' discussion of the complexity of innovations is important to note.

Cognitive Load Theory

This paper has synthesized diffusion research findings to provide a warrant for claiming the potential relevance of Sweller's CLT to a possible explanation of why and whether technology innovations diffuse in schools. CLT provides a framework for understanding what administrators are asking of teachers when they introduce new technologies with the expectation that the teachers will then immediately integrate the technologies into classroom instruction. The theory focuses on the limitations of the working memory, which only allow for the processing of a few elements of information at a given time, to describe how learning new tasks imposes different forms of cognitive load (Sweller, 2010). Intrinsic load is the mental load imposed by learning the new content or skill itself (Sweller, 2010). Extraneous load pertains to distracting elements which can come from ineffective instructional practices used to teach the new knowledge or other distractions from the learning target (Sweller, 2010). In terms of learning a new technology, these distractions can proceed from a poorly designed interface or insufficient technical support for the technology. The more extraneous load imposed on the learner, the less intrinsic load a learner can process (Sweller, 2010). Germane load refers to the mental efforts devoted to processing knowledge for storage in long term memory (Sweller, 2010).

Complexity and Cognitive Load

Research has shown that individuals perceive elevated levels of mental load when attempting to learn or execute more complex tasks (Çevik & Andre, 2013). Integrating new technologies into instruction has been found to be a source of excessive cognitive load in several research studies (Bower, Dalgarno, Kennedy, Lee, & Kenney, 2015; Chambers, Threlfall, & Roper, 2012; Feldon, 2007). CLT describes complex tasks as having higher amounts of element interactivity (Sweller, 2010). In other words, content or skills of greater complexity require the interaction of a greater number of elements, or individual chunks of information, to be understood (Sweller, 2010). It should be remembered that Rogers (2003) claims in his discussion on the complexity of innovations that the more complex an innovation, the lesser its rate of adoption. One reason he offers is the distance between inventors and users which confounds the lines of communication required to support the user in learning and understanding the innovation (Rogers & Svenning, 1969). In his own investigations of innovation diffusions, Rogers has found the lack of technical support and inadequate information from the designers about the disseminated technologies to be major reasons for individuals to defer from adopting the innovations (Rogers, 1975; Mahler & Rogers, 1999). One must conclude then that adapting the process of facilitating the learning of the technologies to their levels of complexity might have increased their rates of adoption.

The Problem with Problem-solving

CLT research asserts that problem-solving activities are an inappropriate instructional strategy for novice learners due to the excessive mental load they impose (Kirschner, Sweller, & Clark, 2010; Sweller, 2008). Their reasoning is that problem-solving requires prior knowledge a novice does not have in adequate supply (Kirschner, Sweller, & Clark, 2010; Sweller, 2008). Research has consistently provided evidence that instructional practices which require novice learners to engage in problem-solving activities are less effective than guided instruction (Çevik & Andre, 2013; Kirschner, Sweller, & Clark, 2010; Kissane, Kalyuga, Chandler, & Sweller, 2008; Clarke, Ayres, & Sweller, 2005). In their article responding to this criticism of problem-based (PBL) and constructivist learning, Schmidt, Loyens, van Gog, and Paas (2006) defend PBL saying that the method can be successful for novice learners and conducive to the human cognitive architecture. However, the authors describe conditions for PBL in which the learners receive supports through peer collaboration, extended time for completion, and the assistance of an expert who provides content information at the point of need (Schmidt et al., 2006), supports that would serve to decrease the mental load on learners. It can be argued that the majority of professional developments which accompany the integration of a new technology place teachers in a situation in which they are required to problem-solve but without the supports of time and collaboration described by Schmidt et al. (2006). During problem-solving activities, learners are required to apply prior knowledge to new contexts in order to be successful, much like teachers when they are required to independently master a new technology and figure out how to integrate it within their pedagogical and content knowledge as well as successfully implement the technology within the classroom environment. When teachers are presented with a new and unfamiliar digital interface, only a limited

number will have the prior knowledge that will assist them in learning the new technology. Sweller (2008) cautions against the use of technology during instruction without considering the limitations of the human cognitive architecture. If one can apply the principles of CLT to an assessment of the typical technology training provided to teachers, it might be said that the trainings are not designed so that everyone achieves full mastery. Thus, one should not expect everyone to adopt the technology.

The Role of Guidance and Scaffolding

Rather than putting learners presented with new knowledge through the trial-and-error process of problem-solving, proponents of CLT recommend a more guided approach through scaffolding with fully worked then with faded examples (Kirschner, Sweller, & Clark, 2010; Kissane, Kalyuga, Chandler, & Sweller, 2008; Sweller, 2010). Sweller (2008) advises that instructors should "always show learners how to do something rather than have them reinvent the wheel" (p. 34). Research studies comparing the results of instructional practices using worked or faded examples to those which take a problem-solving approach find that learners presented with unfamiliar content perform better with worked examples (Çevik & Andre, 2013; Kissane, Kalyuga, Chandler, & Sweller, 2008; Clarke, Ayres, & Sweller, 2005; Kirschner, Sweller, & Clark, 2010). CLT explains the reason for this trend in research findings. When presented with new, unfamiliar content, learners have little to no prior knowledge to assist them with processing the content. Modeling content through the provision of worked examples supplies learners with the supports they need to manage the load of processing the new content (Sweller, 2010; Feldon, 2007). Through practicing with worked examples, learners gain the experience they need to process the content (Çevik & Andre, 2013). This practice is especially necessary when tasks are higher in complexity, or have higher element interactivity (Sweller, 2010). The success of scaffolding learners with worked examples is compelling evidence that lack of attention to the cognitive limitations of teachers during technology trainings may affect how willing they are to adopt the new technology. A common theme in research on professional development when analyzing the data collected from participants is the importance of mentorship and feedback from an expert and peer support and modeling (Ching & Hursh, 2013; Kim, Kim, Lee, Spector, & DeMeester, 2012; Davis, Preston, & Sahin, 2009; Frank, Zhao, Penuel, Ellefson, & Porter, 2011; Vavasseur & MacGregor, 2008; Goktas, Yildirim, & Yildirim, 2009; Overbaugh & Lu, 2008). One might infer then that providing teachers with the opportunity to learn through modeling and imitating worked examples has proven successful in these research studies. Sweller (2008), in a discussion of the borrowing and reorganizing principle of CLT which describes how the working memory processes new information and information from long term memory, claims that one's basic source of information is the long-term memory of others shared through various forms of communication. Providing teachers with professional development that gives them more time to receive mentorship and learn from others well before being expected to use new technology independently in the classroom will surely lead to a higher rate of adoption than the traditional short-term trainings that typically take place.

Expertise Reversal Effect

There are times, however, when worked examples are not the best choice: when the learners have enough expertise on a topic that worked examples become redundant and thus a source of extraneous load, a phenomenon known as the expertise reversal effect (Sweller, 2010; Sweller, 2008). This effect has been supported by evidence in research comparing the performance of learners with more and less expertise during instruction utilizing worked examples (Kirschner, Sweller, & Clark, 2010; Kissane, Kalyuga, Chandler, & Sweller, 2008; Clarke, Ayres, & Sweller, 2005). If technology training provided for teachers could be considered as taking a constructivist or problem-solving approach, CLT and the expertise reversal effect would predict that the training would favor teachers with more prior knowledge in technology. According to DoI, an innovation is adopted in the beginning by a small group of individuals categorized as innovators (Rogers, 2003). If professional development in technology provided to teachers as part of the diffusion process does not offer adequate scaffolding for those who have less experience, the teachers who have expertise in technology will be more likely to adopt the innovation before their peers and fulfill the roles of the innovators and early adopters in Rogers' model. Thus, the implications of the expertise reversal effect can serve as a possible explanation behind Rogers' theory on an innovation's rate of adoption.

Technology and Cognitive Load

Extraneous load, the form of mental load that distracts the learner from processing the target information, can come from instructional design practices as seen in the use of problem-solving activities with novice learners, but the use of a computer interface during instruction and learning can be a source as well (Sweller, 2010; Sweller, 2008). If the interface is poorly designed and not created with the user in mind, the interface itself can be a source of extraneous load. Rogers (2003; 1969) discusses the issue of an innovation's complexity making it difficult to learn and understand and thus decreasing the likelihood of adoption, and he observes that this happens often because of the distance between the inventor and the end user. Rogers (2003) hypothesizes that with the larger amount of time a designer spends with the technology than the end user, it becomes difficult for the designer to empathize with and predict the user's perception of and ability to learn the interface. Certain features of technology and how it is used can be additional sources of extraneous load. In the teacher technology training scenario described in the introduction to this paper, the teachers each have a laptop to use while a training coordinator draws their attention to a large screen at the front of the room where she demonstrates the use of each technology program the district has adopted. Having the teachers share their attention between the coordinator and her presentation and their laptops where they attempt to follow along creates what CLT terms as the split attention effect, which according to the theory deters the teachers from learning about the programs (Sweller, 2010; Sweller, 2008). The modality effect in which the same information is presented simultaneously from a variety of sources also imposes extraneous load on learners (Sweller, 2010; Sweller, 2008). This effect is also likely to occur in the situation described, especially if the coordinator provides the teachers handouts containing the same information she delivers through her presentation and which is also available on the teachers' laptops. Sweller (2010; 2008) asserts that the redundant, simultaneous delivery of the same information from various sources reduces the quality of learning. Research provides evidence that shows when learners are allowed to first learn and master the technology interface itself before learning its applications as opposed to being presented with the interface and its functions and applications simultaneously, they perform better on assessments of their knowledge (Clarke, Ayres, & Sweller, 2005; Davis, Preston, & Sahin, 2009). It follows then that designing technology training to accommodate the cognitive limitations of the learners would yield better learning outcomes.

Applications to the Design of Technology Training for Teachers

DoI and CLT research, when analyzed side by side, find common ground in recommendations for the design of technology training with the view of helping teachers learn and integrate a new technology. The following points are supported by both theories. Teachers must be supported through the process of learning a new technology through mentoring, scaffolding and peer support that is consistent with the technology's complexity (Bitan-Friedlander, Dreyfus, & Milgrom, 2004; Bower, Dalgarno, Kennedy, Lee, & Kenney, 2015; Brinkerhoff, 2006; Chambers, Threlfall, & Roper, 2012; Ching & Hursh, 2013; Davis, Preston, & Sahin, 2009; Frank, Zhao, Penuel, Ellefson, & Porter, 2011; Vavasseur & MacGregor, 2008; Goktas, Yildirim, & Yildirim, 2009; Hegedus et al., 2014; Kao, Tsai, & Shih, 2014; Kim, Kim, Lee, Spector, & DeMeester, 2012; Overbaugh & Lu, 2008; Rogers, 1975; Rogers, 2003; Rogers & Svenning, 1969; Feldon, 2007; Sweller, 2008). The training must be adapted to the teachers' levels of prior knowledge, being conscious of the fact that teachers with more expertise will not be served as well by the instructional practices designed for novices (De, Kavitha, & Kanagasabai, 2014; Clarke, Ayres, & Sweller, 2005; Çevik & Andre, 2013; Kissane, Kalyuga, Chandler, & Sweller, 2008; Kirschner, Sweller, & Clark, 2010). The teachers must receive continued technical and instructional support (Mahler & Rogers, 1999; Bitan-Friedlander, Dreyfus, & Milgrom, 2004; Bower, Dalgarno, Kennedy, Lee, & Kenney, 2015; Brinkerhoff, 2006; Feldon, 2007; Goktas, Yildirim, & Yildirim, 2009; Overbaugh & Lu, 2008; Wright & Wilson, 2007). Finally, teachers must be allowed sufficient release time from classroom responsibilities in order to focus attention on learning the technology and its applications to instruction before being expected to independently integrate the technology in the classroom (Rogers & Svenning, 1969; Clarke, Ayres, & Sweller, 2005; Davis, Preston, & Sahin, 2009).

Discussion

Everett Rogers (2003) claims that the complexity of an innovation has a negative relationship with its rate of diffusion but seems to offer no framework explaining how an individual manages complexity in order to understand, learn, and then adopt an innovation. CLT may be the means of opening a door that as yet in research appears to have not only been closed but overlooked. Sweller's theory provides an explanation for how teachers

presented with new technologies are best able to manage the mental load of learning a new digital interface, applying the technology to instructional practices, and then actively using the technology with their students to improve their learning outcomes. The understanding afforded by the application of CLT's principles to the design of technology training for teachers may lead the way to improved rates of technology diffusion in schools.

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Instructional Methods for Online Writing Courses: A Case Study

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Abstract

Composition courses, English as a Second Language courses, Business and Technical Communication, among others, are often delivered through both asynchronous and synchronous learning environments and methodologies. Many face-to-face and online course comparison studies have been conducted; however, few studies on writing courses directly compare online and traditional versions of the same course. This study allowed the researcher to determine student attitudes about writing courses and compared the effectiveness of two delivery methods by looking at student learning outcomes and perceived course achievement.

Keywords: Online writing course, instructional methods, e-learning methods, comparison study, online and face-to-face

Introduction

This research was aimed at improving online undergraduate writing courses. Through interview and survey questions, the researcher helped ascertain relevant learner attitudes about online learning. The researcher also gathered qualitative and quantitative data focused on improving online education for

undergraduate writing courses, which could be used at any higher education institution. The following question was used to frame the data collection process in general:
- Are there any particular instructional methods that work well for online writing classes?
- Conversely, are there any instructional methods that do not work well?

Literature Review

With the increase of online course offerings, understanding more about best practices is becoming increasingly more important. Currently, there is a relative lack of knowledge on how online instruction affects students in writing courses (Newell et al., 2011), especially in terms of best practices. While many factors, such as anxiety, can negatively affect a student's success in any course, the best predictor to success in online coursework is as follows: grade point average, previous academic achievement (Wojciechowski & Palmer, 2005), student readiness (Harrell 2008; Watkins, et. al., 2004), complete familiarity with the learning management system (Wojciechowski & Palmer 2005; Harrell, 2008), and the age of the students (Xu & Jaggars, 2013). In fact, in Kember's model of Student Completion, a student's "entry characteristics" can be used by an instructor to provide an academic environment conducive to the success of the student (Moore & Kearsley, 2011, p. 159). As such, students who have past academic success, past online course experience, tech skills, and are able to self-direct their own learning, are more likely to be successful in their courses.

In terms of a comparison of success between online and offline writing students (in the same course), Mehlenbacher et. al (2000) found that there was no difference in students' course grades at the end of the semester in each respective course (with three different instructors). In this same study, the researchers found that the instructor's pedagogical approaches had less impact on grade success – that course grades, instead, tended to match students' individual success in past writing courses.
A comparison study done at Cuesta College, a college in San Luis Obispo, California, found similar learning styles and learner qualities in the student body in an online health education course; however online students were found to be more "independent, less dependent and less avoidant". Conversely, students in the traditional face-to-face course were less independent, more dependent, and more collaborative in nature (Diaz & Cartnal, 1999). The researchers contend that "strengthening students' less-preferred learning styles helps them become more versatile learners" (Diaz & Cartnal, 1999, p.134) and more successful in future courses.

Carpenter, Brown, and Hickman (2004) also found that online writing students "tend to be more successful as (or more successful than) students who complete" (p.18) the same face-to-face version of the course. However, more students in online writing courses tend to drop out before course completion (Carpenter, Brown, & Hickman, 2004). As such, their literature matches the current consensus that online learners can be more successful, yet they tend to drop out more often than face-to-face students (Rovai & Jordan, 2004; Perry & Pilatti, 2011; Means et al, 2010).

Online learning also has a wealth of benefits for students, in particular the use of online discussion forums. For example, Bain (2012) mentions "asynchronous discussion potentially benefits learners by enabling them to take time to reflect on messages previously posted before making their own contribution" (p.30). This extra time allows responses to be more thoughtful and for discussions to exceed normal class hours (Rovai & Jordan, 2004; Zhu, 2006; Knowles & Kerkman, 2007; Palmer & Holt, 2009). Students are allowed to revisit these forums at any time (Zhu, 2006; Rovai & Jordan 2004; Perry & Pilati, 2011), which allows any topic to be reread and reflected upon throughout the semester. While in-class note-taking allows students to record class discussions and instructor comments, students cannot easily keep track of an entire class discussion and lecture without the use of recording devices. An online discussion, on the contrary, is a conversation locked in time – complete and accessible after the fact. Unfortunately, the usefulness of online discussions varies between students and overall courses, with some students merely taking part in class discussions for grades or when required (Rhodes, 2008).

Specific to writing courses, Gilliam and Wooden (2013) found that the success of online composition courses is, in part, due to the body of tools available to students. Discussion forums, learning management systems, cloud sharing, and emails, to name a few, are simple educational tools that can greatly improve writing education. These tools allow for ideas and information to be shared amongst

students in a more timely and effective manner (Gilliam & Wooden, 2012). As stated, the usefulness of these technologies greatly depend on the individual learner's ability to use these tools effectively (Rhodes, 2008).

Though this is by no means a comprehensive review of the available literature, it is clear that online learning has many advantages and disadvantages in terms of course delivery. However, as mentioned earlier, there is a lack of literature comparing the same course offered in both online and face-to-face; this study aimed to fill that gap.

Methods

Research Question

The following research questions are addressed in this study

- Are there any particular instructional methods that work well for online writing classes?
- Conversely, are there any instructional methods that do not work well?

To answer the above, the following data was collected from students taking an upper-division writing course: student demographic information; perceived success on the three core writing projects (Industry Paper, Ethical Argument Paper, and E-Portfolio); and interviews of a representative voluntary sample from both the offline and online lab courses to gain data for the research questions. Among the 95 research participants, fifty-four students were enrolled face-to-face, and forty-one students were enrolled in the online sections of the same writing course taught by the same instructor.

Course Description

In this writing course, students had three deliverables required to meet the requisite learning outcomes. The first deliverable is a six to ten page research paper analyzing the industry the student intends to work in upon graduation (this will be referred to as the *Industry Analysis Paper* in subsequent discussion). The outcome of this assignment is to gain understanding of what trends are taking place within their field, what skills their potential employers require for specific job positions, and what educational pathway best positions them for work in the field. The second assignment was a 10 to 12 page ethical argument essay focused on a tech-related ethics issue (later referred to as the *Ethics Paper*). The third major assignment was an e-portfolio that includes the student's resume, cover letter, introduction about themselves, video about themselves, and a shorter version of their prospective capstone.

During face-to-face (F2F) lab sections, the course professor relied heavily upon class interaction and group work. For example, during an observed class, the instructor began the session by having each student do a "freewrite" on which specific technologies were important to their daily lives (Elbow, 1989). The instructor then had each student share his or her thoughts with the class. After this discussion, the instructor led the class through a twenty-minute lecture about an upcoming assignment (Industry Analysis Paper), writing practices, and the importance of understanding their reading audience. Following the lecture, the students worked in small groups to practice writing for different audiences (e.g. professional and lay audience groups). By using a flipped class method, the instructor allowed students to emulate real-world communication that students would see in their future work environment. In online sections of the course, however, the professor relied upon discussion forums to drive student interaction on each given topic. Each student was required to reply to a prompt and then reply to the student who posted before him or her.

For both the online and face-to-face courses, the instructor used a Moodle-based learning management system (LMS). Within this LMS, all of the courses resources and assignments were near the top of the page. Students would have to scroll down the page to find their weekly readings and assignments. Minor changes were made to projects to allow the online students to have a comparable learning experience. For example, instead of a traditional class presentation, online students narrated slideshows and posted these videos to the LMS for peer feedback.

All four sections (two face-to-face and two online sections) had a separate online LMS course shell. The professor used this page to share course news, course information (e.g. the course syllabus), assignment instructions, weekly readings, media, general writing resources, APA citation resources, presentation resources, lecture materials, and weekly activities. Even though two of the course sections were taught face-to-face, students in all four classes used the Internet regularly and extensively.

Data Collection and Data Analysis

A pre-survey was administered to the target population in the third week of the semester to collect demographic information. The survey was created using Google Forms and was housed on each course section's LMS homepage. The students were asked to complete the survey by both their professor and the researcher. Due to a consistent slate of reminders, the survey saw 95 respondents out of a possible 97 students, reaching a response rate of 97.9 percent.

The pre-survey allows for collection of both quantitative data and qualitative data. Students assessed their academic writing readiness, skills, and past experiences based on a Likert Scale ranging from 1 to 7. After the quantitative questions in a given section, the course students were asked to offer additional insights about course delivery preferences, writing activities they enjoyed, and about past learning experiences. A post-survey was delivered at the end of the semester asking the same or similar questions. The survey was housed on the LMS course homepage, in a similar fashion to how the pre-survey was conducted.

The interview questions were constructed based on preliminary data analysis of the pre-survey responses. The researcher asked questions about each student's favorite writing teacher, why students took the section of the course that they did, among others. These questions were asked in ways that would triangulate the data to make the qualitative data as secure as a measuring tool as possible.
To evaluate the qualitative responses given by the respondents, coding for patterns (Saldalnia, 2009) was used. The codes were grouped into primary groups, such as communication, with sub-topics for further delineation of the data collected. Also, each code was grouped into either an online or face-to-face category for easier referencing.

Results

When students were asked about the best ways they learn academic writing, many stated the need for relatable topics, reading, practice and repetition, a good instructor in a face-to-face setting, regular feedback, and useful peer review. Scores of students commented on the need for topics that relate to them and modeled writing practice (e.g. reading famous pieces of work, looking at how a professor would structure an argument, or past examples of successful work by a student). In fact, many students commented about face-to-face instruction directly, and how online instruction doesn't fit the need of most writing students. However, there was a small minority of students who felt online instruction could be beneficial (in terms of its ability to give students more self-directed learning options), or that online instruction was on its way to being more useful to writing instructors. One student commented on the relative safety blanket that most students feel towards face-to-face instruction:

I'm not sure what the best ways are to learn academic writing. Throughout my school years, I've always learned face to face and that is what has been best for me. But as technology is being incorporated into more at schools, who knows maybe online classes will become more and more common.

One student summed it up best by saying that the way a student learns writing best was completely dependent on the student. For example, one student noted,

"*the best way* [for me] *to learn writing is via an online class but I know that it might be more of a hassle for the professor. I think being able to digest the information at your own pace is a great benefit*."

A recurring theme throughout many student responses was the need for constant repetition and practice for the improvement of academic writing skills. One student felt "the best ways to learn academic writing would be practice. Doing it often, regularly, with regular feedback." The methods of practice varied widely in the data collected. Many students reflected upon the need for regular reading practice to

observe both good academic writing and for improving writing style. One student asserted the need for a multitude of writing exercises:

Reading and writing are, unsurprisingly, the best ways to learn excellent writing skills. The 'free write' sessions at the start of our CST 300L class are a great way to practice, for example. I would also recommend setting aside 10-15 minutes for 'free-reading' - not only will it engender more interest in reading/writing in general, it also solidifies an individual's grasp of grammar, correct syntax, and vocabulary by virtue of continued exposure to a published author's level of writing.

In short, students routinely elevated writing practice as the most important way to improve one's own writing.

Others expounded upon the need for a knowledgeable instructor and for the need for consistent and concise feedback, from both the instructor and one's peers, such as in the form of structured and unstructured peer review. Many times, when students mentioned face-to-face classes (or alluded to them), one of the biggest positives stated was the ability for timely feedback from their instructors. Implied in this was that online instruction was not timely or that students won't get the same influential feedback on their academic writing. Interestingly, some students, those self-reporting as more comfortable with face-to-face writing instruction, still validated components of online learning as "useful". For example one student stated:

The best ways to learn academic writing is from example. It is always best to be shown an example and the steps to make towards writing a paper. Also if class is not in session it is always appreciated if the professor provides the students with links and websites to checkout for further information.

As such, even if students don't engage fully in an online writing course, many used the Internet or other online tools and resources, to improve their writing.

Respondents also called for a more extensive offering of writing assignments. Whether it involved reading, academic writing, free writes, structured short writing assignments, many students called for more types of practice. For example, one student clearly commented on their disdain for the standard writing curriculum seen in most academic courses:

I've been doing MLA/APA since high school and I am so over it, I know it backwards and forwards and it's just redundant and stressful. I would rather be refining my writing strategies, because one class I have never been required to take is a creative writing class and I'm upset that I've never had the opportunity to enjoy one, yet I keep ending up doing these research papers that will never amount to anything because they are all so bland.

This led many students to note the need for more relatable topics. One student stated how writing on an engaging topic could lead to new insights:

By finding a topic that you are heavily invested in, emotionally and/or intellectually and then finding research that support your ideas. That can often lead you to discover whole new perspectives on a subject and even change your mind entirely. Once you have solid facts and numerous, trustworthy sources, you just have to be motivated to put it all into the form of a paper.

In short, students want a vast array of writing activities with which they can develop new writing skills. However, students want more than just the standard writing activities that make up most writing courses. Even more so, they want to have more control on the topics on which they can write on and make the assignments more closely related to their academic, professional, and personal goals.

When asked about other activities to improve their writing, some online students offered suggestions. One student wished that there was an online chat room on the LMS, so that students could chat about their work and get help from one another. Another student offered the suggestion for a more immediate feedback system. Lastly, one student mentioned that a more interactive forum could be used, to allow students to share more information with one another.

Students were then asked how important they perceived in-class discussions being, in terms of learning about academic writing. There was a significant difference in the scores for face-to-face and online students ($|t(75)| = 2.72$, $p < .01$). Students in the face-to-face course found these types of discussions to benefit their learning more than online students did. Many students reported this later during the written survey, with many focusing either directly on discussing with their fellow students or professors. However, many online students also mentioned that they found the forums as a sufficient form of class discussion and

as a great place to disseminate their ideas. Regardless, these results show that face-to-face students prefer class discussions more than online students.

In a follow-up question, students were asked to describe how important one-to-one discussion with their professor was to their learning of academic writing. There was a significant difference in the scores for face-to-face and online student group ($|t(75)| = 2.22$, $p < .05$). These results strengthen the previous findings by showing that the face-to-face valued individual discussions with their professor more than online students did.

Both student groups were asked about how well they could use the LMS to learn more about academic writing. There was a statistically significant difference in the scores for face-to-face and online student groups ($|t(65.47)| = 2.02$, $p < .05$). These results suggest that online students feel more comfortable using the LMS to learn academic writing. Naturally, these students relied on using the LMS for their day-to-day class work. However, every student (whether online or face-to-face) had to use the LMS to turn in assignments, participate in discussion forums, download course materials, etc. As such, these results suggest that online students felt more comfortable using the LMS to learn academic writing, possibly due to their usage of the LMS in all facets of their course learning experience.

Students were next asked to describe ways that they felt were best to learn academic writing. Over half of the students (36 in total) mentioned practice specifically in their response. Practice included writing for fun, journaling, and doing course assignments. Another key aspect of learning academic writing focused on feedback. Some students preferred feedback from the course professor, while others felt peer review was more substantial. Twelve students mentioned face-to-face classes made learning academic writing easier. One student wrote that face-to-face was better "*because it is hard to learn the ways of a good writer by just sitting in front of a computer reading information about assignments, the class, or even why you didn't necessarily do good on a paper*." Many students who mentioned feedback also cited face-to-face as an advantage because of their ability to get specific feedback sooner or feedback that could be targeted better to their direct concern.

Examples and *Coursework* were two other keywords that showed up consistently in participant responses. Three students mentioned reading academic articles and using them as examples of how to write such papers in the future. Others mentioned the forums and ethics paper coursework as being helpful to their understanding of how to articulate an informed argument. Also, many students offered additional ways to learn writing. Three students mentioned short essays, while other students mentioned the length of an assignment as being a deterrent to improving academic writing. Lastly, many students felt that coursework needed to be more fun and that it should also match their personal interests more. Twenty different students wrote that they would enjoy writing if it relatable to their future career goals, more creative in nature, or simply a fun writing task in general.

The most common responses to the question of what specific activities in the course were perceived to be most helpful for each student included free-writes, reading, the course assignments and papers, and feedback.

Ten students mentioned free-writes as a helpful exercise in the course. One student mentioned that the free-writes were a more fun and less stressful way to engage in the critical thinking processes necessary to be a successful writer. Other students mentioned that it was a great way to warm-up before other class activities or that the free-write prompts spurred additional thoughts for future or past assignments.

Thirteen students mentioned reading and accompanying resources as a helpful learning activity. Reasons varied as to why reading was helpful. One student mentioned that readings and resources, such as TED Talk videos, helped her gain a fuller standing of social issues affecting her career field. Other students mentioned style guides and peer review as helping them to improve their writing.

Forty-seven students mentioned course assignments in some form in their response. Thirty-one of these students, found the research papers to be the most helpful assignments in the course. Of these thirty-one students, 15 mentioned the industry analysis paper as the most helpful assignment for them. One student stated that,

Paper 1 helped me out a lot with learning about academic writing because it was basically a research paper about my career path. I think that it really connected my dream goals and realization of the requirements to get there all in one paper."

Other students mentioned that the ethics papers helped them to learn more about academic research skills and to strengthen their understanding of APA essay structuring.

A majority of respondents focused on timely feedback and the frequency of feedback from the professor. After meeting with the professor, the researcher learned that the course professor suffered from an unexpected physical impairment that limited her computer use and thus delayed feedback; in fact, some students did not receive feedback on assignments for lengths as long as two months. Despite her physical limitations, she was available to meet both face-to-face and online students during office hours (on campus or virtual) to provide verbal feedback. Many students took advantage of that, but students who didn't have time to meet her were unable to get this type of instantaneous feedback.

Students also discussed examples and peer review as important forms of feedback on their writing. Students mentioned poor examples of previous attempts on assignments could be shared, as well as good examples. Students also wanted the instructor to share examples as well, a practice the professor used frequently in each course lecture. Lastly, a few students mentioned advice from peers who have taken the class previously or tutors being a way that they like to receive feedback on their writing.

At the end of the post-survey, students were asked to fill out short-answer course reflection questions. Topics included perceived course success, why they took a certain delivery method, how the LMS affected their coursework, their opinions of online and face-to-face assignments, and how they would have done if they would have taken the opposite delivery method.

The first course reflection question focused on perceived success in terms of learning how to perform academic writing. Sixteen students felt they learned nothing new after taking the course. The majority of these responses noted that they had taken previous courses that taught them similar skills. An overwhelming amount of students felt the course did help them to improve their writing. Many students mentioned APA citation skills, formulation of a research topic, argumentative writing, among other skills, all improved. One student stated, "*I think I learned to mature my writing, write for a broader audience, write more technically and not use loaded language that reveals a bias of opinion*". Nine students felt indifference about perceived improvement post-instruction. Of these students, many mentioned they felt that they had not changed much as writers, so it was difficult to determine how they perceive their writing abilities (especially if any positive changes had been made).

The second course reflection question focused on perceptions of coursework and its usefulness. Thirty-three students found the coursework to be helpful or fairly helpful in terms of supporting their learning. Many students commented on the length of assignments and wished the essays would have been shorter or broken up into multiple assignments. A smaller majority of those who found the coursework to be helpful also mentioned that the coursework was fun. Of these students many "enjoyed the forums that required us to respond to a TED Talk", because it helped them to develop upon their own opinions in an academic environment.

Other students found the coursework to be not useful, tedious, repetitive, boring, unnecessary, and difficult. Only a few students found the entirety of the class to be unhelpful, with many students only finding particular activities to be less useful for their learning. One student felt strongly that "*there should be more academic writing work instead of watching YouTube videos and other busy work*". This student felt that this form of writing responses did not help to improve his academic writing, but instead opinion-based writing instead. Interestingly, a small group of students found the forums and other online activities to be the least helpful to their learning, with not one student mentioning a face-to-face activity negatively in response to this particular question.

One reflection question queried students about why they took either the online or face-to-face version of the course. Thirty-nine students mentioned that they took the online version, with twenty-two specifically mentioning time constraints, the time of the course, or their work schedule as the main reason they took the online course. One student mentioned that:

I… would rather work from home especially, because this isn't math or science, this is pro seminar. The content shouldn't be only online or face to face but choosing online definitely gives me more leeway to express myself and participate in the forum discussion unlike in face to face where I only maybe be able to say a few things or nothing at all depending on the amount of students taking the face to face course.

Many students mentioned work schedules affecting their ability to get up for or to be able to get to the course at 8AM. Of these students, some thought an online course would be easier in terms of course content compared to the face-to-face version. Others mentioned that they could pace themselves according to their learning style or time that they could put towards the course each day.

Twenty-seven students mentioned their reasons for taking the face-to-face version of the course as well, that they needed feedback from and interaction with the instructor and their classmates to be successful. A student reflected that they preferred taking the "*offline version of the course because I prefer to have an instructor when I am being taught something, anything really. Also, [the course professor] is a good instructor to have for a writing course*". In fact, some students took the course because they had either had or knew about this course instructor and felt that taking the face-to-face version would benefit them more because they could work closely with her. Others mentioned that they did not take the online version of the course because of previous bad experiences with online coursework or because they were unaware that the course was offered online at all.

After students reflected about the delivery method, students were asked to share how the LMS affected their coursework. Nearly twenty students felt that the LMS had no effect on the coursework and that the class would have been just as useful without out it. Others commented on its usefulness, while others disliked the LMS and found it to be a detriment.

Those who enjoyed the LMS found it easy-to-use, enjoyable, made information easier to access, and improved their efficiency. One student mentioned that the greatest "*advantage of using [the LMS is that] it greatly increased my efficiency, as having all the material in one place was helpful*." Others found access to be a huge help when working on their assignments because they could access the LMS on their mobile devices. Many students enjoyed that they could view deadlines for assignments on the LMS and that they could access their grades as well. One student mentioned that "*unlike a face to face [course] where you can easily forget things, [the LMS] has all the information you need until the semester ends*." Lastly, a small group of students mentioned the online activities housed on the LMS such as Ted Talks, forums, and other writing assignments that they enjoyed.

Those who disliked the LMS noted that it was difficult to use, unfamiliar to them, had a bad user interface, and that it would lag and glitch at times. Many students noted instances where the LMS shut down while turning in an assignment or did not submit a quiz on the first or second click. One student reflected that the LMS shut "down on me during a quiz, writing an assignment, and even uploading a project". Others mentioned the interface being poor and not having adequate information in one place. Students felt that they would continuously need to hunt through different pages of the LMS to get to the information they need. While not necessarily mentioned for this course, students mentioned that their experiences with the LMS were greatly dependent on how well the professor knew how to use the LMS. Due to the LMS being upgraded to version 2.5, many students found it to be "laggy" and "glitch" compared to the older version or compared to different learning management systems used at previous colleges.

Discussion

Implications and Limitations

While there are many aspects of the student population studied that are typical of upper division students taking writing-emphasis courses at a four-year university, it should be noted that the sample population used in this study was comprised of self-identified computer science majors. As these students are frequent computer users, this particular attribute is less representative of students taking online coursework, especially in terms of their comfort level using the available online tools. Another possible limitation to this study is that, by utilizing the 'Flipped Classroom' approach, the face-to-face sections studies here may not represent the more traditional classroom approach of other instructors. Were this not the case, attitudes toward the LMS, online discussion boards, and multi-media resources and activities could significantly differ (if a comparison is even possible). In addition, since this study only looked at one semester of work, follow-up studies would provide a more comprehensive data set from which to draw conclusions.

Another limitation lies in the fact that this paper looked solely at perceived success, interest, and perceived enjoyment of learning activities. Data, such as grades and course assignments, would strengthen the findings presented here. Since access to such data was impossible, the researcher could only explore what students thought about their writing, instead of how it translated to grade or academic success. The above factors limit the generalizability of this study and its ability to be replicated in other schools or disciplines; however, given the push to include more technology in the classroom and the increased popularity of both online coursework and the 'Flipped Classroom', the findings reported here will likely increase in currency insofar as its representation of 'new' college writing pedagogies.

Conclusion

College level students – whether in a traditional classroom setting or online – want a range of activities and assignments from which to learn. In this study, students reported that practice was the best way to learn writing, and as such, instructors of both on-line and face-to-face classes can take advantage of their students' desire to practice their academic writing by using the online tools available for them. Similarly, instructors should consider offering students a broader range of activities for writing practice, especially activities relevant to their students' personal or educational interests. While the intent of this study was to reveal best practices for the online writing courses, some themes that emerged from this comparison is that students feel that they benefit most from the following: diversity in assignments, activities, and learning materials; timely feedback, and writing practice.

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Design Thinking: A New Construct for Educators

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Abstract

Design Thinking is a creative problem-solving approach being considered for use in teacher education and research. However, since the term "design" has been over-used, some might question whether Design Thinking is more than an old idea with a trendy new name. In many cases it is still unclear as to what the theoretical basis for Design Thinking is, whether it aligns well with the field of education, or how it compares to other well-established approaches. We will show that this fuzziness stems from three Design Thinking discourses which overlap, but do not always align. We will describe Design Thinking and how it compares to Inquiry-Based and Problem-Based Learning, Instructional Design, and Design-Based Research. Finally, we will describe a pilot study utilizing a Design Thinking approach. This material is based upon work partially supported by the Engineering Research Center Program of the National Science Foundation under NSF Cooperative Agreement No. EEC-1449501. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect those of the National Science Foundation.

Design Thinking Background

Both Kimbell (2011) and Johansson-Sköldberg, Woodilla, and Çetinkaya (2013) agree that Design Thinking is one of separate discourses. Both suggested that there is a scholarly discourse founded on theoretical and empirical research, and a business innovation discourse founded on experiential and anecdotal evidence. Kimbell further suggested a third discourse embedded in the wicked problems discourse first argued by Rittel and Webber (1973). These authors caution researchers to be cognizant of the appropriate theoretical foundations for proposed studies into Design Thinking.

Scholarly designerly thinking discourse. In 1969, Herbert Simon wrote a chapter on the "Science of Design" in a book entitled *The Science of the Artificial* in which he argued for a need to better understand the process by which manmade objects were produced. While his book suggested a post-positivist stance (Buchanan, 1992), Simon was one of the first to suggest that professional designers solve problems differently than professionals in other fields (Johansson-Sköldberg et al., 2013; Kimbell, 2011). In juxtaposition, Donald Schön's (1983) work, *The Reflective Practitioner*, reflected a more constructivist stance, and suggested that the design process was one of divergent-convergent conversations with the problem frame in which the designer dually reflects-on-action and reflects-in-action.

Throughout the 1980s, Lawson, Cross, and Rowe separately conducted empirical research utilizing ethnographic and case study methods to better understand and define designerly knowledge and the process by which they solve problems (Johansson-Sköldberg et al., 2013). Through the work of these researchers, it was determined that designerly thinking is an approach to solving design problems utilizing an abductive process. They described this approach as inherently ambiguous, iterative, productive, visualized, collaborative, empathetic, situative, and satisficed. Further, while Designerly Thinking is systematic in its process, with designers often utilizing process models from within their own fields, designers diverge and converge from these models as part of their attempt to better adapt their understanding of the problem frame based on new and changing information. By

the 21st century, continued research in the field led Cross (2011) to the suggestion that designerly ways of knowing could be utilized within any field as a more general Design Thinking approach.

Wicked problems design thinking discourse. Johansson-Sköldberg et al. (2013) considered the wicked problems Design Thinking discourse to be a refinement of the Scholarly Designerly Thinking discourse since it still relies on the same theoretical foundations. However, Kimbell (2011) argued that the addition of Rittel and Webber's (1973) Wicked Problems approach changed aspects of the original conversation, which warranted its own discourse. This offshoot occurred when Buchanan (1992) suggested that the Design Thinking discourse was becoming too scientific. He suggested that while researchers should scientifically study the design process, the design process itself should not be likened to a scientific process as originally suggested by Simon (1969).

Rittel and Webber (1973) argued that solutions for "wicked" problems must be determined within context because a systematic formula for solving them does not exist. Because the designer satisfices the solution by determining the stopping point for the solution when it is good enough, wicked problems are technically without final solutions. While wicked problems may seem similar to other known problems, there will always be some aspect that is unique. Therefore, designers must be careful about selecting an obvious solution too early in the process. Also, one determined wicked problem may simply be the symptom of a greater wicked problem. Buchanan (1992) utilized learning theory from John Dewey (1986) combined with these wicked problem characteristics to describe a Design Thinking process as a balance between the analytic and creative.

Innovative design thinking discourse. The Innovative Design Thinking discourse seems to have originated in the early 1990s when Stanford University mechanical engineering professor David M. Kelley participated in a merger of several design firms which led to the creation of the design consulting firm IDEO (Johansson-Sköldberg et al., 2013; Kimbell, 2011). Kelley continued to work for Stanford and be part of IDEO. While at Stanford, he taught design education courses utilizing design process strategies. In 2005, he partnered with the Hasso Plattner Institute in Potsdam, Germany, to create the Stanford University Hasso Plattner Design School, nicknamed the d.School (d.School, 2016). As part of this program, students from any degree field may take courses on problem solving utilizing the Stanford model within a design studio environment. Concurrently, Roger Martin (2009), Dean of the Rotman School of Management for the University of Toronto and former consultant for IDEO, and Tim Brown (2009) current CEO and president of IDEO, made an argument that the Design Thinking approach can be applied within almost any field to develop innovative solutions. Most recently IDEO, in conjunction with a school district, created a *Design Thinking for Educators* toolkit based on the IDEO Design Thinking process model (IDEO, 2016).

Much of the literature from this discourse supporting the IDEO and Stanford models was based on the personal experiences or anecdotal evidence of these designers. This does not suggest that their models lack impact or efficacy; it simply means they were not empirically-based. Yet the Stanford and IDEO models are quickly becoming the basis for empirical studies beyond the field of business, such as healthcare and education. This may be due to the strongly parsimonious nature of their models. However, the Scholarly Designerly Thinking researchers would argue that Design Thinking cannot be diluted down to a linear process model as this would defeat its base assumptions (Cross, 2001, 2011; Lawson, 2006; Rowe, 1991). With this in mind, it is a combination of the Scholarly Designerly Thinking and Wicked Problems Design Thinking discourses, both of which are theoretically- and empirically-based, that will form the basis for this discussion.

Design Thinking Approach

Though Design Thinking researchers agreed that certain assumptions define the Design Thinking approach—such as ambiguity, iteration, production, visualization, collaboration, empathy, situation, and satisficing—the abductive, non-linear nature of the process does not suggest a simple process model (Cross, 2006; Buchanan, 1992; Rittel & Webber, 1973). Design Thinking's fuzziness of construct might suggest a whimsical nature in which only those attuned to some magical internal force can use it successfully. Yet, research demonstrated that while it involves creativity of thought and a willingness to accept uncertainty, Design Thinking is most often conducted in an extremely systematic way (Cross, 2001, 2006; Lawson, 2006; Rowe, 1991).

Designers may have been taught a traditional linear process model for their specific design field; however, in practice they often did not follow these models step-by-discrete-step. Instead, they purposefully used a recursive process to diverge from one step to return to an earlier one, often picking up new information in the process. This problem-framing process caused the designer to simultaneously understand the initial problem while searching for a solution (Cross, 2006; Lawson, 2006; Schön, 1983). This caused designers to change and reconstruct their frame over and over again. It is likely that they begin by developing many mini solutions—which diverged from the traditional process to follow certain aspects of those solution paths—and tested them by building or sketching

models until the rationale they followed collapsed and led them to converge again. Eventually this fluctuating divergence-convergence of problem-solution paths narrows and slows, until through a situation of satisficing, the designers decide they have a workable solution for that situation in that moment. Please note that this process is not geared to finding THE BEST possible solution; instead, it searches until it finds a workable one. However, it is possible that the workable solution is the best possible solution.

As part of this process, most designers clarify the problem, seek empathy through multiple stakeholder perspectives, develop ideas through prototypes, and then test those prototypes (Cross, 1990; Kimbell, 2011). They also reflect and revise throughout (Schön, 1983). However, note that Design Thinking researchers have refrained from developing their own Design Thinking process model perhaps fearing that such a model would imply sequential, discrete stages to be followed in a rigid way, which would defeat its very assumptions (Buchanan, 1992). At the same time, Cross (2006) strongly conveyed the importance of sketching and visualization as a method for increased insight when working with wicked problems. With that in mind, Figure 1 demonstrates the asymmetrical fluctuating nature of the process.

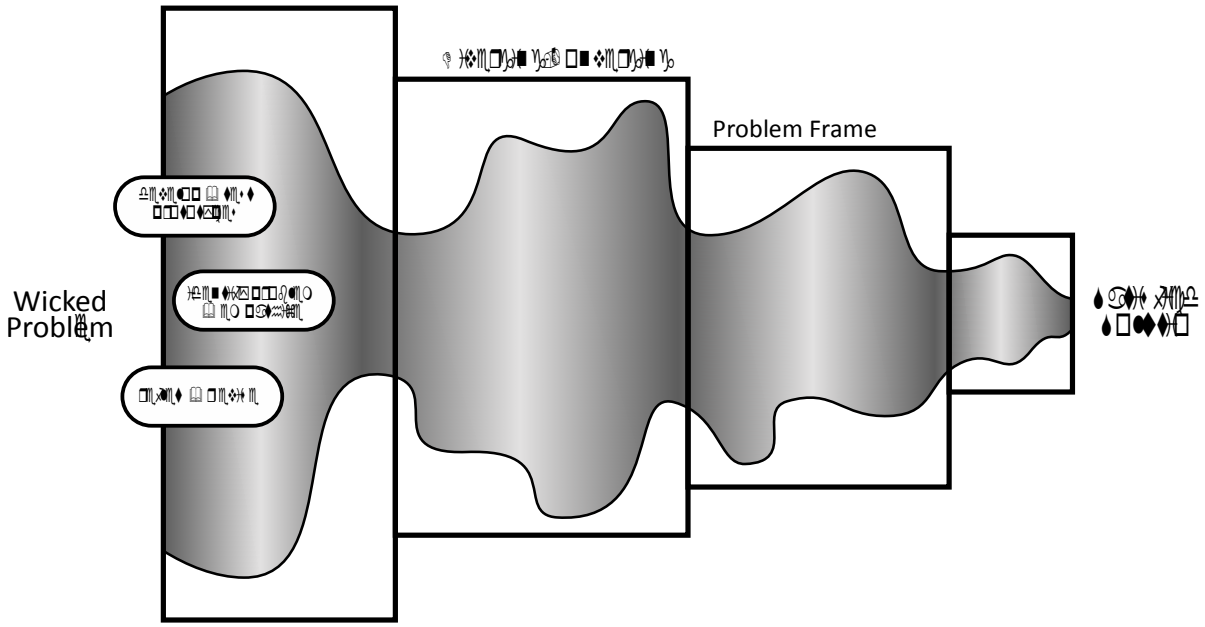

Figure 1. Visualization of the Design Thinking Approach.

Design Thinking Comparison

Design Thinking encompasses the base assumptions and processes utilized by professional designers across design fields. However, each field has developed its own process models, patterns, and assumptions specific to their individual fields. Some design fields, such as graphic, interior, or fashion design more heavily relate to a creative craft in which intuition plays a larger role. Other more technical fields are built on a stronger foundation of systematic analysis, such as engineering, architecture, or instructional design. This does not mean that creative design fields are not systematic or are without rules, nor does it mean that analytical design fields ignore context, innovation, or aesthetics. Therefore, while Instructional Design has its own models and processes, it has Design Thinking as a core set of principles and practices in common with other design fields such as graphic design or architecture. Also, researchers have begun to build upon the notion of teachers as designers, and to suggest that teachers need to develop design dispositions (Kali, McKenney, & Sagy, 2015; Koh, Chai, Hong, & Tsai, 2015; McKenney, Kali, Markauskaite, & Voogt, 2015; Svihla, Reeve, Sagy, & Kali, 2015) that will help them adapt to the complexity of teaching in the 21st century (Darling-Hammond, 2006; Jordan, 2016). However, there are already several well-known problem-solving approaches utilized in teaching.

Problem-Solving Approaches

How is Design Thinking different from Inquiry-Based Learning, Problem-Based Learning, Instructional Design, or Design-Based Research? To answer this question, we chose to compare their base epistemologies, agents, definitions, roles of the teacher, and assumptions (see Table 1).

Agents. For the purpose of this presentation, we define the agent as the person primarily in charge of moving the learning approach forward. Without this person, the approach would fall apart. Inquiry-Based Learning and Problem-Based Learning have the learner as the main agent. The designer is the main agent for Instructional Design and Design Thinking, and the researcher is the agent for Design-Based Research. While it is possible that teachers could choose to utilize Design Thinking as a K-12 learning strategy, it is meant to be used with highly ill-structured wicked problems and assumes a certain level of base knowledge. Design Thinking would be better used by teachers as designers to create learning experiences for students. In contrast, Inquiry-Based and Problem-Based Learning are instructional strategies through which learners come to their own understanding of the content with guidance from the teacher through scaffolding, modeling, and coaching. Instructional Design is most often enacted by a professional who has a degree in an Instructional Systems Design field. While teachers may be taught some Instructional Design methods, they do not have the same level of expertise that the professional designer does and may find the detailed lesson plans expected within the field to be impractical for their own use in the classroom. In Design-Based Research an outside researcher works with a classroom teacher to develop, test, and revise a learning intervention.

Epistemologies. Two major aspects of educational reform have changed how lesson planning is perceived. First, the No Child Left Behind Act moved schools towards a more standards-based focus, which resulted in high-stakes testing and data-driven curricula (Dee & Jacob, 2011). Second, educational reforms, such as Common Core, 21st Century Skills, and Next Generation Science Standards have resulted in a drive towards critical thinking and inquiry as equally important as specific content areas (Core Standards, 2016; NASBE, 2016; P21, 2016). These have given rise to constructivism and the learning sciences field (Driscoll, 2007; Jonassen, Cernusca, & Ionas, 2007; Reiser, 2007).

All five problem-solving approaches utilize some aspect of a constructivist perspective; however, they differ in the degree to which the environment provides learning structure and accountability on the part of the agent for developing successful solutions. Both Inquiry-Based Learning and Instructional Design continue to lean towards a post-positivistic science stance, even though they have constructivist leanings. Some Instructional Designers may argue that constructivism is antithetical to behaviorist and information processing cognitivist-based Instructional Design (Reiser, 2007), but Instructional Design has experienced a shift making it more about what works best for those learners at that time, which is a pragmatism that can work with aspects of constructivism (Smith & Ragan, 1999). Proponents of Inquiry-Based Learning describe it as emerging from a constructivist stance in which students explore scientific problems; however, they also heavily rely on a linear 5E stage model and conduct research on how best to train teachers to its correct use in the classroom (Lakin & Wallace, 2015). This suggests that Inquiry-Based Learning promotes higher level critical thinking and engages and motivates students through a personal connection with the problems, while still heavily promoting right and wrong answers, which is a more post-positivistic stance.

Problem-Based Learning, Design Thinking, and Design-Based Research heavily focus on context and experiential participation; yet, they still assume a systematic process. This suggests that they are moderately constructivist with pragmatist leanings. Some have argued that Problem-Based Learning is too open and lacking in structure to be an effective learning approach (Kirschner, Sweller, & Clark, 2006); however, proponents of Problem-Based Learning argue that, as an approach, it involves heavy scaffolding and has been shown to be empirically effective (Hmelo-Silver, Duncan, & Chinn, 2007). Design Thinking utilizes an abductive fluctuating approach to problem framing and solving, often combined with the use of a field specific process model. This approach is both creative and analytical, and designers are expected to determine when they have reached the most workable solution. Not the correct solution, but the best one at that time given the information they have and the needs of the users. This implies a pragmatism. Design-Based Research is a research method promoted by learning scientists who believe "learning, cognition, knowing, and context are irreducibly co-constituted and cannot be treated as isolated entities or processes" (Barab & Squire, 2004, p. 1). They are constructivists in that the research must be situated in context; however, they would accept both quantitative and qualitative data as meaningful evidence. This also suggests a pragmatist stance, making it pair well with Design Thinking.

Definitions. Part of the reason that it is necessary to compare these approaches is the similarity of their definitions. All five approaches define themselves as a way to construct learning as part of participating in problem-solving. Even Design-Based Research develops, implements, and tests learning interventions. However, it is supposed that most research, including Design-Based Research, has at its base an educational learning question and,

therefore, a problem. Also, the nature of Design-Based Research questions focus on how and why, rather than on what, which suggests that these problems are somewhat ill-defined. But problem-solving is not an explicit assumption of Design-Based Research. The other four approaches describe the type of problem best utilized with their approach.

For example, Inquiry-Based Learning is often paired with science, technology, engineering, and math (STEM) subjects, with a heavy leaning toward science. This approach often uses the 5E model of engage, explore, explain, elaborate, and evaluate (Lakin & Wallace, 2015). Because of the linear aspect of the model, and an assumption that solutions must be supported and rationalized through evidence, this approach works best with structured problems.

Instructional Designers are taught to conduct needs assessments to determine whether or not instruction is even warranted. However, because of the extremely systematic process they are expected to follow—and the fact that most Instructional Design is created for industry which often provides relatively structured parameters—this approach works best with somewhat to moderately ill-structured problems.

Table 1
Comparison of Educational Problem-Solving Learning Approaches

	Inquiry-Based Learning	Problem-Based Learning	Instructional Design	Design Thinking	Design-Based Research
Agent	Learner	Learner	Professional designer	Teacher as designer	Researcher
Epistemology Degree	Low Constructivism	Moderate Constructivism	Low Constructivism / Pragmatism	Moderate Constructivism / Pragmatism	Moderate Constructivism / Pragmatism
Definition	Systematic learning strategy for investigating structured problems similar to a real-world scientist.	Experiential learning strategy for solving authentic problems that are moderately ill-structured.	Systematic approach for designing learning instruction that is somewhat to moderately ill-structured.	Fluctuating approach for concurrently framing and solving problems that are wickedly ill-structured.	Ecological mixed method research that suggests educational research must be situated in context.
Teacher Role	*Guide* Help learners through a process of investigation to support their hypotheses; uses modeling and coaching.	*Facilitator* Provide opportunities that develop learner knowledge and lead towards solutions; uses questioning.	*Subject Matter Expert* Work with then implement the instructional material created by the professional designer.	*Designer* Create lessons using personal expertise and stakeholder perspectives to develop learning experiences.	*Co-Researcher* Work with a researcher to develop a plan that provides insight into a question that affects practice.
Assumptions	Ask questions, propose hypotheses, investigate, gather evidence, consider other explanations, communicate.	Multiple perspectives, prior knowledge, self-directed, collaborative, motivating, authentic.	Learning is measurable, task analysis, three-part objectives, formative and summative evaluation.	Ambiguous, iterative, productive, visualized, collaborative, empathetic, situative, satisficed.	Contextual, designs & tests interventions—not variables, mixed methods, how and why focus, impacts practice.
Key Authors	Bybee et al. (1989) Karplus (1980) Lakin & Wallace (2015) Schwab & Brandwein (1962)	Barrows & Tamblyn (1980) Hmelo-Silver (2004)	Ertmer & Newby (2013) Reiser & Dempsey (2007) Smith & Ragan (1999)	Buchanan (1992) Cross (2006, 2011) Lawson (2006) Rowe (1991) Schön (1983)	Barab & Squire (2004) Brown (1992) Cobb (2003) Lave (1996) Penuel et al. (2011)

Note. Inquiry-Based Learning and Problem-Based Learning are learning strategies. Instructional Design and Design Thinking are lesson design approaches. Design-Based Research is a method for conducting research.

Both Problem-Based Learning and Design Thinking work best with problems that have a highly ill-structured nature. However, Jonassen and Hung (2008) suggest that design problems may simply be too abstract and complex for a learner to work through with any level of autonomy. While Problem-Based Learning problems are extremely ill-structured, Design Thinking problems are wickedly so. Therefore, Design Thinking is best used with students who have some content expertise already.

Roles of the Teacher. The role of the teacher in each of these approaches is quite distinct. In both of the strategy approaches, Inquiry-Based and Problem-Based Learning, the teacher acts as a guide or facilitator. In Inquiry-Based Learning, aspects of the learning can be labeled correct or incorrect. This suggests that the teacher needs to closely monitor learner understanding and application. In Problem-Based Learning, the learning is more learner directed. This requires teachers to ensure that learners have opportunities to gain the knowledge they will need to create an effective solution. With Instructional Design, the teacher acts as the subject matter expert (SME), offering information on the constraints, learning goals, objectives, and issues of style. With Design-Based Research, the teacher is a little bit closer to the research than with Instructional Design. Without the teacher, the researcher would be shut out of the classroom, so they are co-creating. However, the researcher usually has slightly higher authority on how the research will be planned and conducted. Lastly, with Design Thinking, the teacher is the designer. He/she has the expertise, the knowledge of the classroom, the knowledge of the subject, and is responsible for constructing the learning environment. He/she is also aware of any possible constraints. To be the most effective though, the Design Thinker will heavily utilize interviews, surveys, and observations of all stakeholders in order to make the most informed decision they can. This means teachers do not simply assume an understanding of their learners, they actually work with them for better empathy and insight.

Assumptions. Since all five approaches utilize a constructivist stance on some level, many of their assumptions overlap. For example, all five approaches suggest some aspect of communication. Inquiry-Based Learning promotes question asking, Problem-Based Learning requires multiple perspectives, Instructional Design requires a task analysis which involves working with various stakeholders, Design Thinking is empathetic, and Design-Based Researchers work with the teacher. Closely connected to this is the concept of collaboration. Problem-Based Learning and Design Thinking explicitly assume collaboration while it is simply implied in the other three. All five must develop, implement, and test something, whether that be a hypothesis, curriculum, or intervention. All five also suggest some type of revision, reflection, or evaluation. Yet there are still a few points of difference. Problem-Based Learning is more self-directed than Inquiry-Based Learning. Problem-Based Learning, Design Thinking, and Design-Based Research stress the importance of authentic, situated learning problems. Design Thinking sees the power of ambiguity and failure as a learning path, and as such, is extremely iterative while also suggesting that the designer satisfices the solution at some point. Lastly, Design Thinking assumes that the best designs are ones that have been visualized through story-boards, concept maps, sketching, and proto-typing or, in education, mini-teaches. This does not imply that the other approaches are against visualization or iteration—these may even be implied—but they are not a focus the way they are in Design Thinking.

Design Thinking Pilot Study

The 21st-century learning environment has changed what teachers must know and be able to do. Today's teachers face complex and ambiguous issues that can best be defined as wicked problems that require a shift in thinking (Jordan, Kleinsasser, & Roe, 2014). As a way to tackle the uncertainties inherent in education, other scholars assert that 21st-century teachers need to become designers who consider not just the lesson itself, but also aspects of the setting, stakeholders, and resources (Darling-Hammond, 2006; Kirschner, 2015; Lambert & Gong, 2010; Svihla et al., 2015) to create a specialized learning experience every time they teach (Laurillard, 2012). Researchers argue that teacher education programs must begin to incorporate Design Thinking, a creative problem-solving process, into their coursework (Kali et al., 2015). As a first step, however, we must first determine how Design Thinking practices influence education. A Design Thinking educational approach could increase experienced teachers' dispositions towards design by providing a framework for developing higher-level inquiry and innovation for their students' learning experiences (Koh et al., 2015) while continuing to align that instruction with current best practices in teaching. However, educational research on Design Thinking is still in its infancy. We are therefore interested in exploring the following questions:

1. How do Design Thinking practices influence STEM teachers' lesson designs?
2. In what ways do STEM teachers believe Design Thinking aligns with the design of learning experiences?
3. How and to what extent do STEM teachers believe Design Thinking practices could be effective in pre-service teacher preparation?

Method

We utilized a Design-Based Research (Brown, 1992) method in which we worked directly with the teacher participants to develop the curriculum intervention that would be utilized in their classrooms. For this study, we

preferred to focus on in-service teachers who demonstrated expertise in their content area based on the fact that they have chosen to participate in a summer program called a Research Experience for Teachers (RET) through Engineering Research Centers (ERC) housed at a large southwestern university. The ERCs worked with local partner schools to invite teachers to apply for the 5-week RET program. Eight teachers were selected to participate in two separate ERC programs, one in biogeotechnics and one in solar power. Of the 16 teachers, one teacher took on more of an administrative role and was not there for all of the events, limiting the study to 15. Five teachers were male, ten were female. Nine teachers represented underrepresented populations and six were white. Thirteen of the teachers were over 30. Fourteen teachers have taught in K-14 education for at least four years, with ten having taught at least seven years. Grade levels were pretty evenly split with four teachers teaching elementary, four teaching middle, four teaching high school, and three teaching community college. Ten teachers have Masters degrees in some education field and two have doctorates.

Procedure

Phase I. During the first week of a five-week summer program, the first author conducted a three-hour Design Thinking workshop for two separate groups: RET A (biogeotechnics) and RET B (solar energy). Before participating in the workshop, RET A and RET B teachers took the Pre-Design Thinking Survey, which included a design disposition scale by Koh et al. (2014). For RET A teachers, the Design Thinking overview session included RET teachers and undergraduate and high school students. Because this group included people other than teachers, the workshop provided a general overview of Design Thinking, and everyone participated in a design activity in which they worked in teams to design the ideal science lab. While the workshop was conducted for the whole group, data was only collected on the teachers. For RET B teachers, the workshop was split across two days and only included teachers. Their workshop more specifically discussed Design Thinking as an approach for designing learning experiences. The design activity more directly had participants begin to brainstorm actual curricula.

Phase II. Over the next four weeks, the first author worked with both RETs to facilitate their creation of a curriculum project based on their summer lab experience. During the first session in week two for RET A, she conducted a semi-structured Opening Discussion Group Interview about teacher participants' common lesson design practices before we heavily utilized the Design Thinking model. Then, once a week, she formally met with just the RET A and B teachers. During this time, she worked with them on the next stage of the Design Thinking approach. They then worked on that stage of the model to help them create their curriculum module. For example, during Week 2, we brainstormed their problem based on the lab to which they had been assigned; during Week 3, we worked on determining solution ideas and sketched those out; and during Week 4, they tested and gave feedback for their solutions. In RET A, we had teacher participants describe their lesson to the undergraduate and high school students and elicit feedback. Then, though RET A and RET B teachers had never met before and worked in slightly different science fields, we had them formally meet to present their lessons to each other and gain feedback. At the end of the final week, she conducted a Post-Design Thinking Survey.

Phase III. As teacher participants finalize their lesson designs, the ERCs have asked that they implement them in their classrooms. We are working with the teachers to observe and take field notes of those lessons.

Conclusion

The Design Thinking approach is a general process for solving wicked problems with first principles stemming from all design fields. As such, it can be partnered with more specific design models such as ADDIE/ASSURE to help walk novices through initial processes or it can be applied alone to generate more abstract critical inquiry. Because of the extremely ill-structured nature of Design Thinking problems, it is recommended that Inquiry-Based or Problem-Based Learning be enacted with learners while Design Thinking be utilized for lesson design with teachers, making it more similar to Instructional Design. However, while the use of Instructional Design for teacher lesson designing has proven useful, it has never proliferated in K-12 public education. It has been suggested that, since teachers do not have to demonstrate explicit lesson writing ability in real-world practice and since instructional design can be extremely time consuming in its implementation, teachers simply find it impractical. While a Design Thinking approach is not conceptually simpler or easier to learn, it is relatively flexible in its application and does not require the same level of fine detail or adherence to rules/steps as instructional design.

Design Thinking does promote sketching, modeling, and prototyping—which could be represented in teaching as outlining, storyboarding, role-playing, or mini-teaches—yet, Design Thinking proponents would not expect every aspect of the process to be explicitly delineated as long as a final working learning experience resulted. The drawback is that expert designers apply design patterns they have created as a result of their prior design

experiences while constructing the problem frame. Novices do not have a large store of these design patterns with which to reconceive the same problem frame. Thus, while it is important to allow pre-service and novice teachers opportunities for uncertainty and failure, it is equally important that they are provided with basic strategies and patterns that they can then apply to real-world situations.

Design Thinking is not a free-for-all. It simply assumes a balance between the analytical and the creative, and not allowing one to subsume the other. Teachers can absolutely utilize instructional design models. But if they spend all of their time methodically following each step, without truly understanding the connection of those steps to the overall learning and the individual needs of their students, they will have missed the whole point of the instruction. Design Thinking provides a method for teachers to step back and view the whole picture.

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Survey of Teacher Educators on Professional Development Materials Used for Technology Integration Training

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Introduction

Technology is very important for improving teaching quality and student success. The Common Core State Standards emphasize that teachers should use technology to provide improved teaching in the United States. Every year hundreds of research articles are submitted and published to find effective strategies to facilitate technology integration for teachers worldwide (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, E., & Sendurur, P., 2012). Many teachers do not have specific technological and pedagogical skills for the implementation of new technology. The most important reason is the lack of effective professional development activities for technology integration (Kim, C., Kim, M.K., Lee, Spector, & DeMeester, 2013; Ertmer et al., 2012; Kopcha, 2012). Effective professional development must develop teachers' knowledge, skills, and effectiveness in raising student achievement (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Wei, Darling-Hammond, & Adamson, 2010). Professional development is a formal process such as a conference, seminar, or workshop; collaborative learning among members of a work team; or a course at a college or university. It can also occur in informal contexts such as discussions among work colleagues, independent reading and research, observations of a colleague's work, or other learning from a peer (Mizell, 2010). Teachers need professional development that focuses on information and communication technology skills for teaching (The Organisation for Economic Co-operation and Development, 2009; 2014).

CDW Government LLC (2010 as cited in Moeller & Reitzes, 2011) conducted a survey of more than 1,000 high school teachers, IT staff, and students and found that only eight percent of the teachers surveyed fully integrate technology into the classroom. Teachers often used technology to give presentations or show videos, while students did not actively participate in the activity. This is not technology integration; technology integration is making technology an integral part of the teaching and learning process so that it impacts resources, teacher and student roles, and instructional activities (Cennamo, Ross, Ertmer, 2014, p.18). True technology integration requires some changes for using resources, teacher and student roles, and instructional activities (Dwyer, Ringstaff, & Sandholtz, 1991 as cited in Cennamo et al., 2014). Teachers need professional development on how to use technology in the

subjects they teach and to better understand how technology should support teaching and learning activities (Moeller & Reitzes, 2011).

But, most of teachers do not have specific technological and pedagogical skills for implementation of new technology and the most important reason for this is a lack of effective professional development activities for technology integration (Kim, C., Kim, M.K., Lee, Spector, & DeMeester, 2013; Ertmer et al., 2012; Kopcha, 2012).

This study aimed to investigate what teacher educators think about professional development materials used for technology integration training, what hindrances impact such professional development, and what do they think are the most effective professional development delivery methods for training technology integration in the classroom.

Participants

An invitational e-mail was sent to members of the Association for Educational Communication and Technology (AECT) members in the Teacher Education Division (TED), It was felt that this group was representative as teacher educators for both pre-service and in-service teachers. There were 38 respondents (6 professors, 3 associate professors, 5 assistant professors, 8 associate faculties, and 16 others (i.e. teaching assistants and educational technology coordinators) participated voluntary.

Methodology

Our study investigated what teacher educators think about professional development materials used for technology integration training. For this purpose an online survey was prepared by the researchers, using Survey Monkey. The survey included open-ended and Likert-type questions concerned with professional development for technology integration. The link to the online survey was sent in an invitational e-mail to AECT members of the Teacher Education Division (TED). There were 38 respondents comprised of six professors, three associate professors, five assistant professors, eight associate faculties, and 16 others (i.e. teaching assistants and educational technology coordinators) that participated voluntary. Their average experience in teacher education was 10.6 years. Responses to open-ended questions were analyzed. They were grouped by common themes and categories and frequency counts were tallied. Data from the Likert type questions were analyzed and means, standard deviations, and percentages were reported.

Findings

According to the findings, individual or collaborative research (X=7.71) is the most effective professional development activity for technology integration. Following this were qualification programs (X=7.53), participation in a network of teachers formed specifically for the professional development of teachers (X=7.53), and courses/workshops for technology integration (X=7.5). Teacher educators consider observation visits to other schools (X=6.74), as the least effective professional development activity for technology integration. Table 1 shows the mean ratings and corresponding standard deviations.

Table 1 Effectiveness of PD activity for technology integration
No effect – 0, Large effect – 10

PD Activity	**N**	**Mean**	**Standard Deviation**
Courses / workshops	38	7.5000	2.40214
Education conferences or seminars	38	7.0263	1.79318
Observation visits to other schools	38	6.7368	2.11410
Qualification program (e.g., a degree program)	38	7.5263	2.17774
Participation in a network of teachers formed specifically for the professional development of teachers	38	7.5263	2.41322
Individual or collaborative research	38	7.7105	1.84402
Informal dialogue to improve teaching	38	7.2632	2.39012

Additional findings were that professional development training sessions were considered to often conflict with teachers' work schedule (X=3.1), were mostly episodic (X=3.1), and short-term (X=3.06. Teacher educators

think that a lot of relevant professional development is offered for teachers that is not too expensive or unaffordable. Web 2.0 tools and social media, journal articles and books, workshops and courses, and sharing teaching experiences in a community of teachers (via online conferences, webinars, blogs, learning management systems) are the resources mostly being used in the teacher educators' field and current trends in professional development for technology integration.

Another set of survey questions asked what the barriers were to professional development for technology integration. As can be seen from Table 2, time conflicts with teachers' work schedule were seen as the number one barrier. Other cited barriers were: PD training was too short, training was too episodic, and there was a lack of employer support.

Table 2 Barriers to participation in professional development
Strongly Disagree – 1, Disagree – 2, Agree – 3, Strongly Agree – 4

Barriers	**N**	**Mean**	**Standard Deviation**
Teachers do not have the prerequisites (e.g. qualifications, experience, and seniority).	31	25484	1.05952
Professional development is too expensive / unaffordable.	31	2.2548	.79785
There is a lack of employer support.	31	2.8387	.93441
Professional development conflicts with teachers' work schedule.	31	3.1000	.77460
Teachers do not have time because of family responsibilities.	31	2.5806	.80723
There is no relevant professional development offered for teachers.	31	2.0000	.93095
There are no incentives for participating in such activities.	31	2.8710	.95715
The professional development offered is of poor quality.	31	2.4839	.85131
Professional development is not readily accessible to teachers.	31	2.5161	.85131
Professional development trainings are short-term.	31	3.0645	.81386
Professional development trainings are episodic.	31	3.0968	.87005
Professional development trainings are disconnected.	31	2.9355	.85383

Teacher educators were also asked about current trends in resources used for PD in technology integration. There is a wide range of resources being used for training in technology integration, including: Web 2.0 tools and social media, journal articles and books, workshops and courses, and sharing teaching experiences in community of teachers (via online conferences, webinars, blogs, learning management systems). Specific comments about current trends included:

"In college, there are instructional consultants that offer one-on-one support. Also, our instructors team (for a technology integration course) also share teaching experiences with each other."

"As an instructor of in-service teachers, who instructs only online courses, all of the resources available to me are electronic. Given the time constraints faced by teachers, and the fact that I instruct teachers from a large geographic area, no face-to-face interaction occurs. Therefore, a learning management system (BlackBoard) is at the center of the instruction. In addition to this, Atomic Learning, VoiceThread, Google Sites, Gmail, Google Drive, Lotus Notes are utilized, along with various mobile applications and Web 2.0 tools selected by individual students."

"We have a new technology lab which is available to all K-12 pre-service and in-service teachers. We use a wide range of technologies to improve K-12 teacher skills. We use social media, animations, multimedia productions, Smartboard, whiteboard, Google applications, web resources and many others applications."

"TPACK [technological pedagogical content knowledge] articles are used to spark discussion. Jonassen's *Meaningful Learning with Technology* is used as a text."

"The state has technology program initiatives which focus on preparing teachers with understanding the 21st century learner and providing resources to implement within the classroom."

"We utilize training labs and conferences to boosts tech usage and training. But the biggest difference we see is when we get professors to integrate tech tools into the learning materials. Then they have to be more savvy because they are going to get questions from students and they want to look good."

"I am seeing significant use of professional learning networks (PLN's) and Edcamps. Although I agree that these initiatives allow the individual to personalize their professional development, I believe that the lack of leadership may leave some lost due to lack of direction. Especially those at a very low comfort level with the use of social media for professional purposes."

When we analyzed teacher educators' opinions for the future trends for resources in professional development for technology integration, it was seen that most of participants did not see any significant changes in the near future. Some do think mobile technologies, professional learning communities in combination with hands-on training, and collaborative leadership with teachers will be more useful. Table 3 shows the categories, with frequency count, for respondents opinions on future trends.

Table 3 Future trends in professional development for technology integration

	Categories	f	%
1	Instructional consultants and online professional development courses	11	38
2	Mobile technologies	7	24
3	Open sources and digital resources	6	21
4	Learning management systems	3	10
5	Pre-service courses	2	7
	Total	29	100

Some specific responses as to future trends in PD for technology integration were insightful and listed as here.

"Instructional consultants for professional development. They can provide customized professional development opportunities, which will make the support more relevant and useful."

"I am not completely sure, but I believe that although there is merit to edcamps and PLN's, many educational programs (on both the college and k-12 levels) would benefit from a leadership component to these types of program that provides more structure."

"Learning management systems currently in use are having difficulty keeping pace with the demands and needs of online instruction, and therefore have been changing rapidly. It will be necessary for organizations to adopt an LMS which fits their needs and is kept current to avoid much of the inefficiently currently present in online learning. Web 2.0 and mobile applications are quickly taking the place of larger locally-installed and net-hosted software as online collaboration becomes more important to instructors and students alike."

"Current digital natives have to be taught how to integrate technology into their k-12 environments. Many pre-service teachers possess neither the skills nor will to learn how to do this. Many k-12 pre-service programs demand technology integration but provide little guidance as to integrating the learning theory behind the desired integration."

"I really think that it is much too time consuming for an individual educator to develop materials for technology integration, but I think that they can modify existing materials for their own courses or classes. Even open source information will be time consuming for educators to gather for every topic they cover. I believe that resources will be purchased through textbook publishers, and then supplemented and/or modified by educators."

Teacher educators were also asked for their recommendations for a successful professional development for technology integration. The most commonly cited (n=16) was intensive and ongoing training courses. The frequency and percentage for cited recommendations are shown in table 4.

Table 4 Teacher educators' recommendations for a successful PD for technology integration

	Categories	f	%
1	Intensive and ongoing training courses	16	42
2	Hands-on experiences and workshops	6	16
3	Online environments	5	13
4	Collaborative groups and cooperation with technology user teachers	5	13
5	Hiring instructional consultants	4	11
6	Motivate and instilling confidence in teachers	2	5
	Total	38	100

Some of the specific recommendations for PD technology integration are as follows:

"I recommend programs designed using Gagne's Nine Events of Instruction. The PD modules then can provide examples and non-examples for the participants. The modules should allow opportunities for guided practice and the creation of job aides to continue use as just in time learning aids."

"Time. Professional development works best when it is offered more than five times per year, targeted to specific goals that teachers and school leaders outline together, and reflected upon genuinely to refine technology integration."

"When providing professional development opportunities to in-service teachers, taking time constraints into consideration is of utmost importance. PD opportunities, therefore, must have flexibility and be easily accessible. Being able to easily communicate, collaborate, and share information is also crucial, and should take into consideration compatibility issues such as use with a variety of platforms, systems, browsers, and types of hardware."
"Learning skills that help the user to understand how computer applications work so that they can see how it might integrate into their work."

"It is important to research and utilize the latest technologies for Social Networking and to maximize on the virtual "Face to Face" experiences."

"Talk with others that are using technology. Don't get locked into a single product, application or vendor."

"Three things: 1 -Teachers need to learn how to engage in reflective practice. 2- Teachers MUST develop and nurture a PLN (professional learning network) like Twitter ed chats. 3- There must be an expectation of experimentation and adaptation of new skills and tools (in other words, p.d. can't just be a one-shot event. It needs to be fully integrated and built upon with successive learning events.)."

"Hire instructional consultants that have knowledge in teaching pedagogy, instructional design, and educational technology."

"More support from parents, stakeholders and of course improving teachers' motivation to integrate technology in their classroom."

"When our university went to a self-paced program with videos and step-by-step guides for tech training, it really took off because professors did not have the fear of being embarrassed because they did not pick up on how to use technology in front of their peers. They went at their own pace and were very happy."

Teacher educators were asked what were the best technology integration training programs in the United States. Of the respondents, 21 teacher educators could not definitely say what the best technology integration training programs are in the United States. Only 17 teacher educators gave some program and training name. Eight university programs and seven different official institutes' programs and grants were stated. Two teacher educators gave some specific examples of online resources.

The survey respondents were also asked recommendations for successful job-embedded professional development for technology integration. Job-embedded professional development (JEPD) refers to teacher learning that is grounded in day-to-day teaching practice and is designed to enhance teachers' content-specific instructional practices with the intent of improving student learning. It is primarily school or classroom based and is integrated into the workday, consisting of teachers assessing and finding solutions for authentic and immediate problems of practice as part of a cycle of continuous improvement. JEPD is a shared, ongoing process that is locally rooted and makes a direct connection between learning and application in daily practice, thereby requiring active teacher involvement in cooperative, inquiry-based work." (Croft, Coggshall, Dolan, Powers, & Killion, 2010).

Teacher educators were asked for recommendations for JEPD. Of the 29 that responded to this question, recommended and 15 of them (52%) believe that we need Advisory Council and Teams / IT or ET consultants in schools.Table 5 lists the frequency and percentages of the recommendations for JEPD.

Table 5 Teacher educators' recommendations for a successful JEPD for technology integration

	Categories	f	%
1	**Advisory Council and Team / IT or ET consultants**	**15**	**48**
2	**Various hands-on PDs and action researches**	**7**	**23**
3	**Teacher learning communities**	**4**	**13**
4	**Online and mobile environments**	**3**	**10**
5	**Teaching learning**	**2**	**6**
	Total	**31**	**100**

There were also specific comments about resources for JPED for technology integration. As few of the more critical ones are as follows.

"I think a teacher sending a video clip of her teaching to an off-site coach and they discuss it in an online conference and talk about what could be improved can be effective. But it is also crucial to make a personal relationship to make the teacher comfortable. So I think an instructional consulting office should be a better choice. But consultants need to make sure the information is confidential so that teachers can be totally open."

"Too often, instruction and technology are viewed as distinct elements. My research indicates the need for greater emphasis to merge the both elements. Unfortunately, schools have either technology leaders OR instructional leaders. No leader as yet is an expert in both."

"I'm a big believer in the mentor-mentee model. Having someone who I respect available to me when (and where) I need them has a huge ROI on my development. I learn what I need to know, when I need it, and I benefit from the experiences of my mentor."
"Have an educational technology professional on site dedicated to assisting teachers integrate technology into teaching and learning."

"I think the teacher working with a coach after they have learned a new tech tool, and together they work to embed it in a lesson or training piece has been the most successful experience I have seen."

"Greater follow-up by administrators. There must be an expectation of professional growth in teachers' tech integration as well as instructional design. These two concepts must go hand-in-hand. Learning tech without understanding the real instructional/learning need limits the usefulness and impact of that tool. Schools also need to focus on building capacity and collaboration by capitalizing on the skills of individual teachers. In other words, stress the collaborative workplace as a means for teachers to learn and grow with their tech skills."

"The concepts stated in the research above support effective JEPD. To make sure that it is successful and has a long-lasting effect, there should be ongoing support but the faculty shouldn't feel pressured into finding "tech" solutions when offline solutions can be just as effective. Students should also be surveyed to share their reactions/interpretations to the changes implemented by their teachers."

Discussion and Conclusions

Individual or collaborative research was considered the most effective professional development activity for technology integration. This suggests further research to determine the effective strategies for action or even experimental research conducted into professional development for technology integration.

The most cited barrier to profession development is due to conflicts between trainings and teachers' work schedule. Training being offered sporadically and episodic, as well as short-term are also agreed issues with barriers to participation in professional development. This suggest that a model for consistent and regularly scheduled professional development, with work release provided, might be a promising approach.

Online training resources at the macro and micro level are the most popular resources currently used in professional development for technology integration. Future research would help to target specific resources and the pedagogical strategies for employing them.

The authors look forward to extending this study to a broader population in the near future to include a larger sample size. We also hope to follow up on some more specific issues related to the transfer of professional development to the teaching setting and to changes that are occurring to online training resources.

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An Investigation of Secondary Pre-Service Music Teachers' Pedagogical Content Knowledge and Teacher's Self-Efficacy through Peer Mentoring: A Case Study of the Graduate School of Music Education in South Korea

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Abstract

The purpose of this study is to examine PCK and self-efficacy of the pre-service teachers enrolled in the graduate school of music education through peer mentoring. In this study, 37 pre-service teachers participated in preparing teaching guides and demonstrating classes for 16 weeks. The survey, interview and self-reflection journal were used to analyze the components of PCK and teachers' self-efficacy. As a result of analyzing the survey result, the interview and self-reflection journal, it was found that the pre-service teachers acquired diverse knowledge, prepared teaching guides and confidently demonstrated classes through mentoring. Such result implicates that the pre-service teachers must be provided with diverse opportunities to participate in researching and developing practical class demonstrations and teaching methods such as the school field.

Introduction

The purpose of education for pre-service teachers is to educate such pre-service teachers so that they can apply their knowledge acquired through the college of education or the graduate school of education to the actual school field. Such education for pre-service teachers requires the pedagogical content knowledge in cultural, specialized areas and emphasizes the capacity in diverse fields (Sahin et al., 2013). However, the course for training teachers has been educating such pre-service teachers for decades based on the same context without changing its system to cope with the change of time (Park, 2008).

Such education for pre-service teachers emphasizes to educate pre-service teachers so that they can apply the learned theory to the actual school field. Many colleges of education or graduate schools of education conduct education based on the theories (Bleicher & Lindgren, 2005;), and enhances PCK of pre-service teachers through educational practices and educational activities (Jang, 2011). With regards to the enhancement of PCK, Rusznyak andWalton(2011) emphasized the important of the lesson planning guidelines in the process of teachers' educational activities.

Peer mentoring is another matter considered important in enhancing PCK. Mentoring is a process for purposely organizing a team consisting of members with more experiences and skills and members with less experiences and skills in order to enhance and develop a certain capacity in accordance to the agreed goal (Murray, 2002). Peer mentoring is a mutual sharing of conversations among teachers on their students and classes. The teachers or pre-service teachers with more experiences serve as the mentors. The mentees(teachers) are not only provided with how to build attitude and character as teachers but are also provided with how to teach in the actual field of education through the advice or counsel provided by the experienced mentors(teachers).

The subject of music pedagogy runs classes consisting of content delivery and practical practice (singing/instrumental music). The department of music education proposes the teaching method in the class demonstration process through providing pre-service teachers with an understanding on class expertise which reflects the characteristics of the practice-based classes. However, such pre-service teachers in Korea are experiencing difficulties in systematically constructing classes relating to the music subject and running classes by balancing theories and activities within that process (Yun, 2014). It is necessary for the school music teachers to construct their class plan in accordance to the curriculums. Such class plan is an important factor that allows the learners to acquire musical knowledge and musical skills, and it contributes to the effective construction management of music classes. Accordingly, pre-service music teachers must acquire knowledge on how to prepare a systematic class plan and be educated on music pedagogy relating to the music

In addition to PCK, teachers' self-efficacy is another factor influential on the capacity of teachers. Such teacher's self-efficacy is part of the self-efficacy serving as the expectancy that their belief and behavior based on their confidence that they are able to successfully run classes will have a positive influence on the academic achievement of learners (Gibson & Dembo, 1984; Riggs & Enochs, 1990).
The specific study problems are as follows.
Initially, is PCK among pre-service teachers enhanced through peer mentoring?
Secondly, is teachers' self-efficacy of pre-service teachers enhanced through peer mentoring?

Research Methodology

Participants and Research period

This study is a case study conducted by the author while teaching the <music education of instructional materials and teaching methods for music> class at the graduate school of music education. The <music education of instructional materials and teaching methods for music> is an essential class to be taken by the students enrolled in the graduate school of music education to complete the course for acquiring the teacher's license. As for the survey, 37 students (male students: 8, female students 29) out of 39 students participated in the pre·post-class surveys, and the group interview and self-reflection journal were additionally conducted to collect the specific data. 10 students who volunteered participated in the group interview conducted during the final class. The interview lasted for approximately 120 minutes based on the semi-structured questions prepared by the author.

Instruments

The PCK Instrument in Science Teaching for Elementary School Teachers by Park, S. H.(2003) based on SPTOK(Student Perceptions of Teacher's Knowledge by Tuna(2000) was suitably adjusted to the secondary pre-service music teachers to be used as a tool for measuring PCK in this study.
STEBI(Science Teaching Efficacy Beliefs Instrument) developed by Riggs and Enochs(1990) was adjusted based on the translation, adjustment by Jo, Hyung Sook(1998) to be used as a tool for measuring teachers' self-efficacy in this study.

As for the interview tool, the interview questions semi-structured in accordance to the study problem consisted of questions related to pedagogical content knowledge included in the <music education of instructional materials and teaching methods for music> class and questions on teachers' self-efficacy. As for the self-reflection journal, all 39 students were divided into mentors and mentees to analyze the contents.

Explanation of <music education of instructional materials and teaching methods for music>

The educational goal of the <music education of instructional materials and teaching methods for music> class is to educate pre-service music teachers so that they can apply various educational theories and teaching methods acquired throughout the teaching training courses to the field of education. It is to allow them to acquire expertise and qualifications as teachers through preparing teaching guides, demonstrating classes, analyzing textbooks and developing teaching materials throughout the 16 weeks of class period. Such pre-service teachers are provided with an opportunity to acquire knowledge on teaching-learning and experience actual tasks performed by in-service teachers. While the learners were studying and learning the subjects and curriculums included in the class, they were provided with an opportunity to acquire PCK through their continuous team activities and feedbacks provided by the instructor on music subject matters.

Data analysis

The interview data and self-reflection journal contents were analyzed by categorizing and arranging them into the main topics and deducting the conclusion. The interview data were all recorded and integrated into MP3. The integrated contents were carefully read several times prior to setting the coding category. The initial coding was conducted according to the coding category, and the contents were categorized into the related topics to develop a common topic in the second coding. Then the contents of the developed topics were summarized to interpret the important contents. The developed topics and data were used to describe the results.

Result

As a result, it was confirmed that PCK and teachers' self-efficacy among pre-service teachers enrolled in the graduate school of education were enhanced through the use of mentoring. A number of measures were proposed to enhance PCK among teachers through the use of peer mentoring and such measures include a study on pre-service teachers' perception of technological pedagogical content knowledge and ICT course experience through ICT assessment(Koh et al. 2013), a study on pre-service teachers' PCK displayed in classes requiring analysis/evidence-based thinking from students(Monte-Sano, 2011) and an analytical study on relationship among educational use of internet, pre-service teachers' technological PCK and teachers' self-efficacy(Sahin et al., 2013). This study in comparison to studies described above is different from the preexisting discussion in that the mentoring based on pre-service teachers with no experience instead of in-service teachers is effective as well. In fact, there are not many opportunities for pre-service teachers to effectively learn PCK and teachers' self-efficacy. In addition, since PCK and teachers' self-efficacy are mutually related, it seems that the progress in a certain field is related to the progress in another field (Horzum, 2013; Park, 2008; Sahin et al., 2013).

In this study, PCK and teachers' self-efficacy among pre-service teachers indicated a positive change through the mentoring conducted in the <music education of instructional materials and teaching methods for music> class. As a result of examining changes in PCK and teachers' self-efficacy based on 7 different knowledge-based areas, a significant change was indicated in all 7 areas. In addition, it was confirmed that the learners displayed changes through the interview and self-reflection journal. Pre-service teachers analyzed and examined themselves as instructors as they acquired diverse teaching methods through developing teaching guides and reviewing classes demonstrated by other pre-service teachers. It was confirmed that such pre-service teachers enhanced their self-efficacy and gained confidence in preparing for and running classes through interacting with other pre-service teachers as mentors and mentees.

Conclusion

Music teachers must be able to run balanced classes as an expert specializing in educational theories and practices. Such music teachers are required to perform as educationalists with musical knowledges, practical skills, abundant experiences and educational thinking. The classes effectively run by such prepared teachers contribute to enhancing the learning ability of the learners. The pre-service music teacher who received the preexisting practice-based education must come up with diverse methods for running their classes in order to continuously enhance their PCK and teachers' self-efficacy. It is necessary to provide an environment where such pre-service teachers can escape from the lecture-based classes to sufficiently acquire teaching experiences as actual teachers through preparing diverse teaching guides and demonstrating classes. Teachers are the main agents of classes. The quality of classes varies depending on how teachers run their classes. Pre-service teachers are able to expand their knowledge base required for their own teaching activities by cultivating and examining their own PCK through classes demonstrated by other pre-service teachers. Accordingly, it is necessary to view such PCK from comprehensive and diverse perspectives through various subject-related activities. Such pre-service teachers will be able to cultivate their expertise as music teachers and enhance teachers' self-efficacy through diverse case studies.

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Creative Teacher, Creative Teaching: Identifying Indicators and Inspiration for Professional Innovation in the Teaching Environment

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Index Descriptors: creative teaching, creative teacher, creative environment

Abstract

This research was designed to reveal elements of the teaching environment that support creative teaching by asking creative teachers to share experiences of professional innovation. The study used the Abbreviated Torrance Test for Adults (Goff, 2002) to measure the creativity of teachers at an urban, private school revered for quality teaching. Participants were interviewed to learn about their experiences of professional innovation and the places that inspired or dissuaded them to be creatively engaged. The findings suggest that proactive behavior and constructivist thinking are indicators of creative teachers, and that creative teachers are inspired by a culture that values teacher expertise, collaboration, and the unique delivery of curricula. The findings also suggest that symbolic attributes of the teaching environment are a source of inspiration for creative instruction. Building off of existing knowledge about creative teaching and creative teachers, this work provides directions for future research.

Introduction

Creativity is an exciting research area in education. Creative teaching has been linked to effective teaching (Sawyer, 2011; Reilly et al, 2011) that enhances learning (Rinkevich, 2011). Research indicates that when teachers model creative thinking, it promotes creative thinking among learners (Nickerson, 2010; Horng et al, 2005). Creative teaching is an important component of nurturing creativity (Grainger, Barnes & Scoffham, 2004; Beghetto & Kaufman, 2010; Cheng et al, 2010; Sternberg, 2015).

Current research is broadening our understanding about creativity in education, but it is predominantly examined through the lens of the learner. The National Advisory Committee on Creative Cultural Education (1999) proposed that creative teaching warrants distinction. Creative teaching should be distinguished from teaching *for* creativity. Distinguishing creative teaching in this way calls for new ways of investigating educational environments. What contextual elements of the teaching environment activate or discourage teachers to be creative and professionally innovative? What measures drive the expression of this creative behavior? These inquiries are the foundation of this research.

Literature

Creative teaching is defined as educational exchanges facilitated by the teacher that are "unique, customized and meaningful" (Rinkevich, 2011), and that are exciting, engaging and innovative (Craft, 2011). Creative teaching is complex, involving a broad range of skills, experience, and perspectives (Ambrose, 2005). Sawyer (2010) suggests that this act of creative teaching emerges as a form of "disciplined improvisation," intimately tied to teacher experience.

Rubenstein, McCoach, and Siegle (2013) suggest that the teaching environment can inhibit teacher creativity. They emphasize the role of teacher perceptions and the sense a professional may have about the creative opportunities within their environment. Though professionals may be fit to be creative, their environment may encourage reluctance to do so. They present the teaching environment as an area of creative teaching that needs to be further developed.

A number of physical attributes of the learning environment have been attributed to learning outcomes and creative production. In their literature review of learning environments and creativity, Warner & Myers (2009) compiled the known variables that influence creative behavior, including; technology, color, lighting, furniture, decoration, elements that engage senses, resources, class size, and physical configurations within and between physical rooms. Jankowska & Atlay (2008) suggest that aesthetic, visual, and flexible attributes of spaces enhance learning, and support the generation of creative spaces.

Other research that has contributed to identifying these and other environmental qualities that foster creativity include those by Kristensen (2004), Cropley & Cropley (2008), and Jindal-Snape et al. (2013). These studies are focused on learners, yet they compile an important collection of known elements that contextualize a creative climate in an educational setting. The state of knowledge suggests why researching creativity in education is a complicated task, compounded by the intersection of dynamic variables, including: environment, interpersonal relationships, personal interests, and personal skills (Csikszentmihalyi, 1996).

Understanding the factors that engage the creative expression of teachers is essential to understanding how to optimize any educational environment. Most educators would agree that the elements present in an educational environment that inspire creativity among teachers and inspire professional innovation are not necessarily the same elements that support creativity among learners. The elements that define a teaching environment often extend far beyond the tangible attributes of the environment itself. This research is designed to reveal these elements, and to identify the indicators of and inspiration for professional innovation in the teaching environment.

Research Design

This mixed-methods study investigates teacher experiences of professional innovation by employing two approaches; assessing the creative index (Goff, 2002) of participants, and conducting semi-structured, responsive interviews. An urban, private school distinguished for high-quality teaching was selected as the sample school. 18 teachers volunteered to participate in the first phase, and were given the Abbreviated Torrance Test for Adults (Goff, 2002), or ATTA. Participants were sorted by their creativity scores to identify the *least* and the *most* creative participants from the sample. Two more were selected as the mean. The four participants were invited to engage in one-on-one, hour-long interviews.

Direct interviews followed a casual, responsive discussion format. The semi-structured protocols focused on open-ended inquiries about the participants' profession, and to share experiences of feeling innovative and creative. The interviews included a participant-led tour, prompting participants to share the places they relate to creative teaching, and the places they feel creatively restricted. The places, spaces and things the participants identified as important to the context of the prompts were tagged using pre-numbered stickers. As each sticker was placed, the numbers were read aloud so they could be sequenced with the interview transcript. After the interview was complete, each sticker was retrieved and its context was photographed and noted.

Analysis

The descriptive data was analyzed using a thematic approach aimed to identify broad concepts. The concepts provided a framework to organize what the participants perceived as important for creative teaching and professional innovation. A deeper analysis focused on defining categories within each concept, and expanding the properties of each. This involved implementing an open coding approach, reviewing the data line by line while also referencing the contexts evident in the photographs and field notes obtained during the building tour. The responses were interpreted for contextual importance to the research question. The importance of each category was proportionate to the frequency of responses, and the degree of commonality among participants. This process continued until thematic saturation was reached, and no new concepts, categories, or properties emerged as relevant. The data from all four participants was analyzed non-discriminately during the complete coding process. As a last phase of analysis, the origins of data were reviewed within the clusters to identify the relationship of the responses to participant CI measures.

Findings

Creativity is proportionate to proactive behavior. Creative teachers tend to reject conditions they view as incongruous to a professional ethos. They associate professional innovation with responding to these conditions in distinct ways. Some of these include; expressing disagreement, suggesting solutions, and devising ways to effectively change or navigate the condition(s). Creative teachers are comfortable breaking the rules, and justify doing so out of professional obligation, professional authenticity, acting on intuition and by acting "for the better good." Participants illustrated experiences of being proactive when they said:

> *I will always break the rules. See, what's funny about that is that I don't think I'm somebody who questions authority - very responsive to authority. I think that that's just a professional obligation. [...] I'm not someone who will do things just because that's the way it's always been done.*

I didn't go to graduate school to be a teacher just so I could come in and teach somebody else's program… [I] unintentionally broke the rules in the sense that I just had a different way of thinking. And I'm not restrained enough to always know when to keep my mouth shut.

You have to just give yourself permission to say, "Well, this is what I'm going to do," because there aren't enough hours in wee for us to talk about every single darn thing that needs to be done. Sometimes we've gotten in trouble for it, but I also don't think that there's-- I don't see myself as-- I can't say that I have ever intentionally not communicated something. Was it intentional, or did we just not get to it? Who knows. The world is not going to come crumbling down.

My first teaching position… it's not like I was really excited. I go to a new school and I'm like, "Hey, I bought an Apple TV, and I want to hook it up so I can wirelessly sync to wherever I am in the room- like teach, and not be stuck in any spot. Can I get it on the network? It's brand new!" "We'll see." And then it doesn't happen all year. So, it's just like that -- step by step, the stuff I would want to do, but the red tape stopped me. And that's maybe where rule breaking would take place. Like, they're not going to know if I just go and do this anyway. I just learned not to ask about certain things!

Creative teachers share constructivist values; they do not limit creative teaching as a means of teaching *for* creativity. They believe that teaching that emphasizes process rather than outcomes and lends relevant experiential learning is creative teaching, and is both ideal and quintessential to quality instruction. Constructivist teaching often leads to improvisational teaching moments that creative teachers associate with professional innovation. Creative teachers strive to facilitate experiences that are meaningful, memorable, and engage both teacher and learner. Participants described this when they said:

The act of messiness, the act of making. Collaboration. Finding out… like, even if something doesn't work, the whole notion of "Well, we are going to keep trying!" And like, we just found out a bunch of ways that it doesn't work. But, getting the experience. Failure… [pauses]. But, you're just not going to give up because of it.

I could not have learned the little, silly - the toolbox that most experienced teachers have about, "All right, class is going nuts. What'll we do now." Or, "Oh, I notice the energy sagging. What do we need to do to get the motivation up?" Or just an on the spot, in the middle of the lesson, maybe you feel it going [inaudible]. How do I shift my gears and think on my feet? [...] It's interesting how much of teaching can't be taught or can't be trained.

[The students] help set up our classroom expectations. We start by identifying children's hopes and dreams, and after identifying their hopes and dreams for the year, then we get kids thinking about, 'How does our classroom need to look, sound, and feel in order for everyone to achieve these hopes and dreams over the course of the year?" [...] And you ask them first, "So, during quiet reading time, how should our classroom look?" And they'll say –- they'll give you their ideas. "How should it sound? How should it feel to be in our room during reading?"

One participant described how embracing a process-oriented style of teaching result organic learning opportunities, and discoveries that enhance both teacher and learner when they said:

…Part of that for me, though, and why I felt so innovative, is that, like, I don't know what they are going to come to me with… like, "Okay, can we do this? And, I'll be like, "I don't know! But let's try!"

Creative teachers are inspired to be creative in a culture that values the professional accolades of its teachers; to be respected as a skilled, knowledgeable and experienced, and trusted to make didactic decisions. To teach in a creative way, creative teachers require encouragement to craft the unique delivery of curricula and also opportunities to work collaboratively as a team. Participants described the importance of individual trust and colloquial rigor to their professional innovation when they said:

I think the big part is that I get inspired when other teachers are getting excited with me, and then it makes me want to uphold to what their excitement is and help get there and help get it done. I mean, when I'm

going solo I get excited too, but I think it brings me up to a whole different level when there is someone else with me collaborating.

Being allow to have the flexibility to collaborate with others and go off of an idea and not have to stick to, like, "Okay, we've got to teach this math concept all at the same time," which I know is the case with some of my other colleagues that teach elsewhere. So, being allowed the flexibility… Being able to take off with something. Like, it really domino-ed into cool projects.

The ethos of the school is this collaboration. We really work in teams. For example, last year four of the [teachers] spent -- we were approved for three days to update and refine some of our [units]. We also created two new ones and did something thinking about how we were going to restructure our two-year curriculum. So we spent three days doing that. One day we spent all together. The rest of the time we were working independently and we would always come back for a little show and tell with our teammates.

Symbolic attributes of the teaching environment inspire creative instruction. These abstract attributes stimulate thinking about exciting and engaging delivery of content, and trigger memories that recall creative teaching moments. On the tour, one participant clarified the power of these intangible attributes when asked to show places they felt professionally innovative. Stopping outside of a room and prompted to talk about it, they said, "It's symbolic. More than just a place." The places creative teachers relate to professional innovation are important because of what happened there. The participants generally identified places based on their memories of feeing professionally connected and personally successful, and expressed being creatively driven by that nostalgia.

Finally, creative teachers reference the physical attributes of the space to less enjoyable experiences; disliking their job and feeling creatively challenged or limited. One participant illustrated the complex role of the physical environment to professional innovation this when they identified a large multi-purpose room as a place they associate with feeling creatively uninspired. They said:

Natural light has a lot to do with it for me and I don't know, this looks more institutional. This piece feels like they've done great things in terms of cheering it up, but the other spaces…again, are still kind of quirky and sort of light-filled and kind of personal and you can see aspects of workmanship – and so here, it just doesn't have the sense of… it's not polished. It's not warm. […] Sometimes we use creativity to like… How do you make the best out of a bad situation? Get creative. Make Lemonade out of lemons. So, there is that element of creativity, and there's the element of when you say innovative… It seems to me more like the kind of pure creativity. Like, given anything, what would you do? […] You're just trying to figure out what's the best way to do this under these circumstances. And it's not always negative, but it's not usually like a blank palette. It's usually more like, these are the constraints, and so what can I do?

Discussion

Building off of existing knowledge about creative teaching and teachers, this research synthesizes the experiences of creative teachers and their perceptions of professional innovation. The findings of this study are important to understanding the relationship between the creative teacher, creative praxis, and the teaching environment. They suggest indicators of creative teachers, and elements in the teaching environment that matter for creative teaching to happen.

Creative teachers share similarities when asked to talk about professional innovation; they share a constructivist style of approaching their work, and assume a proactive role within their professional community. They associate professional innovation with grabbing opportunities to synthesize learning, teaching, and knowledge acquisition as a unified, symbiotic experience. This study suggests that while creative teachers have the aptitude to be creatively expressive in practice, the actuality of teaching in a creative way is informed and sometimes thwarted by the environment. This study highlights the complexities of the teaching environment, and suggests the multivariate degree of attributes that relate to creative action. The findings contribute new knowledge about creative teaching and the teaching environment that address the gap identified by Rubenstein, McCoach, and Siegle (2013)

Conclusion

Knowledge about creative teachers and their experiences putting creative instruction into practice can be used to identify and value the traits of creative teachers, and the decisions they make as professionals. This study provides evidence that creative teachers share similar perspectives about the structured aspects of their teaching environment. The anecdotes of preserving constructivist values while navigating organizational constraints are comparable among the creative participants of this study. The experiences suggest that the teaching environment plays an important role in negotiating creative expression.

The aim of this work is to learn what aspects of the teaching environment activate or discourage them to teach in a creative way, and to use this knowledge to develop more extensive investigations. This work can be expanded to learn more about what substantiates a professional ethos where teachers feel autonomous to exercise creative practice. This work can also inspire future studies to learn more about the physical and abstract attributes of the teaching environment, and the contributions of place and space to inspiring professional innovation.

Although this study focuses on the experiences of measurably creative teachers, the longitudinal goal of this work is to understand what inspires all teachers to be creative teachers.

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Creativity in Education

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The Importance of Creativity

Creativity is important in many fields. "Creativity is a topic of wide scope that is important at both the individual and societal levels for a wide range of task domains" (Sternberg & Lubart, 1999). Recent popular books such as The World Is Flat (Friedman, 2005) and The Rise of the Creative Class (Florida, 2004) both illustrate the broad value of creativity. Corporations and governments on a variety of levels frequently look to support and encourage the development of creativity, particularly as a means to promote innovation, and maintain or improve economic status.

The United Kingdom, as exemplified by Cox (2005), and the government of the People's Republic of China, actively support the development of creativity (see for example, Tischler, L., 2006). And in Tough Choices or Tough Times: The Report of the New Commission on the Skills of the American Workforce, a report by the National Center on Education, & the Economy (2008), the value of innovation and creativity to every American worker was highlighted as a matter of national importance.

Creativity in Education

How learners, teachers, and others are creative is tied to their educational and social background. Often the solution to most problems we face in school, at work, and in life is the dictate of our educational system: there is only one right answer. We select our students on the basis of their ability to play by the rules of high-stakes, standardized tests. We judge our teachers by these same measures. They (and we) need the ability to think beyond linear, expected thinking and to be creative.

Most institutions do not teach creativity or innovation per se; they may examine both topics as academic observers. It is very rare to find courses where the main objective is to develop and foster student creativity. Currently, about 35 American universities offer courses dealing with the development of creativity (Xu et al., 2005).

Fostering Student Creativity

Generating new ideas is a critical and desirable skill for any field. Instructional and other designers need to be creative in how they develop ideas and methods of education that are new, exciting, and applicable to 21st century learners. The challenge here is twofold; how to make instructional designers and teachers more creative, and how to empower them with skills, knowledge and strategies that make their students more creative.

Teaching (Hokanson, 2007) and researching in the field of creativity (see for example, Scott et al., 2004) has fostered a broad understanding of this topic, and confirms that creativity is a skill that can be taught. It requires extensive work by the learner, but the lessons, while not conveying traditional content, will change the learner in many ways that are cherished. We look for our students to be creative at our universities, however we don't necessarily prioritize the development of those skills in either in either the students or instructors.

Summary

Creativity is a skill that enhances the development of any project; small or large. However, it must be developed and practiced by both the learner and instructor. Classic and new techniques are a means for developing this skill, and can be integrated into any online or in-person class.

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VoiceThread: A Design Critique Model for Implementing Asynchronous Feedback into Online, Problem-Based Learning

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Index Descriptors: online teaching and learning, asynchronous feedback

Abstract

VoiceThread was integrated into a traditional interior design studio to promote the fluid exchange of ideas. Using design education as a model for problem-based learning, the authors share the experience and benefits of using online, asynchronous feedback as a supplement to in-person critiques. The teaching and learning experiences suggest VoiceThread as practical method for facilitating the quality feedback necessary for project development, and as an effective tool that enhances any course.

The Importance of Fluid, Descriptive Dialogue

Formative assessment is an important aspect of design education. As an essential form of assessment to the design studio, critiques facilitate student growth by activating a dynamic exchange of ideas. The benefits of fluid, descriptive dialogue are clear. However, maintaining the fluidity of such exchanges can be a challenge for studios that meet twice a week with intervening gaps of time. Email is a critical form of communication outside of class, but lacks the dynamic reciprocity of dialogue that Schön (1987) describes as fundamental to facilitate practice-based learning.

Schön's model of "reflection-in-action" stresses that mutual discourse in design is essential, and should "take place in the context of the student's attempts to design" and should use "actions as well as words." This suggests that the process integral to developing projects cannot be coached *without* the inclusion of multivariate interactions, namely in-person dialogue. Traditional design critiques in this way are fitting. Schön's work suggests that instructors play a critical role as learners work through a project, and that their involvement has the most impact when it matches the student's' pace. Such involvement outside of class time is often a challenge. To supplement this, most scaffolding beyond the studio is attempted as written correspondence via email.

Most educators agree with Schön, that in-person methods are the best way to communicate with and mentor students. But, what is preserved when correspondence is spoken, but not necessarily in-person? Ice et al. (2007) suggests that verbalized feedback conveys more nuance, and that this expressive communication makes learners three times more likely to apply the feedback when developing their work. The study also suggests that learners perceive nuanced feedback as more caring and personalized. Asynchronous methods for exchanging feedback are an effective means of accomplishing spoken, nuanced interactions. Davies (2007) work examining the descriptive nature of verbalized assessment suggests that when "descriptive feedback is increased, students learn more." Davies contends that formative assessment that does this "feeds forward," supporting the conditions for student growth and the development of ideas.

Integrating an Online Alternative to In-Person, Project Feedback

To explore how technology can facilitate descriptive feedback *outside* of class, VoiceThread was integrated into a traditional design studio as an online critiquing platform. VoiceThread is an online discussion space where visual media can be uploaded and presented as a "thread." The program allows viewers to give feedback by leaving typed, audio, or video comments illustrated with a drawing tool. The tool allows participants to edit their comments before delivering them and results in comments that are clear, effective, and useful. Threads are accretive, built upon over time. For archival purposes, they can be exported as digital video files for later viewing. Application of this longitudinal model of assessment is powerful, tracking the life and development of a project and student growth.

Peer Critiques

The students were initially introduced to VoiceThread as a way to conduct randomized, small group peer critiques. Administering the threads enabled monitoring and mediation of the process. The discussions that ensued were meaningful, productive and richly descriptive. Students enjoyed the experience because it provided "space" outside of class to share and discuss their work, and provided an alternative critique process. Thread monitoring allowed the authors to assess the application of knowledge and vocabulary of the student critics.

Outsider Critiques

The asynchronous attributes of VoiceThread made it easy to also connect with outside professionals. The resulting critiques activated rich discussions about refining and actualizing the designs. Also, the process encouraged students to craft quality presentations to match the significance of their audience. Students shared that they carefully considered the feedback, that the experience made them feel connected to industry, and liked that the discussions were not isolated to a single afternoon. The professionals shared an affinity for the online method, and deemed it an engaging and smart strategy to dress up the revered critique: a digital upgrade with equal rigor.

Unexpected Outcomes

Surprisingly, VoiceThread *transformed* how the students solicited feedback. The authors noted a drastic decline in email that was synchronous to an increase in student-generated threads; they adopted the tool as the primary way to communicate. One student shared, "This online program allows us to view the work of other students across different sections and is allowing us to get feedback out of class without wasting valuable class time." For design studios that meet twice a week with intervening gaps of time, this improves the fluidity of dialogue paramount to Schön's model.

Observed Benefits to Teaching and Learning

The authors observed four benefits to implementing VoiceThread. First, the tool gets students talking about their work and the development of their ideas. Students embrace it as a means to contribute to conversations, initiate dialogue, provide feedback, and demonstrate their ability to engage in productive discourse. Second, the tool provides opportunities to expose students to a diverse group of professionals outside their immediate community. This enriches the experience and discussions. Third, the tool allows students to privately and repeatedly review their feedback. Fourth, the accretive nature of the tool allows discussions to extend far beyond the limits of an afternoon because participants can contribute to a project thread as long as it is active. The ability to revisit any past discussion is informative to both instructors and students, offering useful post-project reflection.

As an added observation, the students *liked* using the online technology. VoiceThread increased the frequency of verbal dialogue, and students enjoyed having access to more descriptive feedback. Students shared that the online discussions encouraged them to push the development of their ideas rather than spin their wheels or start over. Furthermore, they expressed appreciation for having a "real" method to communicate with their instructor outside of studio. These student testimonies reflect the findings of Ice et al (2007), suggesting that students gather more meaning from nuanced feedback, and that VoiceThread is an effective, online means to exchange it. As suggested by Davies (2004) and observed here, encouraging frequent and descriptive feedback indeed "feeds forward."

Conclusion

VoiceThread is an invaluable and rich counterpart to a traditional, in-person design critique. However, this experience illustrates a working model that educators of *any* discipline can use to facilitate problem-based learning, and enhance teaching and learning.

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Using Telepresence Robots to Provide Authentic Communicative Practices to Remote Foreign Language Learners

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Abstract

Authentic communicative practice is crucial for fostering foreign language learners' communicative competence. However, most learners don't have enough chances to travel to the target countries due to expensive travel costs. This paper proposes a solution using telepresence robot to support the interaction between remote foreign language learners and native speakers in real conversational scenarios. By analysing the interview, field notes, and video clips, this study shows that telepresence robot has huge potential on foreign language learning.

Keywords: Authenticity, Communicative practices, Telepresence robot, Foreign language learning

Introduction

Authentic communicative practice including native speakers, physical environment, and activities in the target country is crucial for foreign language learners as it can foster students' communicative competence in real situation (Strobel, Wang, Weber, & Dyehouse, 2013; Larsen-Freeman, 2013; Volosinov, 1973). Edelson and Reiser (2006) claim that authentic practices can benefit learners from three aspects: being valuable to learners, providing a meaningful context to motivate learners and assisting students in understanding the meaning of knowledge. However, most foreign language learners around the world don't have enough chances to travel to the target countries due to the expensive travel costs. To bridge the gap, this paper proposes a solution that uses telepresence robot, which can be controlled by remote learners online and support video chatting, to support the interaction between remote EFL learners and native speakers in real conversational scenarios.

The term telepresence, firstly proposed by Minsky (1980), refers to giving a remote participant the feeling of actually being present at another location. Now with the development of mobile technology, some mobile devices like iPad, iPhone could be utilized to be the core component in the robot (Greenhow, Ratan, Cain, & Bell, 2016; Sykes, Oskoz, & Thorne, 2013). Thus, the cost of the other parts has been significantly reduced and now telepresence robots like Double Robotics' Double, Keebot, Romo, are typically much more affordable than the travel costs to go to the target countries.

Research Questions

The research questions of this study include: (1) How the physical environment around the telepresence robot influence remote EFL learners' learning experience? (2) What are the learners experience on controlling the robot and how it can influence language learning? (3) what are the differences between telepresence interaction and face-to-face interaction?

Methodology

To investigate the research questions above, we conducted a case study, in which three adult foreign language learners in China are selected to communicate with a native speaker in an American university campus by using and controlling a telepresence robot. All these learners have plan to study oversea but don't have experience on living in the target country. During the study, we designed a 2-hour activity for each learner. In the first half hour, the native speaker and the EFL learner video-chatted via QQ, an online communication tool in China, to get familiar with each other. The native speaker also introduced the whole task to the EFL learners in this phase. After that, the native speaker guided the remote learners to have a tour on an American campus by

controlling Romo, a telepresence robot using iPhone to capture video, to show the remote learner, and to receive the controlling command from the learner. During about 1-hour process, the native speaker played the role of tour guide to introduce the history and the culture of the buildings along the pathway. In the last half hour, the remote learner was asked to wrapped up what s/he had learned and we conducted an interview for each learner about their experience after they finished their wrap-up. During the activities, we also wrote 10-page in total field notes and videotaped about 6-hour video clips.

Findings

After transcribing the interview, we used Atlas.ti to code the transcripts and filed notes. In total 20 codes were identified. Then we used network tool in Atlas.ti to categorize the codes into three themes based on our research questions:(1) The physical environment around the robot can provide rich and authentic learning content; (2) Controlling telepresence robot allows students to explore the environment actively and let them feel being there; (3) Comparing to person-to-person interaction, students feel hard to express their body language, and poor network connection makes the communication between remote students and local native speaker not as smooth as in-person communication.

Discussion and Conclusion

Generally speaking, our findings show that telepresence robots can afford foreign language learners to practice their communication by actively exploring the environment and choosing the learning content they are interested in. Although network delay and no mechanical arms to express body language in current telepresence robot may influence the communication, considering the fast advancement of Internet and robot technologies, this issue could be addressed in the near future. As an emerging technology, telepresence robots show huge potential on foreign language learning by support non-native speakers around world to have access to the physical, social, and cultural context in the target countries and have the chances to practice their communication competence with native speakers in more authentic environments.

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Perceptions of Technology Integration and Creative Curricula in Child Education

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Key Words/Descriptors: creative curricula; technology integration

Abstract

Creative curricula have been a growing topic of interest for the past ten years, and the same can be said of technology integration into curricula. The relationships between creative curricula and technology integration perceptions of participants familiar with the field, specifically those in early childhood education (ECE) through Grade 12, were investigated ($N = 83$) using an online survey that included both open-ended and Likert-scale items. Open-ended responses were analyzed, and major themes emerged. Quantitative analysis of the Likert scale items revealed a significant difference between technology integration perceptions and age. To further investigate this finding, identified themes were discussed through the lens of age. Results of this study will be used as preliminary research to further investigate the relationships between age and technology integration and how the interactions between these two variables influence technology integration practices and the development and implementation of creative curricula.

Introduction and Background

Early childhood education (ECE) forms the basis for future learning with impacts visible as early as kindergarten (Rathburn & Zhang, 2016), and it is important to foster creativity from the start of preschool education (Cheung & Leung, 2015; Robinson, 2006). Hatamleh (2015) found that in order to excel in science and innovation a foundation in creative thinking is of the utmost importance. In addition to Hatamleh, others have noted the value of creative students and workers (e.g., Bresselink, 2013, Moravec, 2013, and Trnova, 2014). Technology, specifically computer-mediated learning, has been shown to assist in creativity in the education field (Annarumma & Fragnito, 2014; Jonassen, Carr, & Yueh, 1998). Varied forms of technology and media provide learners with the tools to be creative and to turn their ideas into reality while meeting the unique needs of learners (Jonassen, Carr, & Yueh, 1998; Oldakowski, 2014).

Teaching students to approach learning and problem solving in a creative manner will instill within them intrinsic values, personal skills, and motivation factors that will help them to be successful and effective in their future learning and life endeavors (Bresselink, 2013; Hartkamp, 2013; Moravec, 2013; Robinson, 2006; Trnova, 2014). Integrating educational technology into curricula can enhance creative thinking and learner performance (Jonassen, Carr, Yueh, 1998; Oldakowski, 2014). Creativity in education flourishes when technology is utilized, allowing learners and educators alike to further develop their skills and take their thoughts, ideas, relationships, and approaches to problem solving to superior levels (Block, Chou, & Jesness, 2014).

Students of the future will use their creativity to produce technology innovations, solve complex issues, construct strong social connections, and continue learning and developing throughout their lives (Besselink, 2013; Hartkamp, 2013; Hatamleh, 2015; Moravce, 2013; Trnova, 2014). Developing creativity skills that rely on technology is crucial as society is on the cusp of a new lifestyle focused on the widespread use of technology and the high value of creativity (Moravec, 2013; van den Hoff, 2014). The onset of the "tech century" has driven the need for increasingly creative learners who embrace challenges and think outside of cultural, educational, and societal

norms and constructs (Hartkamp, 2013; Moravec, 2013), and it has highlighted the need for students to have early and consistent exposure to educational technology from a young age (DeJarnette, 2012; Lund & Seekins, 2014).

Creative curricula are used in ECE around the world (Bresselink, 2013; Hartkamp, 2013; Moravec, 2013; Robinson, 2006; Trnova, 2014). These types of curricula focus on instilling values and practices of creativity in youth while helping students learn to productively and effectively learn in an environment that allows for individual expression and creative outlets (Hu, Wu, & Shieh, 2016). These curricula have proven beneficial to learners (Hartkamp, 2013; Moravec, 2013; Robinson, 2010); and children in creative curricula obtain education in science, the environment, social interactions, literature, and artistic expression (Hui, et al., 2015). Unfortunately, these students are not taught modern technology skills as part of the curriculum (North American Montessori Center, 2010; Powell, 2013).

It becomes incumbent upon educators in schools using creative curricula, therefore, to support students in technology skill development. Teachers' roles with regard to supporting these efforts and in the education process itself vary based on the creative curriculum being used. Understanding the role of the teacher in these curricula can assist in determining how to integrate technology into their practices. With the Reggio Emilia curriculum, for example, educators facilitate student-to-student learning, relationships, active listening, learning in an environment of acceptance, and learning guided by students (Grabell, 2012). The students direct the learning process with instructors acting as facilitators and the incorporating the "environment as the third teacher" (Wells, 2009, p. 9). Learning practices emphasize collaboration and expression through creative freedom (Ricciardi, 2014).

The Montessori curriculum calls for teachers to encourage children to be creative outdoors and through methods such as self and social exploration (Isaacs, 2012; Montessori Answers, 2016; North American Montessori Center, 2010; Rucker, 2011). Educators using Montessori curricula encourage students to explore their scientific surroundings and creatively draw conclusions about what they see, discover, and think (Isaacs, 2012; Montessori Answers, 2016; North American Montessori Center, 2010). The goal for educators using the Montessori curriculum is to keep children in a safe learning environment that creates a clear distinction between reality and imagination (North American Montessori Center, 2010; Rambusch, 2010).

Parent involvement and participation is another aspect of creative curricula. The role parents play when they have a child in a creative curriculum school is larger and more involved than that of a parent in a traditional curriculum school (Abdelfattah, 2015; Bahmaee, Saadatmand, & Yarmohammadian, 2016; Holtvluwer, 2015; Rucker, 2011; Smith, 2014). Parents are expected to engage their children in the pursuit of learning even when their children are not in class (Abdelfattah, 2015; Bahmaee, Saadatmand, & Yarmohammadian, 2016; Holtvluwer, 2015). Creative curricula encourage parental involvement and the continuation of learning outside of the classroom and inside their homes (Isaacs, 2012; Rambusch, 2010; Rucker, 2011; Wells, 2009).

Bahmaee, Saadatmand, and Yarmohammadian (2016) note that in the Montessori method of education the faculty "attempts to incorporate [the] parent in their children's education" (p. 150). In addition, Holtvluwer (2015) states that Montessori schools work to "gently guide the parent who is making different choices in raising their child," and they feel it is their "duty to educate, not intimidate" parents (p. 84). Montessori schools want to increase parent participation and encourage parents to take a more active role in their child's education (Bahmaee, Saadatmand, & Yarmohammadian, 2016; Holtvluwer, 2015), and these schools "must keep plugging away at helping parents" while also working to "assess the parent's needs and what they are willing to listen to and absorb" (Holtvluwer, 2015, p. 84). Reggio Emilia curricula schools also value high parent involvement (Abdelfattah, 2015; Rucker, 201; Smith, 2014). These schools aim to help parents understand the importance and practices of ECE and involve them in child education (Abdelfattah, 2015). Smith (2014) notes that in Reggio Emilia curricula "it is important for parents to understand what is happening in the classroom" (p. 7). Parent involvement is valued and visible at high levels in creative curricula schools and classrooms (Bahmaee, Saadatmand, & Yarmohammadian, 2016; Holtvluwer, 2015; Rucker, 2011; Smith, 2011); parents are expected to participate actively in their child's education in a creative curriculum (Abdelfattah, 2015; Bahmaee, Saadatmand, & Yarmohammadian, 2016; Holtvluwer, 2015; Rucker, 2011)

Because both parents and educators have unique, specific roles in the education of children involved in creative curricula (as do learners, administrators, and instructional designers), understanding the perceptions of these stakeholders and how they feel technology factors into creative curricula is important. Research that considers each of these stakeholders can help create a more holistic, comprehensive understanding of technology integration into creative curricula.

Greater research is warranted with regard to creative curricula, technology integration, and their direct relationship to one another (specifically in ECE). The current data on the relationships and correlations between these two fields is insufficient for early childhood curriculum designers to make well-informed decisions on creativity and technology integration. Because of this, the components of creative curricula in ECE through Grade

12, along with the potential integration and use of technology into the curricula, were investigated. Perceptions of learners, administrators, educators, and instructional designers were considered. With the onset of the tech century, it is important to be aware of the contributions technology makes to society as well as education (Moravec, 2013). Technology is integrated into our daily lives in our homes as well as our work environments; yet, it is not effectively integrated into our schools (ECE through Grade 12), including those using creative curricula (DeJarnette, 2012; Lund & Seekins, 2014; Powell, 2013). It is important that educators are comfortable and confident in this technology revolution and work to provide their students with the best possible tools and chances for success in the future. Research to determine the comfort levels and perceptions with technology integration is essential to learner and educator success. It is a necessity in our field, and we must begin preparing learners from an early age.

Statement of the Problem

The skills that are endorsed by creative curricula can be valuable to student success (Robinson, 2006), as can technology skills (Kivunja, 2014, 2015); and it behooves professionals in the field to investigate the benefits, challenges, and impacts of technology and essential skills on children and curricula. Coupling educational technology with creative curricula becomes an even more powerful combination. With the ability for computers and other technology to meet the unique and diverse needs of learners in a non-traditional way, the incorporation of technology into education is a logical and necessary step that results in better learning for students (Jonassen, Carr, & Yueh, 1998). In addition, adding modern technology into education allows for a multimodal educational approach to be used, thus, reaching even more learners (Oldakowski, 2014).

Proponents of creative curricula focus on bringing creativity back into childhood education (Robinson, 2006, 2010). Though some researchers and analysts have drawn conclusions about the benefits and challenges associated with creative curricula, particularly education (Directorate for Education, 2004; Montessori Answers, 2016; North American Montessori Center, 2010; Wells, 2009), current, updated, unbiased information is limited. Links between early child creative curricula and educational technology are even more sparse.

In response to the need for greater research, this study was completed to identify how educational technology can be used in conjunction with creative curricula to create a powerful learning environment for ECE to Grade 12 learners. This pilot study sought to determine perceived benefits and challenges associated with creative curricula and the uses of technology in education as well as to identify relationships between key factors (age, education level, and occupation) and the potential ways in which technology is and can be coupled with creative curricula.

Methodology

Research Questions

Quantitative and qualitative research questions were established to guide this ex post facto research study. To answer these questions, various stakeholders (child educators, parents of students in centers using creative curricula, instructional designers, and administrators) were surveyed. The following four questions framed the research:

1. What are the relationships, if any, between perceptions of creative curricula, technology integration, and demographic characteristics of study participants?
2. What are the perceived benefits and challenges of creative curricula in childhood education?
3. What are the benefits and challenges of infusing technology into education?
4. How might creative curricula impact the future learning processes and professional and academic actions of students, particularly when technology is integrated?

Instrument

The survey instrument was composed of a combination of 36 items -- 18 Likert-scale, 11 demographic items, 6 open-ended questions, and 1 optional open-ended question. The survey, which was distributed using SurveyMonkey (a secure online survey tool) sought participants' perceptions of three areas: creative curricula, technology integration, and technology integration into creative curricula. The first item on the survey related to informed consent. Participants provided informed consent prior to completing the survey.

To ensure anonymity, personal identifying information items such as names, email addresses, IP addresses, and places of work and education were not included. Likert scale items were based on five response options (strongly agree, agree, neutral, disagree, strongly disagree), and open-ended items allowed respondents to provide descriptions of their own perceptions and experiences in greater detail.

Population

The target population for this research study was individuals working or learning in a field related to creative curricula and/or technology use in education and those who have a vested interest in the enhancement of creative curricula. The primary participant targets were individuals who (a) have a child in a creative curriculum school, (b) have worked in creative curricula settings, (c) work as an instructional designer with a knowledge of creative curricula, (d) are former creative curriculum students, or (e) exist in any combination of the above-noted items. The minimum age of participation was set to 18 years in order to ensure that high school was completed and that participants would be at an appropriate level to understand the questions posed to them.

Sample

The sample consisted of 83 participants. Of those 83 individuals, 50 participated in the survey to completion; only the fully-completed surveys were analyzed. Genders were described as male (n = 13, 26%) and female (n = 37, 74%). Ethnicities identified encompassed Asian, Black (African American), Eurasian (Middle Eastern), Hispanic or Latin American, White, Afro-Caribbean, West African, American, and one non-disclosure (see Table 1). Participants ranged from 18 to over 60 years of age, and education levels ranged from some college (no degree) to graduate degrees. The sample was composed of educator, parent, parent/educator, and other including instructional designer, administrator, doctoral student, and business trainer participants (see Table 2).

Table 1 Ethnicity Frequency and Percent

Ethnicities	Frequency	Percent
American Indian or Alaskan Native	0	0
Asian	7	14
Black (African American)	4	8
Eurasian (Middle Eastern)	1	2
Hispanic or Latin American	1	2
Native Hawaiian or other Pacific Islander	0	0
White	34	68
Two or more races	0	0
Other (please specify)	1	2
Missing	2	4

Table 2 Age, Education, and Role Frequencies and Percent

Demographics	Frequency	Percent
Age Range		
18-29	5	10
30-44	21	42
45-59	18	36
Over 60	6	12
Education		
Some college but no degree	2	4
Associate degree	1	2
Bachelor degree	7	14
Graduate degree	40	80
Role		
Educator	28	56
Parent	4	8
Parent and Educator	15	30
Other	3	6

Results and Findings

Likert-Scale Items

Likert-scale data were analyzed through IBM SPSS Statistics 21.0. Eighteen Likert-scale survey items specifically focused on participants' perceptions of creative curricula and technology integration. A factor analysis was conducted to verify that these instrument items loaded on these two factors. Creative curricula was defined by nine survey items, and technology integration was defined by seven items. Two instrument items failed to load on either of these factors and were removed from further analysis. Creative curricula contributed 36.08% and technology integration contributed 25.00% of the total variance (61.08%). Cronbach's alpha was used to assess internal consistency of the instrument items. The nine creative curricula items ($\alpha = .943$) and the seven technology integration items ($\alpha = .884$) revealed acceptable reliability.

The Spearman rho test was used to determine if significant correlations existed between creative curricula perceptions, technology integration perceptions, and demographic characteristics including age, ethnicity, education, and role. A significant relationship was not found between creative curricula perceptions and demographic variables. However, a significant correlation was revealed between age and technology integration perceptions $r_s = .401$, $p = .004$.

The Kruskal-Wallis test was used to determine if significant differences existed between perceptions of creative curricula and technology integration and demographic characteristics including age, ethnicity, education, and role. A significant difference was revealed between technology integration perceptions and age $\chi^2(3, N = 50) = 9.54$, $p = .023$. The Mann-Whitney U test revealed significant differences between participants over 60 years of age and the three other age groups: 18-29 years of age ($U = .000$, $p = .005$), 30-44 years of age ($U = 21.000$, $p = .012$), and 45-59 years of age ($U = 24.000$, $p = .038$).

Open-Ended Items

A content analysis was conducted for the open-ended survey items, and responses were coded using a latent level of analysis. Exact wording and the nature of the meaning of the response were investigated and informed the themes that emerged. All individual responses were included in the analysis, and responses were categorized according to common ideas and meanings.

To enhance the quality and integrity of the content analyses, multiple coders reviewed the data, and consensus was reached for any responses that were originally coded differently. Once the themes were identified, the researchers discussed the validity of the codes and external reviewers were consulted, as well. This approach allowed for cross-checking and accuracy in interpretation of data and themes. Peer debriefing strategies were also employed.

Themes emerged from the six open-ended survey items. Three themes were identified for items related to benefits, and these same three themes were evident in all items related to benefits (benefits of creative curricula, benefits of technology integration, and benefits of technology integration into creative curricula); this same phenomena was true of the challenges. Therefore, the themes for the survey items related to perceived benefits of creative curricula were the same themes for perceived benefits of technology integration and perceived benefits of technology integration in creative curricula. The themes related to benefits that were identified were instructional environment, soft skills, and miscellaneous. (See Table 3.)

Examples of responses coded as instructional environment included learn through experience and environment, learner-centered, multi-modal, reaches learning disabled, accessibility, and engaging. Responses coded as "soft skills" included social skills, life skills, collaboration, problem solving, critical thinking, real world prep, and independence. The "miscellaneous" category typically related to items that were unclear with regard to meaning. An example of a response included in the miscellaneous category was "amplify each other." In all three categories of benefits combined, only three responses were coded as miscellaneous. It is important to note that three participants saw no benefits.

Table 3 Common themes: Benefits of creative curricula, technology integration in education, and both

Themes	Frequency	Percent
Creative Curricula		
Instructional Environment	10	43
Soft Skills	11	48
Miscellaneous	2	9
Technology integration in Education		
Instructional Environment	19	61
Soft Skills	9	29
Miscellaneous	3	10
Creative Curricula and Technology Integration		
Instructional Environment	17	57
Soft Skills	10	33
Miscellaneous	3	10

The themes related to challenges that were identified were readiness, implementation, environmental, and miscellaneous. Responses coded as readiness included motivation, teacher resistance, lack of teacher knowledge, and training. Implementation included responses such as technology dependence, real life application, accessibility, and teacher technique. Response coded as environmental included security, funding, leadership resistance, and harassment/bullying. Again, responses coded as "miscellaneous" were those that were unclear with regard to meaning, and only five responses were coded as "miscellaneous" in all of analyses related to challenges combined. Examples of responses coded as "miscellaneous" with regard to challenges were "many" and "unsure." It is important to note that one individual saw no challenges with creative curricula. (See Table 4.)

Table 4 Common themes: Challenges of creative curricula, technology integration in education, and both

Themes	Frequency	Percent
Creative Curricula		
Readiness	8	27
Implementation	11	38
Environmental	6	21
Miscellaneous	4	14
Technology integration in Education		
Readiness	6	27
Implementation	10	43
Environmental	4	17
Miscellaneous	3	13
Creative Curricula and Technology Integration		
Readiness	8	32
Implementation	9	36
Environmental	4	16
Miscellaneous	4	16

Discussion

Results of this study revealed a significant relationship between perceptions of technology integration and age. This finding is supported by literature, which indicates that age is a factor that is known to influence perceptions (Elmas, 2013). Further investigation of age differences and perceptions in this study indicated significant differences between participants over 60 years of age and the other three age groups. This suggests that the technology integration perceptions of participants who are 60 years of age and older differed significantly from those participants in the younger age groups. Existing research suggests that when considering the views of younger persons on those of persons of older age, the younger population holds a negative view of both old age and the aging process (Joye & Wilson, 2015). Interestingly, the present study contradicts these negative views held by younger populations identified in existing literature. The present study revealed that the perceptions of the older participants were more positive than their younger counterparts. In fact, none of the participants in the 60 years and older group felt there were negative outcomes associated with technology use in education.

According to literature, differing perceptions can create issues and resistance from the older population as well as the younger population in instances where the person of authority or guidance (i.e. an educator, boss, curriculum designer, etc.) is younger than the student (Joye & Wilson, 2015). With regard to the present study, these ideas relate to the themes related to challenges, specifically readiness and environmental. Responses such as "resistance – leadership," "resistance - teacher" and "board member resistance" suggest that as a whole the participants perceived concerns related to issues of resistance. Based on the correlational results of this study, these perceptions may be based on age and differ among the age groups, with older participants being less resistant.

Chen (2014) found that the use of social and functional strategies is more likely in persons of older age. Responses from participants in the older age group (60 and above) in the present study demonstrated that these skills (coded as soft skills) were benefits of technology integration. These included "future preparation," "real world preparation," and "currency and comfortability with technology." Based on responses, participants perceived that these skills are also beneficial to the instructional environment, particularly when technology is infused into creative curricula, sharing benefits such as "individualized and diverse needs," and "textbook bias is gone." While younger participants also shared perceived benefits, the findings of the present study are supported by Chen's findings.

The results of the preset study demonstrate that perceptions of technology integration, creative curricula, and the interplay of technology integration and creative curricula vary, and these differences can be influenced by age. This is an important consideration with the use of technology in education (Chen, 2014; Elmas, 2013). Age affects the methods and ways in which we learn, and this age effect is visible in technology use and application (Elmas, 2013) as well as technology perceptions (Schulze, 2014). It is important to consider age when implementing new programs and instruction (Nyikahadzoi, Matamande, Taderera, & Mandimika, 2013), and when considering the benefits and challenges associated with movements such as technology integration, creative curricula use, and creative curricula and technology integration age is a key factor.

Conclusion

The results of this research depict a connection between technology and creative curricula that can be strengthened. The key factor of age significantly impacted perceived benefits and challenges of creative curricula, technology education, and the integration of technology in creative curricula. Therefore, this study has extended the ideas discovered in past research to update and delve deeper into the perceived benefits and challenges of creative curricula and technology integration in addition to the potential of integrating technology with creative curricula. In this way, this study has furthered discussions related to the values of creativity and technology use identified in the literature to help prepare students for a "tech society."

The research shared may help those considering the inclusion of technology in creative curricula, and all curricula for that matter, make their decision with more confidence based on the updated research and recent findings related to perceptions and age. The relationships between different age groups and technology integration are more visible as a result of this study. In addition, the data gathered in this research study may help the research team further their creative curricula and modern technology integration work with future research studies.

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Technology Integration Matrix: Benefits to the Pre-Service Educator

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Abstract

The purpose of this research was to determine how use of the Technology Integration Matrix (TIM) influenced preservice educators' metacognition about technology integration into teaching and learning practices. The TIM addressed preservice educators' needs to develop awareness of, and abilities to, apply the International Society for Technology in Education (ISTE) Standards for Teachers and Students (ISTE, 2015). The TIM assisted preservice educators in connecting the ISTE standards to content standards and theories of teaching and learning by developing effective lessons. Through completion of TIMs, preservice educators not only connected ISTE standards and content standards, but also visualized the relationships to pedagogical models and theories. Findings from this study included an increase in preservice educators' awareness of today's learners, ISTE standards, connections to pedagogy, and increased abilities to transform learning experiences.

Introduction

Today's learners need educators to transform learning experiences through effective integration of technology and the International Society for Technology in Education (ISTE) Standards for Teachers and for Students (ISTE, 2015) further emphasize that need. A Technology Integration Matrix (TIM) developed by the researchers was integrated into technology integration courses in a teacher preparation program in order to assist preservice educators in meeting the needs of today's learners. The TIM addressed preservice educators' needs to develop awareness of, and abilities to, apply the ISTE Standards for Teachers and for Students (ISTE, 2015). The purpose of the TIM is for the preservice educators to make connections and implement technology effectively. The researchers' purpose in conducting this study was to examine the effectiveness of this tool.

Literature Review

No matter the theory, method, or strategies used, integrating technology effectively is of utmost importance in meeting the needs of today's learners (Watson & Pecchioni, 2011). Technology provides educators with limitless possibilities to impact students' learning, but without effective planning and implementation, technology becomes wasteful and problematic. Technology will not make a bad teacher good, but a good educator can use it to make

great learning experiences. To assist preservice educators in the ability to effectively integrate technology, the researchers developed a Technology Integration Matrix (TIM). The purpose of the TIM is for the preservice educators to make connections between pedagogical theories, standards, and practical implementation of technology.

Zhao (2015) asserted that "educational systems have been struggling to produce creative and entrepreneurial citizens for decades" (p. 130). Today's learners, or 21st century learners, must have learning and innovation skills, life and career skills, information, media, and technology skills, in addition to content knowledge (Partnership for 21st Century Skills, 2015). It is imperative that an educational revolution take place in which creativity, development of diverse talents, global perspectives, innovation, and entrepreneurship are cultivated (Zhao, 2015). Personalizing the education experience through effective use of technology is the way to meet the needs of today's learners.

ISTE created technology integration standards for educators, students, administrators, coaches, and computer science educators (ISTE, 2015). The goal of such standards is to increase innovation in education. "ISTE Standards work in concert to support students, educators and leaders with clear guidelines for the skills, knowledge and approaches they need to succeed in the digital age" (ISTE, 2015, para. 1). Standards for students include creativity and innovation, research and information fluency, communication and collaboration, critical thinking, problem solving, decision making, digital citizenship, technology operations and concepts. The standards for teachers include words such as facilitate, model, design and develop, and professional growth. Nothing in the standards focuses on using specific technology tools, but rather how to effectively integrate all technology while encouraging creativity, innovation, and citizenship (ISTE, 2015).

Theoretical Framework

The TPACK (Technology, Pedagogy, and Content Knowledge) framework proposed by Koehler and Mishra (2005), explains that desirable use of technology in the classroom requires complex forms of teacher knowledge that integrates content, pedagogy, and technology. To Koehler and Mishra (2005), it is possible for instructors to support the development of a teacher's TPACK through programs that incorporate all sections of the framework throughout the process rather than in isolated chunks that focus on technology, content, or pedagogy individually.

Expanding on Koehler and Mishra's TPACK framework (2005), Wilson, Zygouris-Coe, Cardullo, & Fang (2013), further developed a Metacognitive-TPACK (M-TPACK) framework. This framework draws on the concepts of TPACK as proposed by Koehler and Mishra (2005). M-TPACK holds that for technology to be an integral part of teaching and learning, teachers must have a "positive disposition towards a technology and be metacognitive in their decisions and practices" (Wilson et al., 2013, p. 9). Teachers must have an explorative attitude towards technology use and recognize that technology integration plays a pivotal role in improving both content and 21st century skills (Wilson et al 2013). This framework holds that in addition to TPACK, a metacognitive teacher also has knowledge that the learning environment is about "access to content, research, support, expertise, real world artifacts, accessing information sources, ease of mobility, motivation, curiosity, communication, and collaboration" (Wilson et al. 2013, p. 10).

Methodology

In this study, the TIM provided preservice teachers with the metacognition they needed to effectively integrate technology into their content and pedagogical knowledge.
The following research question was examined:

How does use of the Technology Integration Matrix influence preservice educators' metacognition about technology integration in teaching and learning practices?

Participants and Setting

The study was conducted in a school of teacher education at a university in the Rocky Mountain region using a convenience sampling. The participants were recruited from the preservice educators enrolled in required technology integration courses taught by the researchers. The purpose of the courses was to teach preservice teachers how to effectively integrate technology in their future teaching practices in K-12 educational environments. The participants included students in online and face-to-face educational technology courses. All of the participants

were preservice educators studying early childhood education, primary education, or secondary education with various endorsement areas.

Participants in this qualitative study included approximately 204 students enrolled in Educational Technology (ET) 449, Integrating Technology into Secondary Pedagogy and students enrolled in ET247 and ET347 Integration of Technology in Elementary Pedagogy I and II. All participants were at least 18 years of age.

Data

The Technology Integration Matrix (TIM) developed by the researchers was incorporated into technology integration courses in a teacher preparation program. The tool addressed preservice educators' needs to develop awareness of, and abilities to, apply the ISTE Standards for Teachers and Students (ISTE, 2015), and to make connections between the ISTE standards, content standards, and theories and models for teaching and learning. A pre and post-survey was completed by students in all three courses which gathered demographics and posed qualitative prompts regarding metacognition of technology integration through use of the TIM. Participants for the focus groups were recruited from the face-to-face ET449 course, by a researcher who is not an instructor of ET449. The researcher sought four focus groups comprised of three to five participants each.

Data Collection and Analysis

The data analysis procedures used in this study are consistent with an interpretivist model of qualitative research. According to Erickson (1986) "the basic task of data analysis is to generate assertions that vary in scope and level of inference, largely through induction, and to establish an evidentiary warrant for the assertions one wishes to make" (p. 146). A comparative analysis of the data being collected was utilized (Strauss & Corbin, 1998). The three-step process of open coding, axial coding, and selective coding as described by Strauss and Corbin (1998) was conducted to construct assertions and understand the relationships among sets of data. Descriptive statistics were appropriate for summarizing the data obtained in the study. Specifically, researchers employed descriptive statistics when analyzing demographic data.

Researchers conducted a pilot study in the undergraduate elementary educational technology courses (ET247 and ET347) in the prior semester. The researchers analyzed student work samples from this pilot study, as well as work samples from the current study. The participants'' work samples are completed Technology Integration Matrices. A longitudinal aspect to the study is currently collecting data from participants who used the TIM in ET247 and continue to use it in ET347.

Pilot Study

Participants work samples from the pilot study showed an increase in metacognition of effective technology integration after completing Technology Integration Matrices throughout the semester. Participants' reflections on the matrices explained their initial confusion and uncertainty with integrating technology in future teaching and learning practices; however, by the end of the semester, reflections indicated improvement in their ability to confidently integrate technology. Findings further indicated an increase in preservice educators' abilities to transform learning experiences through effective implementation of technology.

Based on the pilot study, modifications were made to the TIM to maximize potential learning by eliminating superfluous components that did not enhance metacognition of effective technology integration. The modified TIM was designed to increase usability.

Results

Demographic Information

This study employed a convenient sampling method. The N for this study was 69 for both pre and post data. There were 39 participants from the elementary class ET247, and 30 were from ET449. Participants were asked to identify a major and area of licensure on the survey. Major areas included, elementary, secondary, K-12, and early childhood education. Areas of licensure selected included special education, English/language arts, math, social studies/history, Spanish, theatre, and biological sciences. Participants were asked to keep a content area in mind as they responded to the questions. This direction was to assist participants in looking at the questions through a pedagogical lens. A variety of content areas were selected.

Survey Data

To answer the research question, eight open ended questions were posed in both the pre and post survey. The questions were designed to determine preservice teachers' knowledge of effective technology integration, pedagogical/theoretical knowledge they associate with their teaching, and knowledge of ISTE standards; as well as how the matrix assisted them in making connections between theoretical frameworks and technology integration, and how the matrix helped increase their knowledge of effective technology integration. Each question was coded separately and pre and post-tests compared to determine increase or change in metacognition after use of the matrix by the preservice teachers. It is important to note that the classes in which the study took place are designed as technology rich classes and as such employ multiple technology integration projects to equip the preservice teachers with effective technology integration skills that align with the content and curriculum needs of their future students. The TIM was incorporated to assist with critical thinking and in planning technology rich lessons.

Technology integration was addressed in the survey. The first two questions: "What does effective technology integration mean to you" and "How will you use technology to transform learning experiences for your students", acknowledged that most of the participants had some knowledge of what that entailed in the pre-survey. The responses demonstrated some understanding and familiarity with use of technology to transform learning, however the post-survey elicited more comprehensive responses to these questions which can be interpreted as an increase in metacognition of what effective technology integration entails. These post-survey responses were more comprehensive after participating in a technology rich classroom that utilized the TIM as part and parcel of their learning. These responses also showed differentiation, as participants had a much broader understanding of technology use to diversify learning. For example, one participant's response in the pre-survey for these two questions was as follows:

> Q1: "It means learning how to adequately use technology in class."
>
> Q2: "I will use it for students with disabilities to be sure that they are able to learn everything that I am teaching properly and able to learn in a way that makes sense to them."

The participant's post-survey response included:

> Q1: "It means being able to use technology inside and outside of the classroom to ensure students are learning. Using technology to show students who learn a little bit different that it is indeed possible to learn like everyone else."
>
> Q2: "I will make it where there are multiple ways to learn the topic, from visual, to auditory and incorporating both in every lesson so students can pick and choose the way that is best for them to learn."

Some participants' responses were also different in regards to learner centered integration as opposed to general use of technology in the classroom. This improvement is illustrated in another participant's response:

> Pre-survey Q1: "The best way to apply technology in classroom", versus
>
> Post-survey Q1: "Integrating technology in your classroom so it is useful for the student to learn."

Regarding knowledge of ISTE standards, a question posed included participants' knowledge of ISTE standards for both teachers and learners and how they anticipated they would integrate or use these standards in their future classrooms. Out of 69participants, only 24 stated that they were familiar with ISTE standards in the pre-survey. One participant stated that:

> "As of right now, the school I am working at does not require or use ISTE standards to my knowledge. However, if I learn that they do, I will use them in the same way I use the CAS and CCSS. Backwards by design lessons are the best no matter what standards you are using. Therefore, I would use the standards as a starting point and build my lesson from there."

Most participants also had no prior knowledge or experience with any type of technology integration matrix before the class. Of the 69 participants that completed the pre-survey, only 9 were familiar with a technology integration matrix. After the pre-survey the participants were introduced to the matrix, theoretical frameworks and models, ISTE standards, and content standards. The matrix was used in conjunction with the technology rich modules and participants completed the matrix as part of each module. They used the matrix to reflect on the integration process and made connections between frameworks/models and standards.

In the post survey, they were asked three questions intended to capture how the matrix assisted their technology metacognition and integration process. Responses demonstrated that the matrix assisted them in this process. Specifically, these questions intended to determine how the TIM assisted the participants' in applying ISTE standards, how it prepared them to effectively integrate technology in their future teaching practices, and how the TIM assisted them in making connections between learning theories and technology integration. In answering the first question, how the TIM assisted in the application of ISTE standards, participants' responses reflected that use of the TIM helped them in applying ISTE standards across content:

"The TIM helped me understand the ISTE standards on technology more in depth to better cater to my students. I think it made very clear what tech is appropriate for classroom use."

"It gave me time to really ponder and come up with ideas that could actually be used within a lesson or as the lesson for all the different subjects."

"It helped me to look at the goals for teachers and students and adapt my activities and what I wanted to do to match those goals as well as come up with new activities to match goals I hadn't used yet."

"It helped me think about one lesson in several different contexts as well as the how one standard can be hit in many ways, or numerous standards in one lesson depending on small tweaks to the lesson, and work assigned to the students."

In answering the second TIM application question, how it helped them to effectively integrate technology in their future teaching practices, participants' responses demonstrated that the TIM assisted them by increasing their metacognition to effectively integrate technology in their future teaching practices. The following are some of the responses:

"It helped me think about the different components of technology and tackling it from an educational step by step process."

"It helped me think of ways to incorporate different technologies into a variety of subjects."

"It helped me to come up with new ways of teaching different concepts and now I have four different matrices to look at when planning classroom learning experiences."

"It taught me to always ask myself before I bring anything into my classroom 'what standard am I hitting?' Sure you can bring in a digital story telling of the book Charlotte's web, but what standard are you enforcing? connecting the material, bridging it with technology and book work."

The last question posed, intended to determine how the TIM assisted the participants in making connections between learning theories and technology integration. Responses demonstrated that preservice teachers' knowledge of the pedagogical theories and how they can use technology to influence and change their pedagogical practices improved. Participants were expected to critically think and come up with technology rich learning activities for their students using multiple pedagogical theories provided in the matrix. The following are some of the response:

"It helped me find appropriate connections between learning theories and technology integration. One of the most beneficial is understanding what formats aid students the most and which tech fits that need for them."

"Students can learn using technology. The matrix had us evaluate Bloom's Taxonomy methods and explain in detail how they applied to the classroom examples I had to think up."

"It helped me by making me find ways to incorporate technology into every subject not just the same subjects every time, I had to come up with a way to incorporate technology into every subject I teach so it is being used all the time."

"It helped to take one lesson and stretch and alter it to fit into the teaching theories, and how easy or hard it was, in order to be a good teacher you need to think about all theories and learning styles."

Focus Group Data

Participants in the focus group discussed the connections the TIM assisted them in creating. This focus group data further cemented that the TIM indeed helped with these connections between technology integration, standards, and theoretical frameworks. Some of the participants' comments within the discussion included:

"Just literarily the way it sets you up to have to make connections between the standards and the rest."

"I feel like it was a good place to finally bring all strategies with the standards together, you know you learn all the rest in the previous classes but they don't usually really connect them"

"I think even when I am teaching I will set up a similar matrix for myself . . . just to keep track of the standards I am hitting weekly and to keep track of where I wanna go in the future and help me plan in the lesson because it really keeps you a lot more organized . . . and make sure you are progressing at the end of the year."

"Made like a clear linear connection as to standards, technology standards were connected to as far as CDE so it made me realize that ooh so they are doing this with computers and they are doing this with CDE at the same time like this is the standards they are accessing while we are doing this in technology"

"The linear connection made me get creative with what your lesson plans are, coz you are like as long as I hit this . . . then I am actually accessing that standard. It reminds you that you are doing a lot more than just the lesson plan."

Longitudinal Data

The researchers chose to survey participants over a period of enrollment in both ET247 and ET347. Participants were introduced to the TIM in ET247, then they progressed into Integration of Technology in Elementary Pedagogy II (ET347) and have continued to complete the TIM. This aspect of the study was to demonstrate a long term effect of using matrices to help preservice educators to adopt and instill an effective technology integration approach for their future teaching practices. In studying these participants over a series of courses utilizing the TIM, we hoped to identify a longitudinal relationship in their metacognition of technology integration in their teaching and learning practices. The intent was to determine if the participants prolonged use of the TIM continued to influence and improve their technology integration metacognition. Four participants' responses in ET347 were matched with their responses from ET247 and analyzed.

In answering the first two questions: 'What does effective technology integration mean to you" and "How will you use technology to transform learning experiences for your students", these participants' responses varied slightly from their earlier responses. One participant's response illustrated a slightly better understanding of what effective technology integration meant:

> ET247 post-survey: "The best way to apply technology in the classroom", compared to
> ET347 pre-survey: "Effective technology integration means to me, when you understand the information that you are teaching and integrating technology when it is necessary and the most helpful."

Another participant responded:

> ET247 post-survey: "Effective technology integration is using means of technology to present information to students in new ways compared to traditional teaching methods. This includes having students make online videos instead of a poster, or keeping a blog, etc to teach students how to use the technology that surrounds them daily and make it a relevant way to learn in school."
> ET347 pre-survey: "To me it means an equal balance of appropriate technology to help enhance learning. Students of the upcoming generations will not know of a life without it, so using technology can help them make better connections from the learning material and their personal lives."

Finally, one participant's response in ET347 moves beyond integrating a technology tool just for the tools sake, to an approach that integrates technology to enhance learning and help students make connections between concepts using technology tools; as well as appreciating and identifying the ubiquity that technology affords learning:

> "I will use technology to transform the learning experiences for my students by getting my students familiar with technology and able to use technology for all their needs. It will give the students a different way of learning that they can also do at home besides the classroom."

This response can be interpreted as demonstrating a much better understanding of what effective technology entails. These ET347 participants will complete a final survey in the next couple of months to determine any longitudinal aspects to this study.

Conclusion

Today's learners need educators to transform learning experiences through effective integration of technology and the ISTE Standards for Teachers and for Students (ISTE, 2015). Through implementation of the TIM, researchers noted an increase in preservice educators' awareness of the needs of today's learners, the ISTE standards for technology integration, and connections to pedagogical models and theories. The use of the TIM in conjunction with integration tools and strategies in teacher preparation programs have the potential to better prepare preservice teachers for their future teaching practices. Preservice educators repeated use of the TIM throughout their teacher preparation programs can also help improve their abilities to make improved connections between ISTE standards, content standards, and pedagogical models and theories. In addition to these benefits, this study demonstrates that preservice educators' integration of the TIM did improve their M-TPACK, which better prepares them to use technology as integral part of teaching and learning in their future classes.

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Influence of the Teaching Practicum on Pre-service Teachers' Perceptions of Good Teaching

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Ⅰ. Introduction

Numerous studies have been performed on "good teaching," to identify the factors that comprise an effective lesson. The definition of good teaching varies in accordance with educational trends and communities, and formulating a clear definition is a challenge due to the relativity and situatedness of the term "good," and the complexity and multiplicity of the term "teaching" (Seo, 2004). Hence, the definition of good teaching has been continuously reinterpreted, and researchers have taken diverse approaches to analyzing its features (Koh, 2005; Kwon & Pang, 2009; Lee, Lee, & Li Li, 2008; McMahon, 2006; Murphy, Delli, & Edward, 2004). "Good teaching" refers to identifying the problems in education and overcoming them (Gim & Byeon, 2005), as well as supporting learners to actively build knowledge based on a student-centered teaching approach (Seo & Yoo, 2004; Brophy & Porter, 1987; Brophy, 1999; Johnson-Farmer & Frenn, 2009; Zemelman et al., 1998). Morgan and Morris (1999) defined good teaching as teaching practices that stimulate student interests, explain matters in an easy-to-understand manner, treat students kindly, and manage the class effectively. Borich (2000) suggested that good teaching practices include clear and concise lesson delivery, utilizing various teaching methods, focusing on coursework, encouraging active participation from students, and helping students improve their academic performance.

In South Korea, studies on "good teaching" have been vigorously undertaken since the 2000s (Kwon, 2010; Jeon, 2016). Those studies can be classified as follows: those that 1) defined good teaching through reviews of past literature (Gim & Byeon, 2005; Son, 2006), 2) analyzed the perception of teachers and students via interviews or questionnaires (Kim, 2010; Kwon, 2010; Lee & Kim, 2008), 3) studied the features of good teaching through class observations (Lee, 2011; Ahn, 2012), 4) examined the meaning of good teaching at the level of elementary and middle school (Seo, 2004; Jo, 2008; Kim et al., 2003; Kwon, 2010; Kwon & Pang, 2009; Lee, Lee, & Li Li, 2008) or at the level of high school (Park, 2008; Chung, 2007), as well as surveyed the perceptions of good teaching in college students.

However, prior studies of good teaching practices in Korea have focused on identifying the features of good teaching in both primary and secondary education, without examining the practice of such features in actual classes (Kim, 2012), thereby posing a challenge in devising measures for improvement. Furthermore, these studies have primarily been of teachers, with a focus on examining their perceptions.

In the area of teacher education, studies have been conducted on the attitudes, behaviors, and competence of teachers in order to promote effective teaching. Previous studies have shown that, among the numerous factors influencing "good teaching," beliefs and perceptions developed as pre-service teachers are considered to be influential factors in their teaching. For example, studies have reported that teachers' beliefs and perceptions rarely

change, and it is difficult to change their beliefs compared to changing their knowledge, behaviors, and competence. In other words, once teachers' educational beliefs and perceptions are shaped through their personal backgrounds and education in teacher education programs, they are relatively stable. In light of this fact, research on pre-service teachers—the primary period during which their beliefs as teachers are formed—has been undertaken from multiple perspectives. In short, pre-service teachers acquire the range of knowledge and attitudes that are required of them as educators in their teacher education programs. Specifically, the teaching practicum is a preparatory process that enables pre-service teachers to acquire field experience in schools, often being the only teaching opportunity for them prior to becoming certified teachers (Kim, 2004; Choi, 2005). Pre-service teachers verify and apply their learned theories and knowledge in the field and accumulate information regarding appropriate teaching attitude, teaching abilities, decision-making processes, and practical knowledge (Hwang, Jang, & Choi, 2004). The teaching practicum is also an opportunity for pre-service teachers to choose specializations and establish identities as teachers by assessing and examining their roles in the teaching profession.

Because teachers take on leading roles in the classroom as primary agents of education, their perception of what constitutes good teaching shapes their practices in the classroom, which in turn influences students' learning methods, and ultimately affects student academic performance (Kember & Kwan, 2000; Pajares, 1992; Trigwell, Prosser, & Waterhouse, 1999). In addition, considering that educational beliefs and perceptions rarely change, it is never enough to emphasize the importance of establishing appropriate educational beliefs and perceptions of good teaching during the pre-service period.

In this context, the present study analyzes pre-service teachers' perceptions of good teaching, and examines the changes in their perceptions of good teaching before and after the teaching practicum. To this end, we analyze whether the teaching practicum has an impact on pre-service teachers' perceptions of good teaching and whether there are differences in changes of perceptions in accordance with their experience of class observations and teaching demonstrations during the teaching practicum.

Hence, we established the following research questions: First, do pre-service teachers' perceptions of good teaching change after completing the teaching practicum? Second, are there differences in the changes of pre-service teachers' perceptions of good teaching in accordance with class observations? Third, are there differences in the changes of pre-service teachers' perceptions of good teaching in accordance with teaching demonstrations?

Ⅱ. Methods

1. Participants

An online survey was conducted with pre-service teachers attending K University in Seoul before and after their teaching practicum to explore their perceptions of "good teaching" and changes in their perceptions. A total of 139 pre-service teachers responded to the questionnaire, and the participants' general characteristics are shown in Table 1. The vast majority of the participants were female (112, 80.6%), and the greatest number of the participants majored in "other" subjects (34, 24.5%), followed by English (28, 20.1%), and social studies (26, 18.7%), showing that the participants comprised individuals with diverse majors. A majority of the participants had completed less than 20 sessions of class observations (117, 84.1%) and less than 20 teaching demonstration sessions (116, 83.5%) during the teaching practicum.

Table 1 Respondents background

		n	%
Gender	Male	27	19.4
	Female	112	80.6
Major	Korean	22	15.8
	English	28	20.1
	Math	15	10.8
	Social Studies	26	18.7
	Sciences	3	2.2
	Art, Music and Physical education	11	7.9

	other	34	24.5
Class observation	less than 10	59	42.4
	10~20	58	41.7
	20~30	17	12.2
	over 30	5	3.6
Teaching demonstration	less than 10	61	43.9
	10~20	55	39.6
	20~30	13	9.4
	30 40	5	3.6
	over 40	5	3.6
Total		139	100.0

2. Research Tools and Procedure

Data were collected via an online questionnaire before and after the secondary pre-service teachers completed their teaching practicum. We investigated their perceptions of the importance of good teaching in the preliminary test and investigated their performance of the behaviors after they completed the teaching practicum. A total of 152 questionnaires were collected, 13 of which were excluded for omissions or wrong responses, resulting in a total of 139 questionnaires for the final analysis.

The questionnaire used for this study was an adapted and revised version of the "Good" Teacher Questionnaire developed by Devine, Fahie, and McGillicuddy (2013). The validity of the modified questionnaire was verified by three educational technologists. The questionnaire comprised items that surveyed the respondents' backgrounds and measured the respondents' perceived level of importance of each good teaching practice as well as their performance of the behaviors. All of the items were answered according to a 7-point scale. In addition, we included items asking about class observation and teaching demonstration experiences during the teaching practicum. The reliability of the questionnaire was measured by Cronbach's α (.899). The specific composition of the questionnaire is shown in Table 2.

Table 2 Questionnaire composition

Category		Items
aGood teaching practice	1	Clearly delivering lesson contents
	2	Utilizing technology during class
	3	Introducing innovative methods and contents during class
	4	Performing regular evaluations
	5	Continuously implementing student activity-centered learning methods
	6	Thoroughly planning for classes and prepare teaching plans
	7	Keeping abreast with the course progress suggested by the curriculum
	8	Respecting and reflecting students' opinions
	9	Passionately interacting with students
	10	Understanding individual characteristics of students as well as the level at which each student stands
	11	Understanding students' sociocultural environment
	12	Providing detailed explanations of the syllabus and textbooks

Category		Items
	13	Providing challenges appropriate with the level of each student
	14	Managing time appropriately to facilitate the class to flow naturally
	15	Optimizing learning groups, classroom environment, and spatial arrangements for the class
	16	Delivering lesson contents in a consistent and an organized manner
	17	Delivering contents by using verbal expressions that are appropriate for the level of the students
	18	Encouraging students to actively participate in class
	19	Identifying students' misconceptions and addressing them during class
	20	Assessing whether the students have reached the class target
Experience variables		Class observation (Number of sessions)
		Teaching demonstration (hours)
General background		Gender, major, subject taught during field experience

We performed a paired sample t-test to verify whether pre-service teachers showed changes in the perceived level of importance of good teaching practices and the perceived level of the performance of these practices after completing the teaching practicum. In addition, we performed an ANOVA to verify whether there were differences in the changes of pre-service teachers' perceptions of good teaching in accordance with the number of sessions of class observations and teaching demonstrations. The collected data were analyzed using SPSS Statistics V21.0. The level of statistical significance was set to .05.

Ⅲ. Results

1. Changes of Pre-Service Teachers' Perceptions of Good Teaching Before and After the Teaching Practicum

Table 3 shows pre-service teachers' perceived relative importance of various good teaching practices and their perceived degree of compliance to such practices after the teaching practicum, as well as changes in perceptions of good teaching practices before and after the teaching practicum.

Table 3 Differences between the perceived importance and perceived level of performance

		before teaching practicum importance level		after teaching practicum performance level		difference
		M	SD	M	SD	t
1	Clearly delivering lesson contents	6.64	.60	6.42	.91	2.539*
2	Utilizing technology during class	4.52	1.28	4.76	1.49	-1.667
3	Introducing innovative methods and contents during class	4.32	1.31	4.45	1.53	-0.863
4	Performing regular evaluations	5.09	1.14	5.09	1.30	0
5	Continuously implementing student activity-centered learning methods	5.50	1.19	5.66	1.24	-1.295
6	Thoroughly planning for classes and prepare	6.29	.99	6.09	1.24	1.863

		before teaching practicum importance level		after teaching practicum performance level		difference
		M	SD	M	SD	t
	teaching plans					
7	Keeping abreast with the course progress suggested by the curriculum	4.85	1.27	5.26	1.30	-3.292*
8	Respecting and reflecting students' opinions	5.88	.92	5.84	1.09	0.432
9	Passionately interacting with students	6.51	.74	6.50	.82	0.166
10	Understanding individual characteristics of students as well as the level at which each student stands	6.22	.93	5.88	1.21	2.700*
11	Understanding students' sociocultural environment	6.19	.93	5.62	1.38	4.263*
12	Providing detailed explanations of the syllabus and textbooks	5.35	1.09	5.16	1.35	1.524
13	Providing challenges appropriate with the level of each student	6.02	.94	5.74	1.30	2.223*
14	Managing time appropriately to facilitate the class to flow naturally	6.27	.78	6.16	1.06	1.005
15	Optimizing learning groups, classroom environment, and spatial arrangements for the class	5.59	1.07	5.65	1.29	-0.493
16	Delivering lesson contents in a consistent and an organized manner	6.35	.84	6.22	.93	1.309
17	Delivering contents by using verbal expressions that are appropriate for the level of the students	6.36	.73	6.29	.88	0.736
18	Encouraging students to actively participate in class	6.33	.88	6.43	.86	-1.169
19	Identifying students' misconceptions and addressing them during class	5.93	1.04	5.65	1.33	2.348*
20	Assessing whether the students have reached the class target	6.28	.83	6.04	1.17	2.284*
	Total	5.82	.49	5.75	.69	1.265

The pre-service teachers perceived the practices of (1) clearly delivering lesson contents and (9) passionately interacting with students as important behaviors. On the other hand, they perceived the practice of (3) introducing innovative methods and contents during class as the least important, followed by (2) utilizing technology during class, and (7) keeping abreast with the course progress suggested by the curriculum.

After completing the teaching practicum, the pre-service teachers believed that (9) passionately interacting with students was most often practiced, followed by (18) encouraging students to actively participate in class, and (1) clearly delivering lesson contents. Furthermore, similar to the perceived level of importance, the pre-service teachers believed that (3) introducing innovative methods and contents during class and (2) utilizing technology during class were practiced the least.

In the analysis of changes in pre-service teachers' perceptions about the relative importance of good teaching practices and the level of practice of such behaviors after the teaching practicum, 13 items resulted in lower scores for perceived practice compared to importance (11, 10, 1, 19, 20, 13, 6, 12, 16, 14, 17, 8, 9, 4[1]), and six items had higher scores for practice (7, 2, 5, 18, 3, 15). In one item (4), there was no change in the perception of importance and practice.

[1] Listed in the order of difference

Items with significantly lower practice after the teaching practicum were: (11) understanding students' sociocultural environment, (10) understanding individual characteristics of students as well as the level at which each student stands, (1) clearly delivering lesson contents, (19) identifying students' misconceptions and addressing them during class, (20) assessing whether the students have reached the class target, and (13) providing challenges appropriate with the level of each student. On the other hand, (7) keeping abreast with the course progress suggested by the curriculum was found to have significantly higher practice than importance.

2. Differences in Changes of Perceptions of Good Teaching in Accordance with Class Observations

We analyzed the differences in changes of pre-service teachers' perceptions of good teaching before and after the teaching practicum in accordance with the number of class observation sessions they had completed. The results indicated that there were no significant differences in the changes of perceptions of good teaching depending on the number of class observation sessions.

3. Differences in Changes of Perceptions of Good Teaching in Accordance with Teaching Demonstrations

We analyzed the differences in changes of pre-service teachers' perceptions of good teaching before and after the teaching practicum in accordance with the number of teaching demonstration sessions. Table 4 shows the differences in changes of perceptions of specific items in accordance with the number of teaching demonstration sessions completed.

Table 4 Differences in changes of perceptions of good teaching in accordance with teaching demonstrations

			N	M	SD	F
2	Utilizing technology during class	less than 10	61	-0.69	1.679	3.84*
		10 - 20	55	0.02	1.354	
		20 - 30	13	-0.38	1.805	
		30 - 40	5	1.40	2.608	
		over 40	5	1.20	1.924	
5	Continuously implementing student activity-centered learning methods	less than 10	61	0.08	1.333	3.327*
		10 - 20	55	-0.55	1.537	
		20 - 30	13	-0.62	1.502	
		30 - 40	5	1.20	1.304	
		over 40	5	0.80	2.049	
16	Delivering lesson contents in a consistent and an organized manner	less than 10	61	0.04	1.192	2.931*
		10 - 20	55	0.09	1.093	
		20 - 30	13	0.54	0.877	
		30 - 40	5	1.40	1.342	
		over 40	5	-0.80	1.304	
17	Delivering contents by using verbal expressions that are appropriate for the level of the students	less than 10	61	0.05	1.117	2.523*
		10 - 20	55	0.04	0.883	
		20 - 30	13	-0.27	1.013	
		30 - 40	5	1.40	1.342	
		over 40	5	0.00	0.707	
18	Encouraging students to actively participate in class	less than 10	61	0.08	1.102	2.683*
		10 - 20	55	-0.29	0.916	
		20 - 30	13	-0.69	1.251	
		30 - 40	5	0.40	1.673	
		over 40	5	0.60	0.894	
19	Identifying students' misconceptions and addressing	less than 10	61	0.47	1.492	3.424*
		10 - 20	55	0.16	1.302	

		N	M	SD	F
them during class	20 - 30	13	-0.54	1.198	
	30 - 40	5	1.80	1.304	
	over 40	5	-0.40	0.548	

The results showed significant differences in changes of perceptions about the following items in accordance with the number of teaching demonstration sessions completed: (2) utilizing technology during class (5) continuously implementing student activity-centered learning methods, (16) delivering lesson contents in a consistent and organized manner, (17) delivering contents by using verbal expressions that are appropriate for the level of the students, (18) encouraging students to actively participate in the class, and (19) identifying students' misconceptions and addressing them during class.

Ⅳ. Discussion and Conclusion

The purpose of this study was to analyze pre-service teachers' perceptions about good teaching and examine whether there were differences in the changes of perceptions in accordance with teaching practicum experience. To this end, we investigated the perceived relative importance of good teaching practices and the perceived degree of practice of the same behaviors after the pre-service teachers completed the teaching practicum. We also analyzed the differences in perception of good teaching before and after the teaching practicum to examine its impact, and analyzed the differences in the changes of perception depending on class observation and teaching demonstration experience.

The analysis of the perceived relative importance of good teaching behaviors and the perceived degree of practice of such behaviors showed that perceived importance was generally consistent with perceived practice after completion of the teaching practicum. Pre-service teachers generally believed effective delivery of lesson contents and passionate interaction with students to be important behaviors to be practiced often, while they believed the introduction of new methods or contents and the utilization of technology to be less important. Such findings indicate that pre-service teachers' perceptions of good teaching are generally uninfluenced by their teaching practicum experiences, which is in line with previous findings suggesting that it is difficult to change pre-established perceptions of good teaching practices.

The analysis of changes of perceptions of good teaching practices after completing the teaching practicum showed that pre-service teachers believed that understanding students' sociocultural background was the most challenging practice after completing the teaching practicum. Furthermore, they also believed that accurately assessing individual student academic levels and progress and providing tailored measures, as well as clearly delivering lesson contents to be difficult practices. On the other hand, after completing the teaching practicum, pre-service teachers believed that keeping up with the course progress suggested by the curriculum was relatively easy. In particular and despite the fact that clear delivery of lesson contents was perceived to be highly important and practiced often, the difference between the perceived importance and perceived level of performance was significantly lower after the teaching practicum.

In terms of changes of perception of good teaching in accordance with class observations during the teaching practicum, pre-service teachers showed no changes of perception depending on their class observation experience. This implies that class observation does not provide authentic teaching experience, and calls for a reconsideration of the usefulness of class observations and modifications to the operation of teaching practicum programs.

Meanwhile, the pre-service teachers showed changes in their perceptions of some good teaching practices (i.e., utilization of technology, utilization of student-centered learning, consistent and organized delivery of lesson contents, delivery of lesson contents using verbal expressions consistent with the level of the students, encouragement of active participation from students, and addressing of students' misconceptions) depending on the number of teaching demonstration sessions they had completed. Overall, the pre-service teachers perceived the practice of these behaviors to be relatively high within a certain number of teaching demonstration sessions; they perceived them to be difficult to practice as they engaged in more teaching sessions. This result suggests that the number of teaching demonstration sessions significantly changes pre-service teachers' perceptions, accentuating the need for and importance of performing teaching demonstrations during the teaching practicum. Furthermore, the fact that perceptions changed only after a certain number of teaching demonstration sessions points to the need of establishing a recommended number of teaching demonstrations for pre-service teachers during the practicum.

In conclusion, we believe the findings of this study provide meaningful implications for developing specific support plans for pre-service teachers during teacher education programs and for making improvements to current teaching practicum programs.

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A Creative Way to Build Confidence and Preparedness for Face-to-Face Interviews: An Online Interview Simulation

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Index Descriptors: Confidence and Preparedness, Online Interview Simulation

Abstract

An online interview simulation program was used in Interpersonal Communication courses to compare confidence and preparedness in job interview skills between an experimental group of 20 students, participating in four online interview simulations throughout the semester, and a control group of 27 students that had no access to the online interview simulation. Based on survey results from the 47 participants, the online simulation program did not affect confidence and preparedness in real-life interview situations. This article outlines the framework, limitations and outcomes of the study, and examines future areas of research with games and simulations relating to development of soft skills for job interviews.

Introduction

Research indicates graduates need to have confidence and be prepared in the areas of soft skills to gain employment and maintain career success (Crawford, Lang, Fink, Dalton, & Fielitz, 2011; Giallo & Little, 2003; Robles, 2012). Research also suggests that games and simulations are a viable method of training soft skills (Davis, Murphy, Owens, Khazanchi, & Zigars, 2009; deFreitas & Routledge, 2013; Nealy, 2005). For example, games and simulations encourage experiential learning for participants to experience the interview process and gain knowledge of the framework for responding and asking questions while improving preparedness and gaining confidence that is transferred to real-life interviews (Maurer & Solamon, 2006). For the purposes of this research, confidence refers to the belief that one has the ability to perform successfully in order to produce an expected outcome (Bandura, 1986) and preparedness is being ready to take action when a situation or an event occurs (Jackson, 2008). Additionally, games and simulations refer to environments that model a system where students observe outcomes and repercussions based on decisions and actions (Gredler, 1996). Moreover, Jacobs and Dempsey (1993) note that the distinction between games and simulations is ambiguous; hence, for this research, the term games and simulations refer to a single activity. This study examines the use of an online interview simulation, Perfect Interview™ Interview Coach (Perfect Interview, 2011), as a viable teaching tool for soft skills necessary for interviewing; more specifically research focused on individual confidence and preparedness of interview skills exhibited during the interview process.

Theoretical Framework

Employers are acutely aware of the need for soft skills training; however, individuals may not perceive the consequences due to a lack of soft skills during the interview process. Due to this increasing concern there is a necessity for change and games and simulations can provide an online awareness that allows the inclusion of modern and advanced technologies in education to be instructor friendly and effectual for student success with minor repercussions. Games and simulations in soft skills and interview skills training meet different aspects from three theoretical frameworks: Rogers' (1962) Diffusion of Innovation Theory, Concerns-Based Adoption Model (CBAM), and Havelock and Zlotolow's (1995) C-R-E-A-T-E-R model.

Rogers' Diffusion of Innovation Theory states that the change must have relative advantage by outperforming the current method, promote compatibility, limit complexity for adaptation, and the change must be trialable and observable. Games and simulations follow Rogers' theory because they deliver an engaging and enthusiastic learning environment while providing users an environment to repeatedly exercise interview skills,

develop proper verbal and non-verbal communication while enhancing confidence for a real-life interview in a fail-safe environment that delivers feedback for improvement. Games and simulations are compatible with current teaching methods and can be adapted to learning needs, as well as trialable in determining processes and branching methods for success in an observable environment.

CBAM outlines the following stages of concern for change: awareness, informational, personal, management, consequence, collaboration, and refocus (Ellsworth, 2000). Games and simulations provide an online awareness that allows the inclusion of new technology for education to be manageable for instructors and effective for students with little to no consequences. In addition, the online simulation allows for collaboration and provides a corner stone to assimilate other activities into soft skills development following the outline of CBAM.

Facilitating change based on the C-R-E-A-T-E-R model for adopting and implementing games and simulations for soft skills training supports the following seven areas: care, relate, examine, acquire, try, extend, and renew. The C-R-E-A-T-E-R model supports online interview simulations for providing soft skills training as users have opportunities to execute the interview sessions repeatedly and receive feedback in an engaging, safeguarded setting. The use of games and simulations allows for an expansion of customary training and could lead to increased acknowledgement and adoption of technology in soft skills training and academic curriculum as a continuous, self-renewing process that provides students with the skills needed to be prepared and confident during the face-to-face interview experience. This model fortifies the need for soft skills training and conveys corroboration that soft skills training via games and simulations can be successful and integrated into academia. Furthermore, the model provides support to change agents and stakeholders and supports the necessity for increased soft skills training for graduate employment opportunities.

Methodology

A job interview skills self-assessment survey was designed by combining elements of two instruments that were used in similar research (Lin, 2008; Smith et al., 2014). The survey was altered based on suggestions from a focus group of subject matter experts and focus group created from the target population. The Job Interview Skills Self-Assessment Survey comprised of eight demographic questions, nine statements related to confidence, and nine statements related to preparedness relevant to interviews (Appendix A).

In the Fall semester of 2015, ten face-to-face Interpersonal Communications courses of a south-central Kentucky community college were randomly selected as either one of the eight experimental groups or one of the two control groups. Students enrolled in the experimental groups during the Fall 2015 semester participated in four Perfect Interview™ Interview Coach online simulations during the semester. Perfect Interview is designed for users to practice interview skills through multiple attempts with random interviews generated from a database; therefore, the participant responded to a variety of questions and completed four practice sessions, rather than a single use instance, to validate the effect of the simulation on preparedness and confidence. Upon completion of all four interview simulations, students received the Job Interview Skills Self-Assessment Instrument. Students enrolled in the control group during the Fall 2015 semester, with no access to the Perfect Interview™ Interview Coach simulation, received the Job Interview Skills Self-Assessment Instrument during the same time period as the experimental group. Survey participants consisted of a convenience sample of 47 students from a potential 120 participants from the ten Interpersonal Communications courses. The experimental group consisted of 20 students and the control group consisted of 27 students.

A *t*-test analysis was conducted with the mean response of each of the individual eighteen statements from the Job Interview Skills Self-Assessment Survey. The mean responses from each of the individual eighteen survey statements in the experimental group were compared to the mean response of each of the individual eighteen survey statements from the control group. Data from each of the eighteen statements on the survey instrument indicated that the online simulation did not have an effect on the level of either confidence or preparedness given that none of the *t*-tests were significant at $p < .05$ (Appendix B). In other words, there was no significant difference between the levels of confidence and preparedness between the experimental and control groups at the $\alpha = 0.05$ level.

Conclusions

Although the researchers tried to reduce the limits of the study, there were substantial limitations. For example, methodology limitations identified included the use of convenience sampling, small sample size, and researcher bias. However, there were limitations based on the sample population as well. For example, participants may have lacked interest, understanding, or resources to complete online simulation. Similarly, participants may have had problems interpreting and comprehending the survey statements. Also, participants' self-reported

responses may be over- or under-inflated in regards to their perceived levels of confidence and preparedness. Additionally, the simulation environment may have an affect toward perception because simulations are less stressful than face-to-face interviews. Lastly, because the courses had multiple instructors, the course instructor influence and promotion of participation and providing online simulation instructions could have reduced or influenced participation. Consequently, the researchers suggested that future research include: an increased potential pool of participants, complete implementation of the online simulation into course curriculum, confirmation that all participants have access to and complete the online simulation, a follow up to the online survey with a face-to-face mock interview to assess differences in confidence and preparedness, qualitative statements added to the survey to provide a broader scope of participant feedback, and an analysis of individual demographic areas related to confidence and preparedness.

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Appendix A

Job Interview Skills Self-Assessment Instrument

Please choose only one answer for each category below. Do Not include any identifying elements such as name, social security number, or student identification number. This survey is anonymous.

1. What is your academic level?
- ☐ Freshman (0 to 29 credit hours)
- ☐ Sophomore (30 or more credit hours)

2. What is your enrollment status?
- ☐ Full-time (12 hours or more this semester)
- ☐ Part-time (11 hours or less this semester)

3. What is your age?
- ☐ 24 years or younger
- ☐ 25 years or older

4. What is your gender?
- ☐ Male
- ☐ Female
- ☐ Prefer not to answer

5. What is your marital status?
- ☐ Married
- ☐ Single
- ☐ Divorced
- ☐ Widowed
- ☐ Prefer not to answer

6. What is your ethnic group?
- ☐ American Indian or Alaskan Native
- ☐ Asian or Pacific Islander
- ☐ Black, Non-Hispanic
- ☐ Hispanic
- ☐ White, Non-Hispanic
- ☐ Unknown
- ☐ Non-resident Alien
- ☐ Prefer not to answer

7. What is your work status?
- ☐ Unemployed
- ☐ Work 20 or fewer hours per week
- ☐ Work 21-30 hours per week
- ☐ Work 31-40 hours per week
- ☐ Work 41 or more hours per week

8. What is your household size?
- ☐ (myself)
- ☐ 2
- ☐ 3
- ☐ 4 or more

On a scale of 1 (strongly disagree) to 5 (strongly agree), please indicate in each of the nine items below how **CONFIDENT** you are that you have the ability to perform the item successfully. Confidence is the positive belief in your own abilities and qualities.

	1 Strongly Disagree	2 Disagree	3 Neither Agree nor Disagree	4 Agree	5 Strongly Agree
1. I would feel confident going on a job interview.					
2. I would feel confident making a good first impression.					
3. I would feel confident demonstrating verbal communication skills.					
4. I would feel confident demonstrating non-verbal communication skills (eye contact, facial expressions, body language).					
5. I would feel confident promoting my skills and abilities.					
6. I would feel confident understanding the job requirements and work environment.					
7. I would feel confident asking relevant questions related to the job and organization.					
8. I would feel confident maintaining a professional relationship throughout the interview.					
9. I am confident concluding the interview in a positive way.					

On a scale of 1 (strongly disagree) to 5 (strongly agree), please indicate in each of the nine items below how **PREPARED** you are that you are ready to perform each item. Preparedness is being ready for a situation.

	1 Strongly Disagree	2 Disagree	3 Neither Agree nor Disagree	4 Agree	5 Strongly Agree
1. I am prepared to go on a job interview.					
2. I am prepared to make a good first impression.					
3. I am prepared to demonstrate verbal communication skills.					
4. I am prepared to demonstrate non- verbal communication skills (eye contact, facial expressions, body language).					
5. I am prepared to promote my skills and abilities.					
6. I am prepared by understanding the job requirements and work environment.					
7. I am prepared to ask relevant questions related to the job and organization.					
8. I am prepared to maintain a professional relationship throughout the interview.					
9. I am prepared to conclude the interview in a positive way.					

Appendix B

Table 1 t-test Results for Confidence and Preparedness Statements

Variable	Control Mean	Experimental Mean	t Stat (45)	P(T<=t) two-tail
Confidence Statement 1	4.00	3.85	0.41	0.68
Confidence Statement 2	4.07	4.35	-0.85	0.40
Confidence Statement 3	3.85	3.80	0.15	0.88
Confidence Statement 4	3.93	4.00	-0.21	0.83
Confidence Statement 5	4.15	3.95	0.56	0.58
Confidence Statement 6	4.19	4.30	-0.38	0.71
Confidence Statement 7	4.19	4.05	0.45	0.66
Confidence Statement 8	4.33	4.50	0.59	-0.54
Confidence Statement 9	4.22	4.35	0.69	-0.40
Preparedness Statement 1	4.07	3.65	1.33	0.19
Preparedness Statement 2	4.22	4.20	0.08	0.94
Preparedness Statement 3	4.07	3.85	0.80	0.43
Preparedness Statement 4	4.11	4.20	-0.31	0.76
Preparedness Statement 5	4.22	4.20	0.08	0.94
Preparedness Statement 6	4.37	4.30	0.31	0.76
Preparedness Statement 7	4.33	4.00	1.26	0.21
Preparedness Statement 8	4.56	4.40	0.70	0.49
Preparedness Statement 9	4.44	4.45	-0.02	0.98

*n = 27. $p < .05$.

Designing The Class as a Game to Promote Active Learning in K-12 Education: A Literature Review

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Abstract

The educational system in the U.S. needs a "paradigm change" (Reigeluth & Karnopp, 2013) or an "educational sea change" (Shute, 2007). Schools should prepare students for the information age society in which we are living (Reigeluth & Karnopp, 2013; Shute, 2007). There are many lessons we, as educators and instructional designers, can learn from games (Gee, 2003) to enhance or even reinvent our classes and ultimately our schools. Designing the class as a game can promote active learning in K-12 education and lead to improvement in students learning. The aim of this review paper is to a) identify the game elements that can be used in classrooms to motivate, engage, and challenge students and maintain their interest, b) discuss the research studies that have been done in this area, and c) provide future research suggestions at the end. The literature suggests that there are tangible improvements in students' attendance rate, grades, systems thinking, and some insignificant improvements in students' teamwork and time management in classes or schools that used gameful learning.

Key words: Gameful learning, active learning, K-12, game-like learning.

"Children learn as they play. Most importantly, in play children learn how to learn." – O. Fred Donaldson

Forty-seven percent of students in the United States reported that boring classes were a major reason for dropping out of school, 81% said that school was not relevant to their lives, 69% indicated that they were not motivated to work hard, and 35% said that "failing in school" was a key factor for dropping out (Bridgeland, DiIulio, & Morison, 2006). Additionally, other reports like *Nation at Risk* (Gardner, Larsen, Baker, & Campbell, 1983) have criticized the performance of the schools in the United States. These alarms about the educational system in the U.S. suggest the need for a "paradigm change" (Reigeluth & Karnopp, 2013) or "educational sea change" (Shute, 2007). In other words, the educational system needs adjustment.

Today's complex and interconnected society requires students to acquire new types of competencies to be successful (Reigeluth & Karnopp, 2013; Shute, 2007). Schools in the 21st century should prepare students for living in this complex world, equip them with 21st century skills (e.g., systems thinking, critical thinking, team work, and time management), provide learning for all of the students instead of ranking them with standardized tests (Jackson 2009; Reigeluth & Karnopp, 2013; Shute, 2007; Shute & Torres, 2012).

What do we need to reform education? According to the suggestions from *The Silent Epidemic* (Bridgeland et al., 2006), we should enhance teaching and curricula to make school more relevant and engaging, and strengthen the connections between work in real life and school (i.e., 81% of the students in this report said there should be more opportunities for real-world learning). This report also recommends improving instruction, and providing access to learning supports for struggling students so they can perform well.

Teachers often try to sustain motivation and engagement throughout the class so their students can learn as much as possible (Smith & Cardaciotto, 2012). In the traditional teaching approach (i.e., students passively listen to the teacher's lecture) sustaining engagement is difficult to achieve, however educational scholars are looking for new instructional methods to achieve that goal (Fishman, 2013). Designing game-like environments or designing the class as a game can be one solution to these problems.

The majority of people have played games and have likely experienced being fully engaged and motivated while playing those games. Forty-two percent of Americans play video games regularly, or at least three hours per week (Entertainment Software Association, 2015). Why are games so interesting, and what can we, as educators, learn from games to make learning more engaging and motivating? Well-designed games provide players with many ways to be successful by maximized choices, and minimized cost of failure (Gee, 2003). Well-designed games

also motivate and engage players via ever-increasing challenges, constant feedback, problem-solving, interaction, and rewards (Fishman, 2013).

Using games as learning tools both in and outside of classrooms is known as game-based learning (GBL; Gee, 2003; Prensky, 2001). Recently, the idea of using game elements in formal classes to make classes like a game has been receiving attention (Fishman, 2013; Sheldon, 2012; Shute, Ventura & Torres, 2012). While games can be used as a part of a game-like environment, the basis of this idea is to design the class or curricula as a game to entice students to get involved in class activities and practices. Generally, game-like environments support students learning through their mistakes, rewarding their meaningful actions, making students enjoy the class environment, and engaging students in problem solving—just like when they play a game (Sheldon, 2012). The educator's goal, in this type of environment, is to promote active learning to help students learn better while they have fun because enjoyable learning should be one aspect of schools in the 21st century (Reigeluth & Karnopp, 2013).

Definitions

Active Learning

Active learning is an umbrella term referring to "any actions in a learning environment that make students do things and think about what they are doing" (Bonwell & Eison, 1991, p. 5). Additionally, active learning is not just focused on developing students' knowledge, it is also about helping students develop their skills and abilities by providing opportunities "to talk, listen, read, write, and reflect as they approach course content" (Meyers & Jones, 1993, p. xi). Actually, there is no unique definition for active learning and it really depends on the subject matter area and group of learners (Kane, 2004).

Gamification

Gamification is also a broad, new term which refers to using video game elements or mechanics (e.g., levels, badges, and points) in non-game contexts to make the environment (e.g., face to face or online class) more interesting for the users or the learners (Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011). According to the literature, some researchers have tried to come up with new terms like "gameful design" (Fishman, 2013), "game-based pedagogy" (Shute & Torres, 2012), "multiplayer classroom" (Sheldon, 2012), and "game-based teaching" (Jackson, 2009). They did so to emphasize that what they tried to do was creating a full game experience for students including all of the game elements (Llagostera, 2012) rather than using some game elements (e.g., points, badges, etc.) which is commonly known as "gamification" (Fishman, 2013). However, some researchers still use the term "gamification" to describe a gameful environment like Quest to Learn (Lee & Hammer, 2011; Holman, Aguilar, & Fishman, 2013).

Goals and Focus

The aim of this review paper is to a) identify the game elements that can be used in classrooms to challenge students and maintain their interest, and b) discuss the research studies that have been done in this area. My focal question is if the design methods and principles that work to motivate and engage players in games can also motivate and engage learners in K-12 classrooms to help them learn better?

Method

Procedure

The focus of this paper is about designing an entire course as a game. We started with articles which were more related to the use of game elements in class and then we tried to find more articles about studies related to turning the class into a game-like environment.

We collected relevant articles from the following online databases:

- *ERIC,* a database that provides extensive access to educational-related literature.
- *Web of Science,* another well-known data base which Includes Science Citation Index, Social Science Citation Index, Arts & Humanities Citation Index, and the Conference Proceedings Citation Index in Science and Social Science.

- *Google Scholar,* which provides a simple way to broadly search for scholarly literature. Google Scholar helps to find relevant work across the world of scholarly research.

Inclusion Criteria

We accessed full-text, peer-reviewed papers and dissertations. The main keywords we used were *game mechanics, game-based pedagogy, gameful learning, game-like, game elements, active learning, in-class, game theory, engagement, motivation, and k-12*. These keywords were combined to find peer-reviewed articles written by leading authors in journals like *Computer and Education, International Journal of Game-Based Learning, Teaching Education,* and many others. The inclusion criteria consisted of relevance to the topic, related review papers, and experimental-design studies. After an initial screening, 100 related articles were collected, and after in-more-depth screening we kept 18 related articles to conduct this literature review.

Literature Review

"Do not keep children to their studies by compulsion but by play." – Plato

There are a lot of research on active learning, motivation, engagement, and even game-based learning available. When looking at these terms, we see an invisible connection between them and the topic of this literature review. However, there are few studies about designing an entire course as a game. We start this review with active learning, an important part of the topic of this review paper.

Active Learning

Several studies have shown advantages of active over passive learning approaches (e.g., Prince, 2004; Smith & Cardaciotto, 2012). Other articles have focused on how to create active learning environments with different methods like collaborative learning, problem-based learning, role-plays, debates, team work, pair discussion, and other activities (Auster & Wylie, 2006; Prince, 2004).

One interpretation of active learning provided by many educators was that all kinds of learning are by default active, and if students are coming to class, learning the materials, and getting grades just by sitting and listening to their teacher, then they are participating in an active learning environment (Bonwell & Eison, 1991). This way of thinking about active learning was criticized by Bonwell and Eison (1991) and they added that "students must do more than just listen: They must read, write, discuss, or be engaged in solving problems. Most important, to be actively involved, students must engage in such higher-order thinking tasks as analysis, synthesis, and evaluation" (p. 5). On the other hand, Kane (2004) argued that there is no solid definition or methodology for creating active learning environments and it actually depends on the subject areas and group of learners.

Shute (2007) and Jackson (2009) have argued that the traditional lecture-based and teacher-centered model should be revised, if not replaced, with alternative ways of teaching to put students in an active learning context which lead to more effective results for students (i.e., results related to acquiring knowledge and skills students need for their life). Learning environments should be interactive, gain and sustain attention, include formative feedback (e.g., Shute, 2008), and have different levels and appropriate challenges (Shute & Torres, 2012).

Why do games engage and motivate us? Elements of well-designed games

People tend to have great memories from playing their favorite games in childhood, and continue to play different and more complex games as they grow up. How can games motivate and engage us? To answer this question, we looked at many articles. There are some review papers and book chapters (e.g., Ke, 2008; Prensky, 2001; Shute & Ke, 2012) about games and game design trying to identify what are the elements of well-designed or good games.

Shute and Ke (2012) pointed out that good games should grab the attention of the players using different stimuli and retain that attention with challenges that are neither too difficult, nor too easy. If the game is too easy, the players would get bored, and if the game is too difficult, the player may become frustrated (Csikszentmihalyi, 1996). Shute and Ke (2012) also mentioned that the challenges in good games must be in line with players' skill levels (i.e., as players go through the game's different levels, the challenges become more difficult).

Prensky (2001) looked at games from a componential perspective and noted that games include key elements like rules, goals, interaction, outcomes and feedback, conflict, and story. These elements can facilitate immersion into the game. From the literature, we gleaned a pattern of key elements which appears across paper

discussing game elements. This pattern started as early as the 1970s and continued to the present. For example, Avedon (1971) defined ten elements of games (all games and not just digital ones) as: (1) purpose of the game, (2) procedure for action, (3) rules governing action, (4) number of required participants, (5) roles of participants (i.e., indicated functions and status), (6) results or pay-off, (7) abilities and skills required for action (three behavioral domains: cognitive, sensory-motor, and affective), (8) interaction patterns, (9) physical setting and environmental requirements, and (10) required equipment.

Lack of motivation was a main reason for students dropping out of school (Bridgeland et al., 2006). In the same report, 81% of students who drop out of school mentioned that school is not relevant to their lives. According to Keller and Suzuki (2004), the ARCS model (i.e., attention, relevance, confidence, and satisfaction) can predict whether or not learners are motivated and relevancy of the learning content, environment, and activities is an important part of the model (i.e., it what students are learning is not relevant they see it as boring). Therefore, it is not surprising to see students become demotivated in schools when what they do and learn in schools is not considered relevant to their lives.

According to Vockell (2004), we have intrinsic and extrinsic motivations. The traditional approach of teaching is more based on extrinsic motivation (e.g., grades and ranking in standardized tests), whereas the new approach of teaching in schools in the information age need to intrinsically motivate their students (Reigeluth & Karnopp, 2013; Sheldon, 2012). Vockell (2004) believes that it is a huge advantage if a student has intrinsic motivation to learn (i.e., he or she wants to learn because it is beneficial and even enjoyable). He pointed out the factors that promote intrinsic motivation in different contexts including educational contexts: challenge, curiosity, control, competition and cooperation, and recognition. Looking at these factors, it is clear that games, to a high degree, have these same factors.

There are a lot of lessons educators can learn from games, such as learning from mistakes (Gee, 2003; Gee, 2009; Jackson, 2009; Sheldon, 2012). That is, games provide an opportunity for players to experiment and fail repeatedly. In many games, players learn how to play the game by making mistakes many times and learning from each mistake through ongoing feedback (Gee, 2009; Shute & Ke, 2012). In other words, players can keep trying until they succeed, and this process has little cost or risk for them (Lee & Hammer, 2011). In contrast, students in schools with the traditional approaches have few opportunities for trying and failing and the cost associated with failing is high. A goal of schools in the 21st century should be helping students to see failure as learning moments (Lee & Hammer, 2011) rather than negative experiences. One reasonable question to ask is: Isn't school already like a game? Next, we will explore this question.

Isn't school already a game?

It is clear that there are some similarities between games and schools: both of them have clear goals, include certain challenges, need practice to succeed, and use assessment to judge performance (Holman et al., 2013). Additionally, students get points and grades for doing their homework and taking their exams, there is a reward and punishment system for desired and undesired behaviors, and students level-up if they do well in a school year (Lee & Hammer, 2011). Thus, ironically, school is in some ways like games (Jackson, 2009). Why do we need to turn classes into games then if they are already games or gamified?

To answer that question, we should pay attention to the student's dropout rates and their performance in school (Bridgeland et al., 2006). Schools tend to fail to engage students and many students do not describe their class activities as interesting or engaging (Lee & Hammer, 2011). Fried (2005) also thinks grades, schools' common reward system, "take the fun out of learning", (p. 24). Another reason that schools are not interesting for students can be the scarcity of students' choices. As Jackson (2009) indicates, the choice element in games (i.e., the choice of playing or not playing the game and also choices within the game like which level to start with) is possibly one of the differences between games and schools. Therefore, schools failing in engaging and motivating students tend to be poorly designed games that need to be redesigned. Next, we will discuss the major aspects of a class as a game.

Major aspects of a class as a game?

Like the various types of games that we know, a gameful class (Fishman, 2013) or a game-like environment (Sheldon, 2012) can take a variety of forms. According to the literature, current game-like environments are designed based on a major game type: *massively multiplayer online role-playing games* or MMORPGs (i.e., online games that many game players participate in them in real-time) (Sheldon, 2012). Games like *Everquest*, *Dark Age of Camelot*, and *World of Warcraft* are examples of MMORPGs. Choosing this type of game as a basis for designing classes as games is a natural choice because there are a number of students (players)

present in class (real-time environment) who can form a MMORPG (Sheldon, 2012). After reading about some game-like classes (Fishman, 2013; Jackson 2009; Sheldon, 2012) and game-like schools like Quest to Learn (Shute & Torres, 2012), several characteristics of these types of environments have been identified.

Specific goals: Having specific goal(s) is one of the most important elements of well-designed games (Shute & Ke, 2012). A game-like environment should have specific goals. Having clear goal(s) for a class is not a new aspect for game-like classes. As Sheldon (2012) points out, the educational goals in multiplayer or game-like classes do not change; however, the path to achieve those goals changes. To redesign his class as a game he modified the syllabus to use game-like terminology (e.g., battles instead of tests, experiment points instead of grades, etc.) which reframes the goal of the class from a standard syllabus to a multiplayer classroom syllabus.

Rules: When designing a game, it is necessary to stablish a set of rules. For example, if there is a competition throughout the class, it must have certain rules that everyone should obey (Sheldon, 2012). For example, some reported rules are: each person would be in level 1 in the first day of the class (the highest level is level 10), there should be at least 3 members for each group, the members of a groups would be selected by the teacher of the class, assignments should be 100% correct and you have multiple attempts, and so on. These rules and any other rules determine how the class is designed and students can clearly understand how things work in this new environment.

Avatars: Generally, an avatar is the online representation of a game player in a game or social network (Sheldon, 2012). In most of the game-like classes students had to choose their own avatars (i.e., a name of a hero they like with a picture representing the hero and the student). A group also could have an avatar associated with it. Here are some examples of avatars from different classes that were reported by Sheldon: *Princess Peach, Thunder Cannon, Zombie Apocalypse, Jake the Barbarian, and Earthshaker*. Avatars can provide a sense of ownership for students and indirectly enter them into the world of the class game on the first day of the class (Sheldon, 2012).

Game language: All of the examples of designing an entire class as a game have, in one way or another, come up with a game-like language using games terminologies. For example, Sheldon (2012) used the following terminologies in his class:

Table 1. Terminology Map of a multiplayer classroom syllabus

Normal Class	**Multiplayer class**
Student	Player
Teacher	Game Master
Student Name	Avatar Name
Team or group	Guild
Write	Craft
Take Quizzes/Exams	Defeat/Fight Monsters (Mobs)
Presentations	Quests
Individual Presentations	Solo Quests
Two or More Students Not in the Same Guild Presentations	Pick-up Group Quests
Section of the classroom	Zone

Note. From "The multiplayer classroom: designing coursework as a game," (Sheldon, 2012, p. 32).

Other terminologies have been used in different cases. For instance, in Quest to Learn students go through ten missions instead of saying ten weeks (Shute et al., 2012). Jackson (2009) also used three levels of assignments called *Proficient*, *Expert*, or *Guru* for easy to hard assignments. Called digital natives (Jackson, 2009) and the gamer generation (Sheldon, 2012), today's students can instantly make connections to the new language of games in classes and it may change the way they think about class right at the outset.

Flexibility and different choices: A key factor in the success of games in real life is flexibility (Sheldon, 2012). The Game Master (i.e., the teacher) should always be prepared for unexpected situations, and be able to make some adjustments when needed. "The best teachers think on their feet" (Sheldon, 2012, p. 22). For example, the teacher can rearrange the class environment in different ways to have two groups (guilds) competing against each other on the midterm exam (defeating monsters).

Multiple attempts and formative feedback: Students in game-like environments should be able to try and fail multiple times and learn from their mistakes (Fishman, 2013; Jackson, 2009; Sheldon, 2012). Game-like learning environments should provide formative feedback (Shute, 2008), which is an essential aspect of any successful learning environment. Many game-like classes in the literature included this important feature in their classes. Some of them (Sheldon, 2012), however, put some restrictions on the number of attempts or provide more points if the students completed their quests on their first attempt.

Randomness and uncertainty: Sheldon (2012) specifically used random dice roles to determine players next quest in class. Some of the students may not have any quests for the next class and some may have more than one quest. He reported that this feature of his class excited his students and they liked this excitement. Some other cases, reported in Sheldon's book, replicated his randomization method to bring the element of uncertainty to their classes.

Purposeful grouping: This factor has been taken very seriously in game-like environments (Fishman, 2013; Jackson, 2009; Sheldon, 2012). In short, the game master (teacher) should know all the students (players) and their skills and purposefully put them in different groups (guilds). If this kind of grouping takes place in the game-like environment, it can help to improve the performance of all of the students (Jackson, 2009; Sheldon, 2012). For example, in one case the game master put those who weren't interested enough in participating with students eager to be a part of discussions to leverage the motivation of those uninterested students (Sheldon, 2012).

Challenge: Game-like classes have challenge starting from easy-to-do to difficult (Gee, 2009; Jackson, 2009; Shute & Ke, 2012). These challenges should target students' Zone of Proximal Development (Vygotsky, 1978) to make learning challenging but still attainable (Jackson, 2009). For instance, through the leveling process (i.e., going from level 1 to level 10) in Sheldon's (2012) class, students would face appropriate challenges. In Jackson's (2009) class, students would fully complete each level before facing the next challenge. It is expected that students who are challenged to acquire the needed skills for each level as they go forwards are able to handle the challenges in higher levels.

Well-designed behavioral management system: Some terminologies used in game-like classes are about behavioral management (i.e., positive reinforcement, negative reinforcement, etc.). Sheldon (20012) used Experience Points (XP) instead of grades. For example, students in Sheldon's class could collect 1860 XPs to go from level 1 to Level 12. Robert Louis, a math teacher in Stevenson Middle School (Sheldon, 2012), also created an interesting behavioral management system. For example, if the students don't close their laptops they receive negative XP. He reported that as soon as -50 XP was introduced, no laptop was dropped from the tables.

It is important to keep in mind that these game-like environments can be designed differently for different contexts or for different learners. It is expected that some new factors emerge from each game-like class as more classes get redesigned. Examples of classes designed as a game will be discussed next.

Examples of designing the class as a game

There are two major examples to refer when it comes to designing classes as games: 1) Quest to Learn, a new school in New York City, designed to include a game-like instructional system that provides a dynamic, interdisciplinary curriculum, as well as immersive, challenge-based learning experiences (Lee & Hammer, 2011; Sheldon, 2009), and 2) Lee Sheldon's book called *The multiplayer classroom: Designing coursework as a game*. This book is about Sheldon's experience of turning his class into a game. Many teachers got inspired by reading this book and started to adapt this method to help their students learn more effectively (Fishman, 2013; Jackson, 2009; Sheldon, 2012). The lack research studies show that there is a need for doing some empirical research studies in this area. In the following paragraphs, we synthesized the commonalities and differences in these two sources.

There were eight case studies reported in Sheldon's book (2012). His own class, introduction to game design for undergraduate students, was about game design and development and he claimed that he could not find any subject matter to which this method can't be applied. These eight different cases (i.e., in history, math, biology, computer science, media, and education). Moreover, Quest to Learn is a school and has many classes and the entire school is based on game-based pedagogy (Shute & Torres, 2012). Additionally, Fishman's (2013) report, suggest that this method is not dependent on the discipline or topic of the class.

Eight case studies in Sheldon's book (2012) including his own class reported their findings after redesigning their classes as a game. All of the eight cases reported 100% attendance. The same results were seen in other reports and studies (Fishman, 2013; Jackson, 2009). Moreover, students' opinions about their game-like experience showed that they really enjoyed the new atmosphere (Sheldon, 2012) and they even requested that all of their classes be turned into games (Jackson, 2009). Most of the instructors in the case studies mentioned that they

really cared about their students' attendance rates and grades. However, the educators in Quest to Learn were interested in 21 first century skills.

Shute and Torres (2012) conducted an evaluation study to determine the goals of Q2L and then they attempted to evaluate Q2L's success in another study (Shute et al., 2013). There were three main school-level goals pertaining 21st century competencies: *Systems Thinking* (i.e., a way meaningfully construct knowledge from an analysis of the whole and its parts), *Teamwork* (i.e., students collaborate to meet common goals, support and learn from each other, and solve problems), and Time Management (i.e., planning, organizing, handling goals and priorities, and meeting deadlines). Shute and colleagues (2013) found that there was a significant improvement in students' systems thinking (for the first cohort from September 2009 to May 2011: t (34) = 3.72; $p < .001$ and for the second cohort from September 2009 to March 2010: t (21) = 4.20; $p < .001$). However, the team work and time management did not improve significantly.

Summary and Conclusion

The educational system in the U.S. needs a "paradigm change" (Reigeluth & Karnopp, 2013) or an "educational sea change" (Shute, 2007). Schools should prepare students for the information age society in which we are living (Reigeluth & Karnopp, 2013; Shute, 2007). There are many lessons we, as educators and instructional designers, can learn from games (Gee, 2003) to enhance or even reinvent our classes and ultimately our schools. However, designing classes as games (Fishman, 2013; Jackson, 2009; Sheldon, 2012) is not the only way to answer the need for education reform. The literature suggests that there are tangible improvements in students' attendance rate, grades, systems thinking, and some insignificant improvements in students' teamwork and time management. In Figure 1, we illustrated the concept of game-like classes which was derived from the literature. A game-like environment can integrate other methods of learning such as project-based learning, problem-based learning, collaborative learning, and so on to promote active learning and help students learn more effectively.

Figure 1. Game-like class with game elements.

The dearth of empirical research studies in this area provides an opportunity for educational researchers, game designers, teachers, and others to conduct rigorous research studies with to help expand our knowledge about the advantages and disadvantages of this new method of teaching and learning. Studies should look at learning processes, engagement, motivation, learning 21st century skills, and other important constructs rather than just students' attendance or final grades. Sheldon (2012) believes that in the near future researchers will obtain grants to

study the effectiveness of the multiplayer classroom. As we go forward in today's world we need new methods of teaching (e.g., game-like teaching methods) and learning that help our children solve the complex problems they face. It is likely that designing classes like a game can create a suitable environment for this purpose.

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Designing Health Professions Education to Engender Critical Thinking: A Review of the Literature

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Introduction

Over the past several decades, educational researchers have expended considerable effort studying the phenomenon of critical thinking, both to define it and determine how to engender its development in students (Dunne, 2015). Educators in the health professions (e.g., dentistry, nursing) are similarly interested in critical thinking, as it is a foundational component of clinical thinking, the cognitive process that effective clinical practice is based upon (Faucher, 2011). This widespread interest in critical thinking research arose simultaneously with the development of the Internet and online learning, serendipitously raising the academic question of how online instruction may be used to develop critical thinking ability (Chit Ming, 2014; Clegg et al., 2014; Cook & Triola, 2009; Forneris & Peden-McAlpine, 2007; Santiago, 2011; Wilgis & McConnell, 2008; Wyles, McLeod, & Goodfellow, 2013). Contrariwise, Postman (1999) suggested in his book *Building a Bridge to the 18th Century* that these coincidental phenomena are linked; that the rise of the Internet (with its effects on language and information perception) has in fact led to a population-wide deficiency in critical thinking, necessitating an interest in improving it (p. 56).

In order to think critically, one must first possess knowledge to think critically *about*.

Thus, in optometric education (as in the other health professions), students begin their studies by mastering a two-year basic science curriculum, which provides the foundational material—or *grammar*--for more sophisticated lessons of clinical experience (Postman, 1999, p. 163). This basic science curriculum is intensive, with course loads of more than 20 credit hours per semester, and includes courses in optics, the theory and practice of optometric clinical skills, vision science, biochemistry, gross and ocular anatomy and physiology, pharmacology, and neuroanatomy. These courses are focused primarily on the academic elements of the curriculum (i.e., knowledge acquisition, theories of clinical judgment, and general critical thinking) (Southern College of Optometry [SCO]; 2015). Patient-centric elements, such as assessment and evaluation of individual circumstances and values, can only be mastered with direct patient interaction in the clinic (Facione & Facione, 2008; Faucher, 2011; O'Neill & Dluhy, 1997).

It is an important goal in optometric education to develop critical thinking among future optometrists. The Association of Schools and Colleges of Optometry (ASCO) identifies critical thinking and its corollaries—lifelong learning and clinical thinking—as attributes every graduating optometrist should possess (2011). At SCO in Memphis, Tennessee, the administration and faculty have likewise identified these concepts as points of emphasis for its curriculum (SCO, 2009, 2013). Yet, the extensive semester load described above makes it challenging for the SCO faculty to find time for critical thinking instruction during the first two years of the program. To combat this, basic science course instructors attempt to integrate higher-order thinking into their lessons by weaving clinical discussions amid the course content, and developing examination items that require higher-order cognition. However, such elements constitute mere isolated experiences within a curriculum that, on the whole, does not support the development of long-term critical thinking ability (Taylor, 2015; Tiruneh, Verburgh, & Elen, 2014). Large class sizes (i.e., over 130 students in each course at SCO) also make both genuine classroom discussion and thoughtful evaluation difficult to implement and maintain.

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Statement of the Problem

There is a perception among optometric and health-professions educators that students' mastery of the basic science knowledge foundation often erodes significantly after their successful completion of foundational courses. Thus, students often enter the first clinical assignments of their third academic years ignorant of some important fundamentals. Worse is the perception that these students have difficulty not only recalling this grammar, but also expressing or applying what they know in a useful clinical manner. High-quality clinical ability requires high-quality critical thinking, but health professions students also tend to have trouble developing this important skill (Niu, Behar-Horenstein, & Garavan, 2013; Taylor, 2015; Walsh & Hardy, 1999). These difficulties could prevent students from drawing appropriate and important conclusions from their inevitable clinical mistakes, partially negating the full benefit of clinical experience.

Since critical thinking (based on knowledge mastery) is vital to clinical practice in optometry, it is important that optometry students master the foundational material while simultaneously practicing and developing their critical thinking skills and dispositions, both within and apart from clinical practice. This literature review will address the problem of teaching critical thinking in pre-clinical health professions' education, with an emphasis upon optometric education. Our survey of the literature was guided by the following questions:

1. To what extent is critical thinking emphasized among optometric education in the literature?
2. Why is critical thinking development important to the optometric clinician-in-training?
3. What andragogical techniques are being developed and used to teach critical thinking to these populations?
4. To what extent have such efforts been successful?
5. How is the literature deficient on this subject?

Our findings are summarized below, organized loosely according to these topics. Due to the relatively small nature of the optometric education community, we have included illustrative papers from health professions and medical education when applicable. We conclude the paper with recommendations for future research, based upon the deficiencies noted.

Literature review: critical thinking in optometric education

The vast majority (if not totality) of literature in the field of optometric education is published in the *Optometric Education* journal (which is available online at http://journal.opted.org/) or as discrete papers or posters at the American Academy of Optometry

autumn meeting (the proceedings of which are available online at http://www.aaopt.org/).

Therefore, in our review of the existing literature, these sources were predominantly referred to, though traditional methods, such as *Google Scholar* and the *Encore* catalog tool, were also used to locate supporting information. The following discussion is drawn from the yield.

Optometric Education has in its archives a reasonable number of articles that directly discuss critical thinking andragogy. Denial (2008a; 2008b), Elder and Paul (2008), Facione and Facione (2008), Galvin (2008), and Hoppe (2008) all contributed to a critical thinking theme edition in 2008, while Denial and Pitcher (2007), Faucher (2011), Santiago (2011), and Wyles, McLeod, and Goodfellow (2013) published other articles that studied critical thinking.

The scientific papers and posters presented at the American Academy of Optometry meeting are predominantly clinical in their emphases, though an active optometric education section exists. Since 1993, thirty papers or posters have been presented at the meetings that referenced critical thinking in their text. Four of these were specifically about the study of critical or clinical thinking (Denial, 2007; Denial & Pitcher, 2005; Elam, 2001; Damari, Heard, & Jones, 2008).

Importance of critical thought in optometric education

Critical thinking has been extensively examined in educational literature over the past several decades. It has been defined as "purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological and contextual considerations upon which judgment is based" (Facione, 1990, p. 2). In his review of theories and controversies in critical thinking, Dunne (2015) documents this phenomenon in governmental policy and higher education,

summarily stating that "…critical thinking has been heralded for quite some time as being one of the most desirable outcomes of higher education" (p. 86), both for its practical occupational utility as well as its potential for driving lifelong learning. Since both of these outcomes are important in optometric practice, it is perhaps no surprise that optometric education has also resoundingly discussed and embraced the necessity of teaching and practicing critical thought (ACOE, 2011; Elder & Paul, 2008; Galvin, 2008; Hoppe, 2008).

There is considerable research available concerning the nature of critical thinking itself, for it is a broad category that houses many different mental actions. Among these are the *critical thinking skills* needed for high-quality thought: asking questions, defining terms, analyzing information, identifying assumptions, reasoning verbally, inferring from inductive and deductive reasoning, evaluating, seeing both sides of an issue, and decision making (Lai, 2011); and the *disposition* to think critically, or, as Facione (2000) puts it: "consistent internal motivations to act toward or respond to persons, events, or circumstances in habitual, yet potentially malleable ways" (p. 64). Critical thinking dispositions are naturally more developed among participants in less practical fields of study--like arts and humanities--than in practical professions (Walsh & Hardy, 1999), although an active critical thinking disposition has been linked to occupational satisfaction in nursing (Kim, Moon, Kim, Kim, & Less, 2014). In optometric education, it has been shown that critical thinking is correlated to clinical ability, though neither critical thinking skills nor dispositions improve from clinical experience or service-learning participation (Denial, 2007, 2008a, 2008b; Denial & Pitcher, 2005, 2007; Elam, 2001; Kim et al., 2014; Nokes, Nickitas, Keida, & Neville; 2005). Academically, Williams, Schmidt, Tilliss, Wilkins, and Glassnapp (2006) and Denial and Pitcher (2007) determined that critical thinking skills and dispositions were strongly predictive for performance on dental and optometric national board examinations, respectively.

Table 1

Example of Clinical Thinking in Clinical Practice

History/Findings	Clinical Thinking	
A 20 year-old man presents with pain and redness left eye; he is wearing sunglasses indoors	Clinical reasoning: ● Mental representation of the clinical case by hypothesis generation	Pain, hyperemia, sensitivity to light Anterior uveitis? Corneal erosion? Contact lens related complication? Corneal ulcer? Other ocular health problem?
	Decision-making	Additional questions to ask Procedures to do: visual acuity, pupils and slit lamp examination (carefully examine cornea and look for cells and flare in anterior chamber)
	Clinical reasoning: ● Expectations	Visual acuity probably reduced; left pupil may be smaller; limbal injection, possible corneal involvement; cells and flare may be present

	Critical thinking	Do I consider all the possibilities given the available information? What if expectations are not confirmed by clinical data?

Note. Adapted from "Differentiating the Elements of Critical Thinking," by C. Faucher, 2011, *J Optometric Ed, 36*(3), p. 143. Retrieved from http://journal.opted.org/articles/Volume_36_Number_3_CriticalThinking.pdf Copyright 2011 by the Association of Schools and Colleges of Optometry.

Though critical thinking is widely studied and discussed in the medical and health professions' fields, *clinical thinking* is perhaps more important. Clinical thinking is a complex process that begins with recall and understanding of both a foundational body of knowledge and each individual patient's clinical presentation. The astute clinician aptly exploits this fundament to both arrive at an accurate diagnosis and decide upon the most effective treatment to pursue, a process called *clinical reasoning*. Finally, this clinical reasoning is subjected to self-review via critical thinking (Faucher, 2011). Examples of these concepts in a clinical setting are found in Table 1.

The optometrist, though a physician, is not trained as a medical doctor and, as such, is limited in practice to diagnosing and treating refractive error, functional disorders of the visual system, and diseases of the eye and surround. Systemic diseases are not treated by optometrists, but may be identified during the course of a routine optometric examination. A timely referral in such a situation could potentially prevent mortality or morbidity. Thus, optometry students must be able to critically evaluate their patients' clinical presentations in the context of the existing knowledge base--the grammar of gross anatomy, histology, neurophysiology, biochemistry, optics, pathophysiology, and pharmacology--to appropriately assess their patients' health and treat accordingly (Moore & Chalk, 2009). Additionally, optometry students should have the ability to discern which innovative treatments and concepts are efficacious for the treatment of their patients and which are merely novel. Critical thinking will enable them to do this, thus avoiding the use of time and resources tilting at mere windmills.

Techniques for teaching critical thought in optometric education

There are many studies and reviews published in the health professions and optometric literature reporting critical thinking improvements from novel instructional techniques (Chit Ming, 2014; Cook & Triola, 2009; Santiago, 2011; Seif, Brown, & Annan-Coultas, 2013; Wilgis & McConnell, 2008) or overarching course- or curricular-wide redesign (Damari et al., 2008; Good, Earley, & Nichols, 2011; Nehmad & Appel, 2011; Wyles et al., 2013).

Seif, Brown, and Annan-Coultas (2013) created a module on clinical reasoning for physical therapy students, which they hosted on their university's *Moodle* LMS. The module contained video footage of a mock examination, related thought questions, and Internet searches for related resources. At the end of the module, students used what they had learned to create an appropriate exercise plan. Analyses of clinical reflection and clinical reasoning showed significant improvements in 17 of the 26 subcategories of clinical reflection and reasoning, implying that intentionally-designed lessons can have a positive effect on clinical thought. Damari, Heard, and Jones (2008) at SCO developed a course, *Integrative Clinical Analysis*, for their second-year optometry students, to prepare them for the newly-redesigned board examinations, which emphasized clinical thinking. The course was designed around weekly facilitated small-group case-based discussions, development of literature-based diagnosis and management plans, and learning portfolios. The authors reported a general improvement in clinical thinking across the course of the semester. Nehmad and Appel (2011) developed an extended case-based effort at the State University of New York College of Optometry. This *Integrative Track* expanded the ideas of Damari et al. (2008) from a single course to several, placed across the first three years of the optometric curriculum. As of this writing, results have not been published.

Good, Early, and Nichols (2011) at The Ohio State University College of Optometry described a seven-day case-based *Keystone* course, to make first- and second-year optometry students more aware of the clinical thought processes involved in patient care. In it, students completed an introductory training session, followed by facilitated small group work to critically dissect, analyze, and manage routine clinical cases. Upon receiving a case, student teams followed problem-based learning methods in their group work, developing lists of case

information points that demanded more research, summaries of existing pathology, and management plans. The students performed research outside of group time. Qualitative results gleaned from both faculty and students were overwhelmingly positive.

The division of a large class of optometry students into small, facilitated discussion groups is considerably labor intensive for the faculty who must design, grade, and facilitate discussion (Good et al., 2011). Wyles et al. (2013) of the Illinois College of Optometry attempted to mitigate this concern with a hybrid course design called *Primary Care Conference*, in which problem-based clinically-oriented learning could be held in a large class setting. At specific times throughout the third year of study, optometry students are presented with clinical cases in class. They are allotted a period of class time to evaluate the cases and answer critical- thinking questions, using whatever non-electronic references they wish to bring with them. Upon completion of the work period, work is collected for grading, and a classroom discussion is led over the material by the faculty case author. Qualitative evaluation of students indicates the conferences are considered to be useful for development of critical thought and preparation for the licensing examinations.

In their literature reviews, Chit Ming (2014) and Santiago (2008), demonstrated that visual mapping of concepts, arguments, general knowledge, and processes has been found to improve critical thinking and decision-making in a clinical context. Outside of optometric education, Wilgis and McConnell (2008) identified improvements in a pre-/post-test after using concept mapping to propagate better understanding of nursing students' thought processes in clinical scenarios. Concept maps were used to identify patients' health problems and ideal treatments. The small sample size and use of a convenience sample, however, cast some doubt on the results.

Cook and Triola (2009) describe the effects of virtual patients in clinical education, specifically their facilitation of clinical reasoning. Since this element of clinical thought is developed naturally through multiple patient interactions, the use of well-designed virtual patients can help students improve without the use of live patients.

Deficiencies in the existing literature and possibilities for future research

Though the clinical utility of critical thinking has been demonstrated, the body of literature concerning its andragogy is suspect. Many studies and reviews report critical thinking improvements with redesign of course elements (Clegg et al., 2014; Chit Ming, 2014; Cook & Triola, 2009; Good et al., 2011; Lee et al., 2016; Yuan, Williams, & Fan., 2008), but results from these studies are often varied and not repeatable, and therefore do not clearly define an andragogical method. The variations can be explained by differences in research design, implementation of instructional interventions, durations of study, assessment measures used, and sample sizes (Behar-Horenstein & Niu, 2011; Facione, 1990; Niu et al., 2013; Yuan et al., 2008).

The literature on effective critical thinking andragogy could therefore be improved by (1) performing well-designed research with randomized selections into large treatment and control groups (or robust statistical design when randomization is not possible), (2) use of standardized assessment instruments for quantitative measures, and an (3) intervention duration of at least twelve weeks that (4) contains explicit instruction in critical thinking skills (Behar-Horenstein & Niu, 2011; Facione, 1990; Lee et al., 2016; Niu et al., 2013; Lai, 2011; Tiruneh et al., 2014; Yuan et al., 2008). Such research would benefit the optometric profession specifically by training optometrists to better diagnose and treat conditions of the eye and visual system, and the education profession and discipline at large by helping determine how to teach critical thinking in higher education effectively and efficiently (Dunne, 2015). That Lee et al.'s (2016) recent meta-analysis of the entire health professions, dental, and medical literature found but eight examples of such robust study design reinforces the need for more high-quality work.

Conclusion

Though there is substantial research available in the optometric and health professions literature regarding teaching critical thinking, poor study design has led to questionable conclusions. Future studies should be designed to improve both the internal validity and generalizability of the results, so that andragogical methods for imparting critical thinking skills and dispositions to clinical students can be identified and implemented.

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Faculty Members' Best Practice Standards in the Design of Higher Education Online Courses

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Abstract

The purpose of this study was to discover if faculty members adopt best practice standards in the creation of higher education online courses. The results revealed that higher education faculty members do adopt best practice standards in the design of their online courses. In addition, the study determined that full-time versus part-time faculty status is the strongest predictor for the adoption of best practice standard for online course design. It was also indicated that full-time and part-time faculty have different motivational factors for adopting best practice standards for online course design. Lastly, the study indicated that institutions would benefit in providing different types of faculty development delivery methods in the design of quality online courses.

Introduction

The quality of online courses has an impact on retention and student satisfaction in higher education. Designing online courses using best practice standards is a critical role for faculty members in higher education. Therefore, many institutions are adopting best practices in the instructional design of online courses. However, little is known about whether faculty members in higher education are adopting best practice standards in designing their online courses. According to the 2013 Sloan report, online enrollment is growing with an increase of 572,000 students from fall 2010 to fall 2011. Additionally, 6.7 million students took at least one online course in fall 2011, as compared with 1.6 million students in fall 2002. This increase of 5.1 million students represents a compound annual growth rate of 17.3 percent. The Sloan report was based upon the responses from over 2,800 colleges and universities nationwide (Allen & Seaman, 2013). According to the Association of International Educators, in the year 2020, the demand for global higher education seats will double to 200 million from the year 2000 suggesting an increase in international education (Redden, 2009). This tremendous increase in online education for colleges and universities throughout the world, will affect the quality of online courses (Rovai & Downey, 2010).

The impact of quality online courses on retention and student satisfaction has become an important topic in higher education. Therefore, many institutions are adopting a variety of benchmarks and best practices that serve as important guidelines in the instructional design of quality online courses (Herman, 2012). Listed below are some of the organizations that promote benchmarks and best practices in designing online courses.

The Institute for Higher Education Policy released a report sponsored by the National Education Association and Blackboard, Inc. titled *Quality on the Line: Benchmarks for Success in Internet-based Distance Education* which included seven categories of best practice standards (Institute for Higher Education Policy [IHEP], 2000). The American Distance Education Consortium created ten categories of best practice standards and the American Federation of Teachers created *Distance Education: Guidelines for Good Practice*, which includes 14 best practice standards (American Distance Education Consortium [ADEC], 2002; American Federation of Teachers [AFT], 2000). Finally, a consortium of colleges in 2003 named Maryland Online designed a quality assurance rubric called Quality Matters, which included 43 best practice standards grouped into eight categories (Quality Matters [QM], 2014).

All of these organizations provide best practice standards that are important guidelines for many institutions in the instructional design of quality online courses. Table 1 provides an overview of the different best practice standards among the organizations mentioned above.

Table 1 Best practice standards of online education

The Institute for Higher Education Policy (IHEP, 2000)	• Institutional support • Course development • Teaching/learning process • Course structure • Student support • Faculty support • Evaluation and assessment
American Distance Education Consortium (ADEC, 2002)	• Fosters meaning-making, discourse • Moves from knowledge transmission to learner-controlled systems • Provides for reciprocal teaching • Is learner-centered • Encourages active participation, knowledge construction • Based on higher level thinking skills-analysis, synthesis, and evaluation • Promotes active learning • Allows group collaboration and cooperative learning • Provides multiple levels of interaction • Focuses on real-world, problem solving
American Federation of Teachers (AFT, 2000)	• Faculty must retain academic control • Faculty must be prepared to meet the special requirements of teaching at a distance • Course design should be shaped to the potentials of the medium • Students must fully understand course requirements and be prepared to succeed • Close personal interaction must be maintained
Quality Matters (2014)	• Course overview and introduction • Learning objectives • Assessment and measurement • Instructional materials • Learner activities and learner interaction • Course technology • Learner support • Accessibility and usability

Statement of the Problem

The increase in students choosing online education is becoming a persistent and quickly changing issue facing the faculty and administration of many colleges and universities. With this increase in growth, higher education is relying upon faculty to ensure the quality of instruction and learning for online education. Higher education institutions are facing the challenge of ensuring the quality of online instruction by promoting best practice standards of designing online learning courses (Herman, 2012). With the regard to best practice standards, the 2013 Sloan report emphasizes that faculty along with chief academic officers have concerns about the quality of online learning. The report also states "only 30.2 percent of chief academic officers believe that their faculty accepts the value and legitimacy of online education" (Allen & Seaman, 2013, p. 6).

Based on the literature (Baghdadi, 2011; Grandzol & Grandzol, 2006; Schulte, 2009; and Thiede, 2012), designing online courses using best practice standards is a critical role for faculty members in higher education. Institution administrators throughout the country have begun to accept and support best practice standards of designing online learning courses. For example, "with over 800 current subscribers, ranging from four-year colleges and universities, technical and community colleges to other academic organizations, (QM) is the leading provider of tools and

processes used to evaluate quality in course design" (Quality Matters, 2014). However, little is known about whether faculty members in higher education are adopting these best practice standards in designing their online courses. After reviewing the literature, the study found that there is little to say about whether higher education faculty members have adopted best practice standards in the design of their online courses. Therefore, the focus of this study sought to discover to what extent, if any, best practices have been adopted by faculty members in the creation of higher education online courses.

Purpose of Study

Based on the review of best practice standards in designing higher education courses (Achtemeier, Morris, & Finnegan, 2003; Chang & Smith, 2008; Conrad, 2002; Crow, 2008; Davidson-Shivers & Rasmussen, 2006; Johnson, 2004; Koroghlanian & Brinkerhoff, 2007; Lee, Dickerson, & Winslow, 2012; Malikowski, Thompson, & Theis, 20007; Morrison, Kalman, Kemp, 2011; Sheridan & Kelly, 2010; Sims, Dobbs, & Hand, 2002; Stavredes & Herder, 2014; Thurmond, Wambach, Connors, & Frey, 2002; Trigano & Pacurar-Giacomini, 2004), it is important to understand if faculty members indicate that they have adopted best practice standards when designing their online courses. It is also critical to understand which best practice standards faculty members are adopting when designing online courses. Finally, the purpose of this study was to understand how higher education faculty could enhance student learning in a web-based environment by adopting best practice standards.
This non-experimental, cross-sectional study sought to determine whether faculty members in higher education have adopted best practice standards in the design of their online courses. It also investigated the relationships between faculty members' demographic characteristics including faculty development and the adoption of best practice standards for online course design. Questions were answered via a self-report survey and responses were analyzed quantitatively.

Methodology

This non-experimental, cross-sectional study sought to determine whether faculty members in higher education have adopted best practice standards in the design of their online courses. It also investigated the relationships between faculty members' demographic characteristics including faculty development and the adoption of best practice standards for online course design. Questions were answered via a self-report survey and responses were analyzed quantitatively.

Research Questions

1. To what extent do faculty members indicate that they have used best practice standards when designing their online courses?

a. Is there a difference in adoption of best practice standards for online course design based on full-time faculty rank (tenure-track and lecturers)?

b. Is there a difference in adoption of best practice standards for online course design based on full-time or part-time faculty status?

2. Is there a relationship between adoption of best practice standards for online course design and years of online teaching?
3. Is there a relationship between adoption of best practice standards for online course design and portion of online teaching load?
4. What is the strongest predictor for adoption of best practice standards for online course design?
5. Is there any relationship between adoption of best practice standards for online course design and hours of faculty development for online course design?

The Development of the Instrument

The study conducted two different procedures to help validate the instrumentation. The procedure involved sending the pilot instrument to experts in the fields of online course design and online survey development to request feedback and comments, which helped establish the instrument's content validity. Suggestions from the experts were taken into consideration before conducting the main study. This study was conducted using an online instrument presented on SurveyMonkey software. An online instrument was used for data collection in this study because online instruments can be administered to a larger sample more economically, have greater convenience,

and are time efficient (Creswell, 1994). The instrument was a self-report questionnaire with two parts. The first part of the questionnaire contained 43 questions that measured online faculty members' use of best practices in designing online courses. The construct was based on the Quality Matters' (QM) rubric that is used to review best practice standards in designing online courses (Quality Matters, 2014). The QM rubric consists of 43 specific review standards grouped into the following eight general standards: course overview and introduction, learning objectives, assessment and measurement, instructional materials, learner activities and learner interaction, course technology, learner support, accessibility and usability. The response options for the 43 questions were presented on a Likert scale specifying the extent that faculty members strongly disagree, disagree, agree, or strongly agree that their online courses reflect best practice standards for online course design. The scale started at "0", with this number representing the participant "strongly disagreeing" to a question and ended at "3", with this number representing the participant "strongly agreeing". The second part of the questionnaire contained five questions that obtained responses on faculty demographic characteristics including full-time faculty rank, full- time or part-time faculty status, years of teaching online, portion of online teaching load, and faculty development for online course design.

Data Collection

Faculty members who teach online use Internet tools regularly to design course content are usually experienced with using the Internet. Therefore, a web-based survey was used for the collection of data from the faculty member participants. Participants were sent a personalized email inviting them to participate in the study via the Midwestern University's e-mail system. The email contained a consent letter informing faculty members of their rights as participants. If faculty members elected to participate, they clicked a link to SurveyMonkey that was available for them to complete the anonymous questionnaire.

Data Analysis

The statistical tests that were used include an independent samples *t*-test, Pearson correlation, and stepwise linear regression. Once the data were collected from SurveyMonkey, they were downloaded into IBM SPSS 21.0 statistical software to conduct independent samples *t*-tests, Pearson correlation tests, and a stepwise linear regression test.

Results

The instrument was placed on SurveyMonkey.com. An email invitation was sent to all faculty members who have taught at least one online course in the summer 2014, fall 2014, or spring 2015 semesters in the following colleges within a Midwestern University: Business and Innovation, Communication and the Arts, Education, Engineering, Health Sciences, Languages, Literature and Social Sciences, and Natural Sciences and Mathematics. Of the 410 faculty members who were sent an email invitation, ten messages were sent back due to bad email addresses. A total of 102 faculty members completed the survey within 14 business days. A response rate of (25.5%) was the result after three rounds of email reminders.

Discussions

In this study, a web-based survey was used to collect data from online faculty members from a Midwestern University that offers online courses. The survey was titled "Best Practice Standards for Online Course Design". The survey consisted of three sections: "Best Practice Standards Questions", "Faculty Development", and "Demographics". A total of 102 participants of the 400 online faculty members who were sent an email responded to the survey, resulting in a response rate of 25.5%. The specific findings for each research question are presented below based on the data analysis:

Research question 1: To what extent do faculty members indicate that they have used best practice standards when designing their online courses?

There were several noteworthy findings in the present study regarding faculty members' adoption of QM's best practice standards. The mean best practice standard overall score reported by faculty members was 250.49 on a scale from 0-306. Based on the findings, faculty members do indicate and strongly agree that they have used best practice standards when designing their online courses. The study created the scale from 0-306 based on 43 questions derived from the QM's rubric to ascertain whether faculty members indicate that they have used best practice

standards when designing their online courses. The QM's rubric is based upon instructional design principles using best practice standards in designing online courses that include:

1. Course overview and introduction.
2. Learning objectives
3. Assessment and measurement
4. Instructional materials
5. Learner activities and learner interaction
6. Course technology
7. Learner support
8. Accessibility and usability

Faculty members perceived that they have adopted each of the eight best practice standards when designing online courses based on the evaluated results of this study. Each of the eight QM best practice standards has a different range for evaluating the best practice score. Because the individual items, which comprise these QM best practice scores, are not considered equally important, QM assigns a point value to each item with a range of 1 to 3 (with a 3 indicating an item of most importance). To account for this QM point system, the participant's responses on the individual items with a range of 0 to 3 (with a 3 indicating an item of "strongly agree") were multiplied by the QM point value (1 to 3) for a potential score of 0 to 9 for each item in the QM rubric. These computed values were then summed across all of the items within a particular QM best practice standard.

The first category explored to what extent faculty members indicate that they provide a course overview and introduction for their online courses. The best practice standard mean score as computed from the Likert scale for course overview and introduction reported by faculty members was 51.90 on a scale from 0-60. Faculty members do indicate and strongly agree that providing a course overview and introduction for their online course is very important for students. Stavredes & Herder (2014) mention that providing an overview and introduction is crucial for students so that they become familiar with the course. The findings also indicate that faculty members do provide the following items in the course overview and introduction in the design of online courses:

1. General course overview
2. Detailed navigational instructions
3. A purpose of the course
4. Structure of the course
5. Etiquette expectations
6. Course policies
7. Prerequisite knowledge in the discipline
8. Minimum technical skills
9. Instructor self-introduction
10. Students' self-introduction
11.

The findings also suggest that faculty members provide students a navigational tool to help them explore the online course. Lastly, faculty members indicate the importance of providing expectations or course policies regarding academic integrity and rules regarding incomplete grades.

The second category explored to what extent faculty members indicate that they provide learning objectives for their online courses. The best practice standard mean score as computed from the Likert scale for learning objectives reported by faculty members was 36.41 on a scale from 0-45. Based on the analysis, faculty members do indicate and strongly agree that when designing an online course, it is best practice to include learning objectives for their online course. They strongly agree that providing learning objectives helps the faculty members select and organize instructional activities and assessments for effective learning. These learning objectives should be stated clearly and written from the student's perspective. Also, faculty members indicate that providing measurable learning objectives provides a means for evaluating student learning. Faculty members do indicate that they provide instructions on how to meet the learning objectives. According to Morrison, et al. (2011), when faculty members provide learning objectives, the instructional activities and assessments should be in alignment with the course and module learning objectives. Morrison, et al. (2011) also state that by providing learning objectives, it helps provide a quality check in helping the learner accomplish the goals of the course.

The third category explored to what level faculty members indicate they provide assessments and measurements for their online courses. The best practice standard mean score as computed from the Likert scale for assessment and measurement reported by faculty members was 33.18 on a scale from 0-39. Faculty members strongly agree that providing assessments and measurements are important as best practice for aligning the course

and modular objectives. Based on the findings, faculty members do provide measurable assessments that are sequenced, varied, and appropriate to the student work being assessed and are consistent with the course and module objectives of the course. Faculty members also provide frequent feedback when grading assignments and assessments. Literature reveals that the alignment between assessments and measurements with course and modular objectives will help a student succeed in the course (Achtemeier, Morris, and Finnegan, 2003; Thurmond, Wambach, Connors, & Frey, 2002).

The fourth category explored whether faculty members indicate they provide instructional materials for their online courses. The best practice standard mean score as computed from the Likert scale for instructional materials reported by faculty members was 32.36 on a scale from 0-39. This score represents that faculty members do indicate and strongly agree that when designing an online course, it is imperative to provide instructional materials that are current and appropriately cited as a best practice when designing online courses. Also, as a best practice, faculty members use a variety of instructional materials. These materials include: lecture notes, websites, PowerPoint presentations, multimedia, and textbooks. According to the findings, faculty indicate that learner activities should be included in the alignment with the learning objectives for the course and module.

The fifth category looked into whether faculty members indicate that they provide learner activities and learner interaction for their online courses. The best practice standard mean score as computed from the Likert scale for learner activities and learner interaction reported by faculty members was 26.37 on a scale of 0-33. According to the mean score, faculty members do indicate and strongly agree that they have used best practice standards when providing learner activities and learner interaction when designing their online courses. Faculty indicate that learner activities should include be in alignment with the learning objectives for the course and module. The findings also indicate that faculty members provide learner activities that are in alignment with the course and module learning objectives and include student-instructor, student-content, and student-student learning activities. Chang & Smith (2008), mention that students should be able to interact with different individuals in an online course. Based on the findings, faculty members believe that to support active learning, learner interaction should be between student-instructor, student-content, and student-student.

The sixth category explored to what extent faculty members indicate they provide course technology for their online courses. The best practice standard mean score as computed from the Likert scale for course technology reported by faculty members was 27.12 on a scale from 0-33. The findings from the study indicate that faculty members strongly agree that course technologies are readily accessible and are current. This includes discussion boards, chat rooms, wikis, blogs, video, and audio support. Lastly, faculty members strongly agree that navigation throughout the online course is logical, consistent, and efficient.

The seventh item explored to what extent faculty members indicate that they provide learner support for their online courses. The best practice standard mean score as computed from the Likert scale for learner support reported by faculty members was 22.24 on a scale from 0-27. This research indicated that faculty members do provide learner support. Faculty members strongly agree that they provide instructions or a link to: technical support, the universities' accessibility polices and services and information on how the institution's student support services can help students succeed and how students can access the services. According to Johnson (2004), learner support should include policies on accommodations that include how these services can be accessed either by telephone, email, or a website link. Also, learner support should include access to academic support that may include online orientation, access to library resources, tutoring services, and writing centers.

The eighth item explored to what extent faculty members indicate that they provide accessibility and usability for their online courses. The best practice standard mean score as computed from the Likert scale for accessibility and usability reported by faculty members was 20.88 on a scale from 0-30. This score represents that faculty members do indicate and agree that when designing an online course, it is vital to provide accessibility and usability information when designing online courses. Faculty members also agree that providing a link or written communication pertaining to the accessibility department should be included in an online course. According to Crow, (2008), captioning should also be provided for any video or animation shown on the online course.

Research question 1a: Is there a difference in adoption of best practice standards for online course design based on full-time faculty rank (tenure-track and lecturers)?

Tenure-track and lecturer faculty members have no significant differences in adopting best practice standards when designing an online course. Based on the findings, the reasons why tenure-track and lecturer faculty members have no significant differences in adopting best practice standards is because both groups provide instructional design, they optimize technology, and they utilize faculty development when designing online courses. Regarding instructional design, both groups provide and adopt the following:

1. A course overview and introduction

2. Measurable course learning objectives that describe the course outcomes,
3. Measurable assessments that are consistent with the learning objectives
4. Instructional materials that are in alignment with the course and module learning objectives
5. Alignment between the course and module learning objectives, along with learning activities

Also, according to the findings, both tenure-track and lecturer faculty members provide the following pertaining to technology:

1. Course technology that support the course and module learning objectives
2. Instructions and/or link to technical support
3. Accessible technologies such as equivalent alternatives to auditory and visual content

According to several authors (Green, Alejandro, & Brown, 2009; Tabata & Johnsrud, 2008), various reasons can explain why both tenure-track and lecturer faculty members have no significant differences in adopting best practice standards; some reasons include the following:

1. Flexible working conditions
2. Administration values online learning
3. Opportunity to use technology
4. Advancement opportunities
5. Teaching experience
6. Financial incentive
7. Different types of faculty development

Research question 1b: Is there a difference in adoption of best practice standards for online course design based on full-time or part-time-faculty status?

Based on the findings, full-time and part-time faculty members have significant differences when adopting QM best practice standard's categories for online course design. Reasons as to why full-time and part-time faculty members have differences when adopting best practice standards for online course design include motivational differences. Part-time faculty members are motivated to adopt best practice standards for online course design due to having more free time to devote to learning and adopting best practice standards. Also, part-time instructors are motivated to design an online course due to the possibility for a future full-time faculty position (Shea, 2007).

Full-time faculty members are more motivated to adopt best practice standards for online course design due to their commitment to the institution, monetary incentives for developing an online course, personal or professional growth, career advancement, faculty development programs, and administrative support. Also, full-time faculty members are motivated due to opportunities to help in developing quality online courses or quality online programs (Green, Alejandro, & Brown, 2009).

Research question 2: Is there a relationship between adoption of best practice standards for online course design and average years of online teaching?

Faculty members' average years of online teaching does not relate to the adoption of best practice standards for online course design. Roehrs, et al. (2013) also indicate that faculty members' online teaching experience has no relationship in the scoring of QM rubrics. Further analysis of the findings showed that each of the eight best practice standards found no relationship with the adoption of best practice standards for online course design.

Some reasons as to why faculty members' online teaching experience has no relationship with best practice standards may include the various methods as to how they acquired the types of knowledge, skills, abilities, and experiences to teach online. Schmidt, et al. (2013), discusses several types of knowledge, skills, abilities, experiences that include the following:

1. Blended learning situations
2. Experience as an online student
3. Received help from colleagues in the college department
4. Reviewed articles and websites
5. "Jumped right in" or "Got thrown in"
6. Faculty development courses

Research question 3: Is there a relationship between adoption of best practice standards for online course design and portion of online teaching load?

There is a weak relationship between the adoption of best practice standard's categories for online course design and online teaching load in a year. In analyzing the data in more detail, there is a weak relationship between online teaching load in a year and the subsequent two outcome variables:

1. Learner activities and learner interaction
2. Course technology

However, there is no relationship between online teaching load in a year and the following:

1. Course overview and introduction
2. Learning objectives
3. Assessment and measurement
4. Instructional materials
5. Learner support
6. Accessibility and usability

Research question 4: What is the strongest predictor for adoption of best practice standards for online course design?

Full-time and part-time status is the strongest predictor for adoption of best practice standards for online course design. Based on research (Green, Alejandro, & Brown, 2009; Shea, 2007), the following is a reason as to why full-time and part-time status is the strongest predictor. Full-time and part-time faculty members have different types of motivation for adopting best practice standards for online course design. For full-time faculty members these types of motivation include:

1. Commitment to institution
2. Monetary incentives
3. Different types of faculty development programs
4. Different types of delivery of faculty development programs
5. Administrative support
6. Opportunities to develop new online courses
7. Opportunities to develop new online programs
8. Professional growth advancement

For part-time faculty members, the different motivational factors include:

1. More free time
2. The possibility of a future full-time faculty position
3. Online faculty development programs

Research question 5: Is there a relationship between adoption of best practice standards for online course design and hours of faculty development for online course design?

There is no relationship between the adoption of best practices for online course design and hours of faculty development for online course design. A likely reason that there is no relationship is because the quality of faculty development is much more important than the number of hours one attends in any type of training.

Conclusions

According to the results of this study, while designing online courses, faculty members adopt eight best practice standards including course overview and introduction, learning objectives, assessment and measurement, instructional materials, learner activities and learner interaction, course technology, learner support, and accessibility and usability. These findings resonate with Herman's (2012) discussion indicating higher education institutions are adopting best practices for the promotion of quality online courses. The findings from the study imply that faculty members do indicate that providing a course overview and introduction plays a critical role in the design of an online course. Stavredes & Herder (2014) state that, students will become better acclimated to the online learning course by having a course overview and introduction. Therefore, faculty members should adopt a course overview and communicate to the students to "click" on the tab called "Start Here" before perusing anywhere else within the online course. Also, it would be helpful for students if faculty members introduce themselves, either in writing or via video, to the students to provide students a bit of background information about themselves. Lastly, the faculty member should have a discussion board created for students to introduce themselves to the instructor and to other students. Morrison, et al. (2011) emphasize that it is imperative that faculty members provide learning objectives that contain measurable goals throughout the online course. According to this research, faculty members indicate the importance of having measurable learning objectives throughout the course.

This study's findings show that faculty members agree that assessments and measurements should be an alignment with course and modular objectives. As such, faculty members should continue to align their assessments

and measurements with their course and modular objectives. The instructional materials also need to be current and appropriately cited based on best practices when designing online courses (Sims, Dobbs, & Hand, 2002). The findings in the study indicate that faculty members agree that the assessments and measurements should be an alignment with the course and module learning objectives and they agree that these instructional materials need to be current and appropriately cited. Therefore, the findings from this study would suggest faculty members continue to align instructional materials with course and module learning objectives.

According to the findings, faculty members report that they provide instructions in their online courses and they also provide links to technical, accessibility, and academic services for students. Therefore, as a best practice, faculty members should always provide information and links pertaining to technical, accessibility, and academic services in their online courses. An online course should provide a link or written communication on how to obtain accommodations. Also, the course should contain equivalent alternatives for auditory and visual content (Crow, 2008).

The findings indicate that faculty members do believe they should provide alternatives to auditory and visual content. They also agree that the online course needs to provide guidance on how to obtain accommodations. Therefore, the findings from this study would recommend that faculty members provide guidance on how to obtain accommodations and include alternative auditory and visual content for their online courses.

Higher education institutions need to understand the different motivational factors of faculty members when promoting faculty development. These motivational factors include any financial incentives the institution may provide in the design of a new or revised online course. Another factor could be the differences between a full-time and a part-time faculty's motivational levels and how these differences might impact the type and delivery of faculty development programs within the higher education institution. Institutions should insist that part-time faculty must complete some type of faculty training prior to designing an online course. Also, institutions need to offer different types of online design training to all faculty members.

Summary

The findings from this study indicated that faculty members have adopted best practice standards when designing their online courses. Further analysis explored the faculty members' responses to the eight Quality Matters (QM) best practice standards. Within each of the eight best practice standards, faculty members agreed that they have adopted each of the standards. Differences exist between full-time and part-time faculty members in adopting best practice standards for online course design. The literature pertaining to these differences indicates that full-time and part-time faculty has different motivational factors for adopting best practice standards for online course design. Higher education institutions would benefit in determining what type of motivational factors full-time and part-time faculty members have in designing online courses. Institutions would benefit in providing different types of faculty development delivery methods to encourage the design of better quality online courses based on faculty members' preference of method. As this study indicated, faculty members preferred the method of an individual consultation versus an online tutorial.

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Video That Matters: Enhancing Student Engagement Through Interactive Video-Centric Program in Online Courses

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Abstract

As one of the primary components of effective online teaching and learning, student engagement is crucial to the success of online education. By engaging students as active learners, interactive video-centric programs support online education to attain the highest levels of student interaction, engagement and commitment. By taking YouSeeU (YSU) as an example of increasing student engagement in online learning, this study focused on how the interactive video centric-programs promote online education to be more effective and engaging.

Introduction

Students engagement refers to the degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught (Student Engagement Definition, 2015), and also the adequate opportunities of interacting with classmates and instructors (Weatherly & Jennings, 2013). Considerable recent attention has been paid to the concept of "active learning" in online education to increase student engagement, by exposing students "in activities, such as reading, writing, discussion, or problem solving that promote analysis, synthesis, and evaluation of course content" (CRLT,2015; Eison, 2010). Guided by the active learning instructional strategies, instructors have tried to move away from the passive lecturing to more active learning practices (Giannakos, Krogstie, & Aalberg, 2016) for their online learners, and make any effort to increase students engagement with a "partner, in a small group, or with the entire class" (Eison, 2010, p.2), which is crucial to the success of online education (Bayless, Biss, & Johnson, 2012; Cherrett, Wills, Price, Maynard, & Dror, 2009; Choi & Johnson, 2010; Vaughn, Orr, & Gorman, 2015; Weatherly & Jennings, 2013). However, such interaction that has been emphasized by active learning is difficult to be reflected in actual online courses; there was less adequate student engagements and frequent presence observed in online learning than expected. It was hard to track how much student contribution to their group learning, how much they "really" interact with each other, or how much opportune feedback they could receive from the classmates and the instructors.

YouSeeU to increase student engagement in online courses

The latest version of the YouSeeU platform includes asynchronous activities and recordable synchronous meeting capability from planning discussions to group presentations. YouSeeU features include Social connectedness, Spontaneity, Skills assessment, Collaboration, Feedback/Coaching, and Accountability. The video-based assignments of YouSeeU include: Question & Answer, Individual Video, Video Presentation, Group Project, Synchronous Activity, In-class Recording, Text Discussion, and Document Submission. For this study, "Group Project" was used for students to record their group presentations and share with instructor and other groups for evaluation purpose.

By introducing interactive video centric-programs into online courses, the purpose of this study was to discuss students and instructors experience with the tool, and explore their perceptions of using video-centric programs to increase student engagement through active learning in online learning. This study addressed both students and instructors experience in using YouSeeU to attain the highest level of student interaction, engagement, commitment, and collaboration in online education.

Research design

This study targeted the population of students and instructor who were in online learning environment in higher education. Thirty-three Students registered in a 12-week course, "Analyze Workplace Learning", in Spring 2016 were divided into four groups to present group projects in weeks 3 and 4. Group memberships were

automatically assigned using the Group Set setting in the Canvas LMS. Besides presenting and requiring students to access learning materials through traditional passive methods, such as reading documents, watching video lectures, writing posting discussion posts in LMS, this study sought an interactive solution by turning students from passively participations to actively involvements online for their group presentation. A qualitative research design and survey was applied to collect data from the learners and instructor. Three research questions were designed and developed based upon the purpose of study:

- What are the aspects of video-centric program that participants reporting engaging?
- What are the major differences of video-centric programs versus traditional lectures/assignments/presentations in online courses from participants' perspectives?
- What are the key challenges participants experienced with video-centric programs?
-

Data analysis

Thirty-three students enrolled in EDOD 674 was divided into four groups for group presentation assignment. This assignment asked students (1) discussing in their own groups and assigning project portions in order to prepare a presentation file; (2) recording each group member's portion in YSU; (3) combining individual group members' video clips into one video file; and (4) submitting the final video for other groups and the instructor to review. Group 1 (N=9) produced two individual YSU videos for their presentation; Group 2 (N=9) created five individual videos in YSU. This group also had 2 sync meetings discussing the project and two test videos. The final submission file was a narrated PowerPoint video with multiple presenters submitted by a student. Group 3 (N=7) recorded and combined individual videos in YSU. This is how Group Video expected to be done in YSU (see Figure 1). Group 4 (N=8) did not record any videos in YSU. Instead, this group completed a narrated PowerPoint and posted to the LMS's discussion forum.

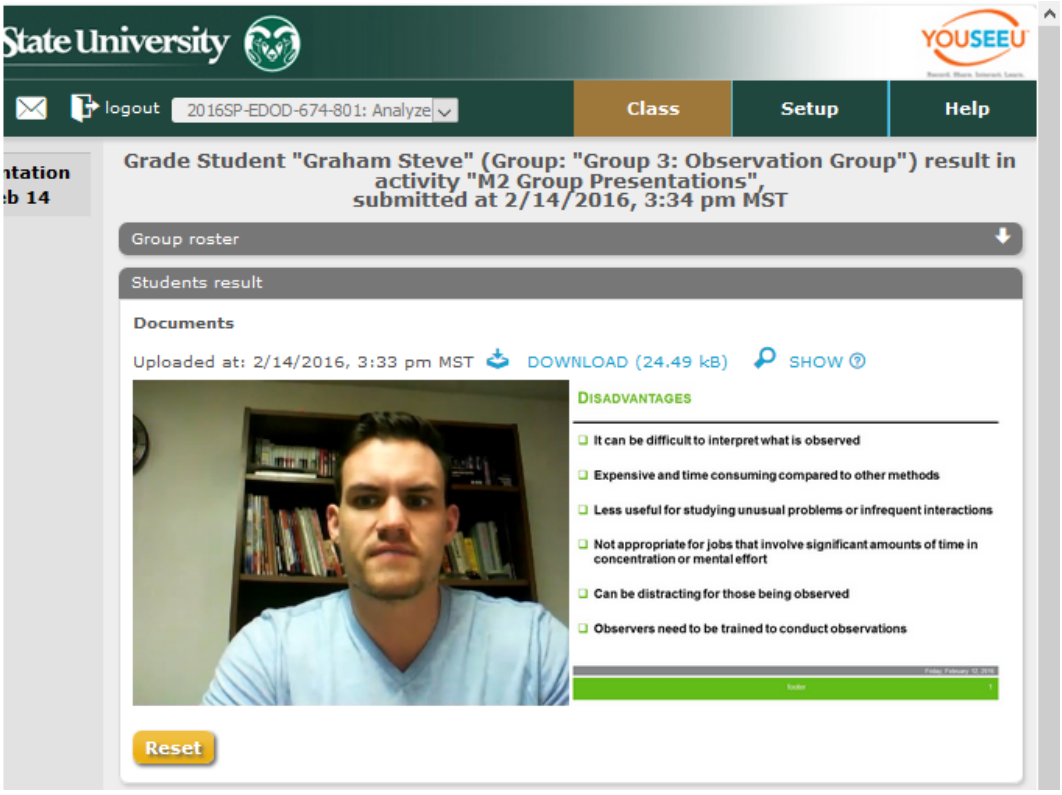

Figure 1. Screenshot of Group Video from group 3

After the YSU group presentations were concluded, 12 out of 33 students submitted their surveys. The questionnaires surveyed participants' technology confidence level, YSU experience, and group experience. Correlations between and among these categories were analyzed:

Participants' technology confidence level

As stated in Table 1, five students (41.6%) reported being confident working with videos and had positive experience with YSU. Six students (50%) reported being confident working with videos but did not have positive experience with YSU. Only one student reported neither confident with videos nor positive with YSU.

Table 1. Participants' technology confidence level versus YouSeeU experience

	Positive YouSeeU Exp.	**Negative YouSeeU Exp.**
Confident with Videos	41.7%	50%
Not confident with videos	0%	8.3%

The data indicated a learning curve in using YSU. Scaffolding strategies should be considered when implementing YSU for group video project.

Participants' group experience

Table 2 demonstrated that five students (58.3%) having positive group experience, while seven students (41.7%) having negative group experience. However, among the students who had positive YSU experience, four out seven (33.3%) had a negative group experience, which was consistent with data in table 1, that is to say students' technology confidence level in video-centric assignment would affect group work.

Table 2. Participants' group versus YouSeeU experience

	Positive YSU Experience	**Negative YSU Experience**
Positive Group experience	25%	33.3%
Negative Group experience	16.7%	25%

Participants' YouSeeU experience

Among the 12 out of 33 students, three of them had positive YSU and group experience, and will use YSU in the future, and only 2 of them had absolute negative of either YSU or positive group experience therefore reported that they will not use YSU in the future. As demonstrated in Table 3, the positive user experience will lead to using the tool in the future integration. However, group experience played an interesting role in YSU integration. Because, no matter whether a group worked or not, students' choice of using YSU in the future was only related with their current experience of YSU.

Table 3. Participants' YouSeeU experience versus Group versus Future use of YouSeeU (T=True, F=False)

	Positive YouSeeU Exp.	**Group Worked**	**Use YouSeeU in Future**
N1	T	T	T
N2	F	T	T
N3	F	T	T
N4	T	T	T
N5	F	F	T
N6	T	F	T
N7	F	F	F
N8	F	T	F
N9	T	F	T
N10	T	T	T
N11	F	T	T
N12	F	F	F

However, one exception was that there was one response (N5) saying that he/she had neither a positive experience of YSU nor a positive experience with group working, but still indicated the intension of using YSU in the future. A further in-depth interview might be needed to explore why the existence of this exception.

Participants' future use of YouSeeU

All students reported positive experience (41.7%) with YSU also reported will use YSU in the future. Among the seven negative experience with YSU, four (57.1%) reported will still consider YSU in the future. Nine

students (75%) reported will use YSU in the future no matter their prior experience with YSU was positive (41.7%) or negative (58.3%). Three students (25%) reported will not use YSU in the future. These students all had prior negative experience with YSU.

Table 4: Participants' YouSeeU experience versus Future use of YouSeeU (T=True, F=False)

	Positive YouSeeU Exp.	**Use YouSeeU in Future**
N1	T	T
N2	F	T
N3	F	T
N4	T	T
N5	F	T
N6	T	T
N7	F	F
N8	F	F
N9	T	T
N10	T	T
N11	F	T
N12	F	F

Discussion

With the collected participants' experience of using YSU in this online presentation assignment, several engaging aspects of using YSU were explored. Meanwhile, the existing challenges of using video-centric program in facilitating student engagement in online learning have also been categorized.

The engaging aspects of video-centric program

Engaging aspect 1: Student engagement. Video-centric program triggered more student engagement and collaboration. This is evident from students' discussions of group presentation, which resulted in an 81-page, single space, Word document for data analysis. Among each group, the participants were not only planning the content of their project, but also tried hard to identify the submission timeline, the outline of project, the collaboration tools, the roles of each member, and the review procedures of the final project, etc. For instance, Group 1 spent quite a lot of time in discussing their project outline and "what collaborative tools" they wanted to use. Group 2 decided to use the YSU sync meeting activity to plan and review their project. When facing the challenge of large group size, Group 3 took an active learning approach by sub-grouping their group into small planning groups. For Group 4, even if they were not able to submit their final YSU group video, they expressed their concern about "having a coherence and quality team". All those evidence demonstrated the video-centric program's ability in increasing student engagement in online learning environment.

Engaging aspect 2: Real-world collaboration. Realistic collaborative atmosphere helps students prepare for work place. As stated by group participants, with YSU they had a quite often communication with other group members in planning the presentation assignment. The communication was not merely through the video centric program, but the video assignment did facilitate a closer relationship among the group. Participants tried to collaborate and mobilization with any tools and technologies that they were all familiar with, such as PowerPoint, Skype meetings, Google Drive, Google Scholar, Office 365, university libraries, phones, etc.

Engaging aspect 3: Social connection. Collaboration among students brings social connections to the online learners. Such as Group 1 members planned the assignment by agreeing on "an outline, and …decide early on what collaborative tools we want to use". Group 2 members suggested a "mind map" to see the flow of topics, which is convenient for group members to re-order and brainstorming. Group 3 utilized YouTube to exchange presentation ideas and training tutorials. Group 4 discussed possibility of using Skype meetings, Canvas Collaborations, Google Docs, and emails for exchanging ideas.

Engaging aspect 4: Authentic learning. YSU's Sync Meeting helps group's project planning. Synchronous tools provide students authentic feeling in a real classroom.

Engaging aspect 5: Problem solving. Students in groups facing different challenges, including time challenges (different time zones, time availability, time flexibility, etc.), different locations (cities, states, countries), students' different technology confidence levels (ranging from novices to advanced), different technology applications background (varies presentation tools experiences, for example, from MS PowerPoint to Adobe Camtasia), different video working experiences (including recording, editing, publishing skills, etc.), and need to

overcome an array of obstacles in order to complete group tasks. One problem solving example demonstrated in this study was sub-grouping technique used by groups 2 and 3 in overcoming the large group size.

Engaging aspect 6: Project management. Students in groups working on assigned presentation need to managing the project from the beginning to the end. For examples, students need to "meet" virtually to brainstorming ideas, assigning project roles and tasks, recording videos, combining videos, and then submitting the videos for feedback and grading.

The differences of video-centric programs versus traditional lectures/assignments/presentations in online courses

Students' perspectives toward lecture/assignment/presentation tools remained with more familiar applications such as MS PowerPoint. Other programs mentioned include Jing, Camtasia, Google Slides, Prezi, etc. It calls for a workshop for students to see what YouSeeU can offer during the class time.

The key challenges participants experienced with video-centric programs

Challenge 1: No prior experience with YouSeeU. Every group had members mentioned the "lack of information" regarding to YouSeeU and the project. Without adequate information of any innovative in online environment might cause "panic" for learners. The best solution for decreasing learners' uncertainty is to provide training sessions or workshop prior to the project. Online tutorials from instructors and instructional designers would also be a good consideration for any innovative online applications.

Challenge 2: Navigation issues of video centric program. As one of the instructor pointed out, YouSeeU was not quite user friendly. The "usability, navigation, and sync with Canvas users" was difficulty to understand. As a new and young video-centric program, YouSeeU does need a lot of improvement in navigation designs, compatibility consideration with LMS, supportive documents, flexibility of grouping members, etc.

Challenge 3: Not enough scaffolding instructions and supportive documents for either the YouSeeU or the assignment. There were many comments from students' discussions across groups that they were "confused on where/how to start", or "not sure where to begin". Several students also mentioned that they "did not understand the assignment fully", and the "assignment is really vague".

Challenge 4: Group size plays an important role when interacting with team members. Students found the "groups are really large" and it was difficult to "collaborate with this large of a group in cyber space." Working with a bigger group in online courses made them hard to "disparate schedules" and communicate evenly across group. Not every group worked well, for example, some group members lack of participation and contribution to the final group presentation. Peer evaluation should be built into group work to improve peer participation and interaction.

Challenge 5: Different time zones create another layer of challenge for group to meet virtually and synchronically. There were quite a lot of discussions and negotiations regarding to meeting time and different time zones. In order to get involved into group discussion for planning the project, students had to identify different time zones, local time, and time availability for each group member, which might be time consuming and limited the times of communication for the entire group. Instructors and instructional designers might need to take the physical locations into consideration before assigning group members in online course.

Limitations

Several limitations of this study were addressed. First, YouSeeU as the video-centric program for online learning was a pretty new and young product; it calls for improvement in navigation design, compatibility with LMS, and supportive documents, etc. This course as a pilot course of integrating YSU into online education was not able to provide adequate technological support or training to students, which to certain extent caused students' negative experience of YSU.

Second, the group size was too big for online discussion and group presentation project. The instructor was aware of the 33 enrollments in this course, but was considering that in real-world work place, group members would need to learn how to communicate effectively within big groups. The big group size generated some groups' negative emotions towards using YSU.

Third, not enough time for group members to get acquainted and to prepare the project. The group presentation assignment was assigned early in the course (weeks 3 and 4) while most of the students were still not familiar with one another. Students, all working adults, had only two weeks to work on the presentation project.

Conclusion

YouSeeU as a video-centric program provides an advanced platform for students to gain interactive online learning experience. The performance of using YSU as a group video presentation tool could be improved if YSU

has a more intuitive navigation system, a more streamlined integration with the learning management system, and more scaffolding supports within the system.

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Google Apps as Research Tools

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Index Descriptors: Google Apps, Research Tools

Background Information

Research has become an important component of university faculty portfolio in Ecuador in the last five years, being a requirement for both promotion and tenure. In Ministerial Agreement 0061-14, the Ministry of Education of Ecuador declares in Art. 4:1 that one of the requirements for promotion is to have publications related to research, professional projects or innovations that promote new knowledge (Ministry of Education, 2014). However many faculty members have difficulties complying due to the lack of experience in research and the follow through to publication. One way Universidad Casa Grande has dealt with this problem is by creating "Proyectos Semilleros" or seed projects. These are research projects proposed by faculty members in their specialty areas that align with the programs previously defined by the Department of Investigation (DI). Once projects have been accepted the DI, students who are in their 5th year of study, in partial fulfillment of their graduation requirements, may choose a project that they would like to work on with a lead and assistant investigator. Each student is responsible for elaborating their individual thesis document, even though they work in a collaborative project (Universidad Casa Grande, 2016). Guiding students through the process is often a challenging task due to lack of time necessary to give students adequate feedback necessary to ensure that they have quality documents.

The Problem

Having had two research projects accepted, the two investigators were faced with the problem of guiding ten (10) students to complete their projects in an eight (8) month period and the investigators only having ten (10) months to do the same. These short time frames are a key issue because producing quality work in the constricted time frames is sometimes difficult for students. As a result, investigators are often challenged to find innovative ways of making the process more efficient for both investigators and students. Knowing the history of some students having difficulties in producing quality documents, especially in relation to the investigators' expectations, some questions were posed.

Questions:

- How can we guide 10 students in their thesis projects in a short time efficiently?
- How can we give each student quality time and feedback?
- How can we give each student quality feedback in a short time to ensure quality documents?
- How can me make this a more successful process for both investigators and students?

Based on previous experiences in the classroom and other projects, the investigators decided that Google Apps would be an appropriate tool for responding to the needs of both students and investigators. The final decision was based on creating a list of advantages and disadvantages

ADVANTAGES	DISADVANTAGES
Students already use the institution e-mail, which is operated by Google, therefore access to the other apps was at hand.	Students are not completely familiar with all of the Google Apps.
One of the investigators has enough experience and knowledge of Google Apps and would be able to do the training required.	We would have to train them in how to use some of the apps.
Investigators would have immediate access to data collected.	
It would be easier to monitor student progress.	

It was decided that the most effective tools to make this process a success was to use the following Google Apps: Classroom, Docs, Form, Spreadsheet and Presentation, based on past experience, as well as, feedback from other researchers-faculty about the possible potential of the apps. The tools were introduced during different stages of the research, however, once present they were constantly used to respond the needs of the students and investigators. The tools were integrated into the research an not taught in isolation.

Google Classroom

Implemented from the moment students were accepted to be a part of the project, Google Classroom was created for each of the two research projects. Each one was used as a repository for information relevant to the student participation in the projects and as a place for them for submitting initial assignments. It included information related to student and investigator schedules (calendar), the accepted investigator proposal as a guideline for their research ahead, key literature review, study questionnaires and other relevant information, included but not limited to academic writing and APA.

Of the 10 students, 9 were familiar with the use of Classroom, because they have used it in various classes with the investigators or other instructors. However, the unfamiliar student quickly adapted to the classroom with the support of her group. Students used it as a source for finding information related to the project, for asking questions in the general commentary forum and for submitting their the first three assignments of the project: Introduction, Literature Review and Research Questions. Even though students participated in an already designed study, it is important that they go through the process of creating and developing their own documents, evidencing autonomy and proficiency in the process.

Google Docs

Students did not receive formal training as how to use Google Docs, for it was assumed that based on past experiences, they were familiar with the app. From the initial assignment students were required to submit their documents in the Docs format. Of the 10 students, 6 were initially resistant and submitted their documents in Word, however the investigators converted the documents into a Docs format and shared it with the students. Students were not penalized for submitting in a different format, however the use of the Doc format allowed both investigators to give feedback in the same document at the same time. This was especially important, because as owners of the document "lost" information was recovered by the investigators on more than one occasion. Some students did not know about the *see revision history* option, which allowed for retrieving a previously saved document. Some of the important features that were key for students were the *comments* and *chat* options. The options allowed students to asked questions in real-time and not have to wait for face-to-face meetings and it allowed the investigators to give quick responses, as well as, keep track of what students were having difficulties with as they were constructing the document. It also permitted students to receive more frequent and quicker feedback as they were constructing their thesis document. Feedback included but was not limited to: academic writing, resources, methodology and general concerns. The *research* option permitted investigators to identify a case of plagiarism in one of the documents.

Google Form and Spreadsheet

Google Form and Spreadsheet were used as two related apps, forms for applying and collecting data and Spreadsheet for retrieving data collected and for analyzing such data. Based on the initial analysis of little or no know of the two apps, students received an 8 hour training, to help ensure effective use in each one. The training was divided into two sessions:

- Four (4) hours in Google Form as how to construct a legible, efficient and effective surveys and applying code of ethics. Students had the advantage of constructing the questionnaires or surveys, depending on which project they were working on, during the workshop.
- Four (4) hours in Google Spreadsheet as how to retrieve code and analyze data collected. Google Form automatically creates a Spreadsheet to retrieve the responses of participants responding to the Form.

Students were very pleased with Form, because they were able to see immediate results of data collected. Based on higher knowledge and comfort with Excel and SPSS, most students opted for using these apps instead of Spreadsheet to analyze data. However, it must be noted that they did use Spreadsheet to code the data retrieved.

Google Presentations

At the time of presentation of this innovation, students have not had a chance to use the Google Presentations, but it will be the app of choice for their defense, based on the success that the investigators and students had with the other collaborative tools.

Positive Outcomes

This innovation started out as a quick solution to a possibly big problem, however it quickly developed into a very effective research tool. Some of the benefits of using the apps were:

- Students received more feedback in time and quality. This was especially important as it permitted four (4) of the 10 students to be able to have finished documents within 4 months. Four (4) students finished-up their results in phase 1 of the project even though they were only required to finish up until the methodology. Even though one (1) student did not work on her document until one week after the deadline, online feedback from the investigators was essential in her finishing her document before the new extension deadline. This is due to the fact that students did not have to wait to meet with researchers face-to-face to have questions answered or to receive feedback. In most cases as students were writing; notifications were received, allowing for a close guidance in the process.
- Students were also able to sync their calendars with the investigators. By seeing, the researchers deadline, students understood the need to work constantly and not sporadically. This also resulted in the investigators being able to gather unfiltered and reliable data from the Spreadsheet of each student, which resulted in data being analyzed and an academic article being presented four (4) months ahead of time.

Negative Outcomes

Even though there were many positive outcomes in the investigative process, there were some negative outcomes as well. For example, students always expected immediate responses and reacted negatively when we were not able to do so, even when they were forewarned that there would be issues with a quick response. One of the biggest difficulties in the process was with students reading and not waiting for the researchers to give them the answer, evidencing a lack of autonomy.

Implications for future

This initial innovation of guiding students through their thesis process was considered a success, even with the difficulties that were presented. However there is a need to identify strategies for guiding students so that they may become more autonomous in the process. The next step in this process would be to assist other researchers in using the tools through training and accompanying them in the process.

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How Web 2.0 Technologies Drive Learning Integration by Using Twitter In The Teaching Process

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Overview

Developments in web based technologies have changed the way that people communicate and search for information. Especially with the rise of Web 2.0 technologies, communication started to take place in horizontal extensions (Siapera, 2012, pp.82-90). The basic features of new media platforms such as simultaneity and interactivity eliminates space and time constraints of conventional media. In addition to this, it enables limitlessly knowledge sharing and storage (Jenkins, 2009, pp.80-150).

While digital technology is spreading ubiquitously, some new terms have become part of the literature. The generation of people who were born in the current digital era are called Digital Natives (Prensky, 2001, pp. 1-6). The concept of being a digital native was first used by Prensky to explain how the current generation of students change their way of learning and communicating. For digital natives, accessing the internet through computers and mobile devices is the first choice to get information (Prensky, 2001, pp. 1-6). They prefer to use media-rich learning methods. Hence, it is important to understand how teaching tools need to be integrated inot instruction to align to this changing process.

New media technologies allow users to collaborate and undertake participatory actions. Especially, social media platforms allow users to share knowledge simultaneously (Toprak v.d., 2009, pp.28-84). In this vain, social media opens up new possibilities to enhance online learning (Selwyn,2007, p.3). Studies show that Twitter, which is one of the most commonly used worldwide social network tools, is used all around the world as the most chosen pedagogical tool (Elavasky, Mislan, & Elavsky, 2011; Feliz, Ricoy, & Feliz, 2015; Junco, Heiberger, & Loken, 2010; Park, 2013; Rinoldo, Tapp, & Laverie, 2011; and Zainal & Deni, 2015).

This research study was conducted to analyze the use of Twitter in a course titled *History of Communication*. This course is taught as part of an undergraduate program in the Communication Department at Sakarya University in Turkey. Within the context of this research, there were two main aims. The first one was to explain the types of posts that were elicited through Twitter. The other goal was to reveal perceptions of the students regarding the use of Twitter as a knowledge acquisition method in the class.

In accordance with this purpose, a mixed research method was conducted. To identify the types of responses, qualitative content analysis was carried out. After that, to understand the perceptions of students; a structured, Likert scale questionnaire was administered. The questionnaire, which was developed by Deni and Zainal (2015, p.201) , was adopted for the study. Questions were translated with the assistance of an expert and a Cronbach Alpha of 0.79 was determined to be acceptable for the 34 students participating in the study.

For this paper, the first part of the study focuses on digital native conceptualization and dramatic changes in the learning process. The second part includes studies that concentrate on the use of Twitter as a pedagogical tool.

The research methodology of the study is explained below. In the final part, results are discussed and suggestions are offered for further use of Twitter in the educational process.

Introduction

In the book "Network Society" Van Djik (2006) describes today's digital society. He points out that networks have become the nervous system of our society. With new media penetration into our daily lives, a new pattern of information and communication is observed. He evaluates this new pattern in terms of three structural characteristics (Dijk,2006, pp.7-50). First of all, new media has been combined with the past forms of communication into a single medium. In the same channel; sound, text, and images can be used. Hence, the media is re-defined as multimedia. Secondly, new media permits controlling the sequence of action and reaction. Producing and receiving information can be exercised without time and space constraints. The sender and receiver may contribute to related message at the same time. Hence, new media is interactive. Finally, new media is totally digital. It recombines images, sound, text in digitized formats by converting them into numerical data. This feature allows information to be transformed via hyperlinks (Dijk, 2006, pp.7-50).

In the light of this multidimensional environment, knowledge becomes a concept which is not directly transferred from instructor to learner but is shared collaboratively (Conrad & Donaldson,2011, pp.1-26). Therefore, instructors need to adapt their teaching approach in terms of this new pattern. To find alternative methods, analyzing the new learner profile is a suggested starting point.

In a very broad definition, digital natives are the people who were born after digital technology become the essential factor of daily life (Prensky, 2001, pp. 1-6):

Digital Natives are used to receiving information really fast. They like to parallel process and multitask. They prefer their graphics before their text rather than the opposite. They prefer random access (like hypertext). They function best when networked. They thrive on instant gratification and frequent rewards. They prefer games to "serious" work. (Prensky, 2001, p. 1)

Prensky (2001) expressed that the generation which grew up with digital technology follows a different pattern to gain knowledge. In this manner, studies show that digital natives prefer using social media networks for knowledge acquisition. West and West (2009) stated that:

Learners in the twenty first century have been Web consumers for much of their lives and are now demanding online instruction that supports participation and interaction. They want learning experiences that are social and that will connect them their peers. (2009, p. 2)

To understand which learning experiences digital natives feel comfortable with, the most preferred mediums need to be analyzed. From this point forth, social networks which digital natives spend their time with on a daily basis might be functionalized as teaching tools. This study discusses how Twitter can provide a lateral support to an effective teaching process.

Studies advocate the use of open digital resources to increase the efficiency of higher education (Nikoi, Rowlett, Armellini, & Witthaus, 2011, pp. 26-120). Leaving didactic tools aside, innovative teaching strategies need to be introduced into higher education. As many studies below indicate, social media might be used incorporate new innovative approaches.

Literature Review

There are many studies that have been completed to document the effect of Web 2.0 technologies on the teaching-learning process. In these studies, it is revealed that Web 2.0 platforms have the capability to create a rich framework for learning. It is emphasized that these technologies increase the interaction between the instructor and students and encourages increased collaboration among students (Atıcı & Yıldırım, 2010, pp. 287-291).

The advantages of using Web 2.0 technologies can be examined from three perspectives. The first is looking at the advantages of using Web 2.0 applications for the instructor, learner, and classroom environment (Elmas & Geban, 2012, pp. 240-252). Firstly, for instructors, the use of Web 2.0 tools brings new initiatives to the classroom. Instructors can conduct various activities within the bounds of multimedia. They may also try different evaluation methods by way of online surveys, blogs, and media channels (Elmas & Geban, 2012, pp. 240-252). Secondly, learners may deepen their research capabilities by using hyper-links. Students who use Web 2.0 tools benefit by increasing their technology literacy skills. Students embrace more active and participatory approaches. Moreover, when students are promoted to using new media platforms in groups, they socialize and take advantage of their shared experiences and knowledge (Elmas & Geban, 2012). Students are empowered to move beyond the classroom and produce content which helps them to become more self-confident. Finally, Web 2.0 tools are also

advantageous for the classroom environment. They support a more active and effective classroom environment (Elmas & Geban, 2012, pp. 240-252).

Using social media as an eLearning platform is a well-known practice for most online professionals, as social media has become almost everyone's second nature and offers opportunities for sharing eLearning techniques, promoting information, and exchanging opinions, views, and comments. In this digital age, new media has become an indivisible part of daily life. This popularity encourages the possibility of integrating it into the eLearning process (Selwyn, 2011). In a study by Karaman, Yıldırım and Kaban (2008, pp. 35-50), the effects of Web 2.0 technologies were analyzed. The results showed that Web 2.0 technologies facilitated teamwork, increased high level thinking skills, and elevated digital media literacy and problem solving skills (Karaman, Yıldırım ve Kaban, 2008, pp. 35-50).

Prioritizing social interaction, collaboration, and sharing Web 2.0 technologies offer new teaching opportunities. The use of social networks, which are one of the most important strategies of new media, are accepted as one of key component. Social networks are the platforms where individuals express themselves and communicate digitally. Boyd and Elison (2007) defined social networks as:

Web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. (Boyd & Elison, 2007, p210-230)

Twitter, which is the most commonly used world-wide social networking application, has aroused interest as an educational tool (Marwick & Boyd, 2011, pp. 1-21). Twitter is defined as a free social networking tool in the form of a microblog which enables users to express themselves by140 character limited messages (Kwak & Lee & Park & Moon, 2010, p.1). Pappas (2014) listed eight advantages and six disadvantages for using Twitter for eLearning.

Advantages

First of all, Twitter messages may be formed of hashtags (#). Hashtags are the items that identifies all the keywords that interest you. This feature helps students to address their research directly to relevant pages and simplifies the process. Instructors may open a hashtag in a Twitter account and instruct students to follow the related information under that hashtag. Secondly, Twitter is easy and free to access. Tweets can be accessed by all mobile devices. In addition to this, it supports simultaneous discussions. Tweets may be posted in the form of live micro-blogging. During the real time of the event, related discussions might be generated. Moreover, these discussions are carried out within the 140 character limit. It forces the users to create the shortest message to come to the point. This might encourage users to focus on the essence of the message. Hence, the argument becomes simple and clear. Furthermore, Twitter connects instructors with the younger generation quickly. Studies show that 40% of Twitter users are under the age of 34 (Mislove, Jørgensen, Ahn, Onnela, & Rosenquist, 2011, pp. 554-557). Digital natives feel comfortable with using Twitter in eLearning. In addition, it provides an opportunity for a message to be delivered to all of the followers at the same time. It can also be used to provide feedback. Twitter prompts instantaneous communication and encourages users to comment about related topics. Instructors can also conduct surveys and open hashtags to evaluate the effectiveness of the course. A course can be enhanced and improved in the light of student results. Finally, Twitter enables learners to collaborate. By sharing ideas, concerns, and interests, learners learn to express themselves effectively (Pappas, 2014).

Disadvantages

The first weak point is that users might feel limited because of only having 140 characters. Learning how to express ideas clearly within this limitation might require additional time and skill. Secondly, Tweets are followed instantaneously. This might cause a challenge when an idea is expressed by many individuals. Users may not find the line that they intended to follow. Thirdly, it does not let the message be delivered in a multi user inbox. Users are restricted to sending only one message at a time. Hence, when an instructor wants to provide a message to all learners, this may result in frustration. In addition to this, it is mainly a text-based media. It does not allow the sharing of visual items more than one at the same time. Hence visual content does not allow for the intended effectiveness. Moreover, as it happens with all social media channels, user attention might be lost easily. While following a conversation, another Tweet might catch the reader's attention and lead the user to bounce to different content. Hence it might result in a waste of time in some cases. Finally, Twitter does not store conversations in the form of a regular archive. Hence, an in-depth online discussion might be problematic (Pappas, 2014).

Deni and Zainal (2015, pp.198-203) evaluated the use of Twitter inside the education field. They searched the correlation between the use of Twitter and learner's motivation (Deni & Zainal, 2015, pp. 198-203). Likewise, Feliz, Junko Ricoy and Feliz (2013, pp.201-213) analyzed the use of Twitter in Master's studies. They discussed the results of the effects of using Twitter as a pedagogical tool and addressed the suggestions. In order to understand the role of Twitter in eLearning, they suggested that more studies need to be carried out.

The Research Study

This research study was applied over a semester in a *History of Communication* course. This course provides basic historical knowledge for a Communication Department student and continues through one semester (ten weeks). Other than teaching from history books, multimedia components are used as a part of the teaching process. Twitter was chosen as a subsidiary teaching tool. The main intent of Twitter integration into the education process was to encourage students to participate in the course and increase the effectiveness of the instructor's teaching. Since Twitter prompts instant responses and allows multimedia-based messages, it served the purpose of the study.

The age of the students who enrolled in the class was 17-19. Hence, they are considered digital natives (Prensky, 2011, pp. 1-6). It was the instructor's belief that using social media might make students feel more comfortable in the learning process and more engaged with the course content. At the beginning of the semester, students were asked to create new Twitter accounts with their names and course ID. The reason was to prevent students' distractions in terms of their coming across other elements. All 34 students who registered in the course were asked to post a tweet after the start of the course about a related topic. Other than this, the instructor prompted a tweet and students were expected to respond. Instructor's prompts were formed around various content. Instructor tweets were posted to motivate students, to check students' learning processes, and perceptions of classroom activities.

This study was conducted with a mixed research methodology. To detect the types of responses, content analysis was employed. Subsequently, to analyze the students' perceptions of the use of Twitter in the classroom, a Likert scale survey was employed. The survey instrument was adapted from the study by Deni and Zainal (2015, pp. 198-203).

Findings and Discussion

During the studied semester, it was found that 135 tweets were posted, other than teacher's posts. On average, every week about 13 tweets were posted during the semester. This number implies that students were not motivated enough to follow Twitter accounts.

Part 1 of Analysis: Coding of Posted Tweets

This section is included to reveal the qualitative content analysis of the students' posts. These codes are formed through careful reading and cross checking. Table 1 represents the types of responses. The number of student was determined in the order of the class attendance paper.

Table 1: Student Posted Tweets

Categories of Posted Tweets	Example	Total Number	Percentage
Replies to instructor's tweet	Instructor: Did you start to study for mid-terms?	65	48.14
Summarize the related topic of each week	Student1: Today, we learn how Homo Sapiens start to speak	21	15.5
Responding to friend's tweet	Student14: @Student5 I did not understand what you mean by this tweet.	17	12.59
Giving opinion after mid-term results	Student21: @instructor please tell me that was a joke!	10	7.40

Ask for clarification	Student20:@instructor What can we say in the end for the accuracy of the press media. Is it high or low? I got confused.	7	5.18
Share information about related topic via hyperlink	Student19:@instructor #Philographics: Big ideas in simple shapes http://www.onprintedpaper.com	4	2.92
Share an experience about studying with photo	Student30: @instructor @student4 @student15 "Studying with coffee"	4	2.92
Share an experience about studying with video	Student36: @instructor @student14 @student3 @student25 @student17 "our dance from press to graphic."	4	2.92
Surveys conducted by students to evaluate the materials that instructor distribute	Student29: @instructor "Don't you think that it would be better that our instructor gave us easier reading papers? A) Agree B) Disagree C) What paper?	2	1.49
Retweet	Student4: @student10 we gave same reply in the same time!!	1	0.75
Total		135	100

Part 2: Perception of Students

Table 2: Student Perceptions

Item	Student Responses	1 Disagree	2 Neutral	3 Agree
1.	Twitter is fun as a coursework	23	33	44
Item	Student Responses	1 Disagree	2 Neutral	3 Agree
2.	Twitter provides a new experience in learning	11	42	47
3.	I use Twitter because it is part of my coursework	82	9	9
4.	Twitter extends what I have learnt in class	29	46	25
5.	Using Twitter is a hassle	57	22	21
6.	Twitter helps me to communicate with the teacher outside class	24	16	60
7.	Twitter helps me to clarify topics that I do not understand in class	24	34	42
8.	Twitter helps me to communicate with my classmates outside class	20	10	70
9.	Twitter helps me to record my concerns about class	10	35	55
10.	Twitter helps me to be active in learning	24	35	41
11.	Twitter is suitable for social networking	35	26	39
12.	I would not use Twitter if it is not part of the coursework	82	9	9
13.	Twitter is a faster mood of classroom	27	27	46

	communication			
14.	Messages on Twitter motive me to do better in the course	24	32	44
15.	Twitter should be part of the coursework for future class	24	30	46
16.	I prefer face to face consultation than sharing my concerns on Twitter	27	24	49
17.	Twitter gives me the freedom to share my thoughts when and where I feel like it	8	42	50
18.	Using Twitter is a waste of time	42	45	13
19.	I learnt a lot things about class through Twitter	32	19	49
20.	I prefer to consult Teacher using Twitter rather than face to face	10	45	45
21.	I feel uncomfortable sharing my concerns on Twitter because people will know my problem	57	19	24
22.	Using Twitter is the easiest and most cost-effective way to discuss learning process	35	25	40
23.	Twitter lets me express myself which I find hard to do in the classroom	10	12	78
24.	Twitter's 140 character limitation is a bother	50	13	37
25.	I feel more engaged with the course through Twitter	8	43	49
26.	I learnt to be precise in expressing my thought using Twitter	26	30	44
27.	I don't find the use of Twitter beneficial to my learning	43	30	27
28.	Twitter makes my learning more collaborative	20	35	45

Discussion

To begin with, Table 1 will be analyzed. As stated in the table, percentages were not distributed equally among the 10 categories. The highest percentage belonged to the first category. Hence it can be said that students use Twitter accounts in this class mostly for the purpose of replying to the instructor's posts. Students logged into Twitter to summarize the topic each week and to respond to other students' posts. This shows that students saw Twitter as an integral part of the course. They found the opportunity to directly communicate with an instructor using a platform outside of the classroom. This demonstrated that the teacher-student interactivity was increased. Moreover, students contacted each other in addition to the class environment. They shared their experiences related to the course, such as photos that showed them preparing for videos and the videos that showed they were reading papers after class. This shows that socialization within the class was also increased. The students also responded to surveys to evaluate the teacher's materials. With this digital feedback, the instructor found the opportunity to further develop teaching methods and resources. These results correlates with the Pappas (2014) arguments on Twitter which claim that Twitter has the capacity to increase interactivity and collaboration among students and it can also be used as a feedback tool.

The analysis of second part builds on the first part's results. First of all, based on the percentages, it can be concluded that students generally have positive attitudes towards the use of Twitter as a part of coursework. In general, they perceived Twitter as a platform where they can share knowledge, experiences, and thoughts. Most of them agreed that Twitter helps them to express themselves freely and be active in learning. A total of 49% of the students pointed out that they feel more engaged with the course by using the Twitter channel. Moreover, 40% agreed that Twitter usually was the easiest way for students to discuss a topic during the learning.

The research results clearly indicate that students approach Twitter positively. They mostly stated that 140 character limitation is not a bother. By a majority, they did not find using Twitter a waste of time. On the contrary, they thought that it helped them to express themselves. A total of 82% replied that they would still use Twitter even if it was not a part of a course. The students in the study commonly perceived Twitter as a tool that helps to collaborate with an instructor and other classmates.

These findings also correlate with the Pappas arguments about Twitter advantages in the learning process. In line with Pappas' arguments, students held a view that Twitter supports faster communication and motives them to be more engaged and active in class. The results of this study did not affirm with the list which Pappas (2014) asserted as disadvantages. Students did not find a 140 characters' limitation as a challenge. These findings are different from the study from which the questionnaire was taken. Deni and Zenial (2015, pp. 198-203) had found that students had a negative perception towards Twitter itself as a learning tool. In their article, students expressed that they found the messages which were posted on Twitter to be superficial. Most of them expressed that Twitter did not help them to clarify their ideas. Students found character limitation as a barrier, On the contrary, this study showed that students felt comfortable with using it as a pedagogical tool. Students also thought that they learnt to be more precise by the character limitation.

There might be two main reasons why findings between the two studies are different. The first reason can be related to the implementation process. At the beginning of the semester, students were asked to open new Twitter accounts with the ID of the course. Students were allowed to use this account just for the class. By doing this, distractibility was limited. The second reason might be related to the evaluation process. Deni and Zenial (2015, pp. 198-203) had allocated 15% of total evaluation to Twitter use within the course. However, in this research, students did not have any worries about grades because implementation was separate and did not have an effect on students' grades.

Conclusion

In today's digital worlds, physical time and space constraints for communication have lost their significance. By this context, education has become an activity that emerges beyond time and distance. With the rise of Web 2.0 technologies, online learning is not focused on a theoretical approach but on implementation. The challenge both educators and learners have is how to advance the mindset beyond the traditional lecture-based passive learning environment.

Nowadays, interactivity shapes learning. Students who are digital natives, actively engage in the learning situation and quickly establish comfort with the technology. New media offers a wealth of opportunities for interaction. Social media has the possibility to engage learners and increase interaction beyond the classroom. This study reveals how Twitter may be integrated into a course and increase the total effectiveness of instruction. It shows that students feel comfortable with using Twitter as a learning tool and developing positive attitudes. According to most of the students in the study, Twitter made them more active in learning and provided alternative ways to gain knowledge. All in all, it can be said that the use of Twitter matters in the teaching and learning process and encourages future studies regarding this innovative pedagogical tool.

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