

# 40<sup>th</sup> annual Proceedings

Selected Research and Development Papers - Volume 1  
Presented at The Annual Convention of the Association for  
Educational Communications and Technology

**AECT** Sponsored by the Research and Theory Division  
And  
The Division of Instructional Design  
Jacksonville, FL

## Editors

Michael Simonson, Ph.D.  
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Nova Southeastern University  
Davie, FL

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# 2017 Annual Proceedings – Jacksonville: Volumes 1 & 2

Volume 1: Selected Research and Development Papers  
And  
Volume 2: Selected Papers  
On the Practice of Educational Communications and Technology

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The Annual Convention of the Association for Educational Communications and Technology  
Sponsored by the Research and Theory Division  
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## Preface

For the thirty-ninth 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 Jacksonville, FL. 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  
Deborah J. Seepersaud  
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# **Gamification for Change: A New Approach to Investigate Students' Attitudes Toward Educational Gamification in Online Learning Environments**

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## **Introduction**

Gamification is “the use of game design elements in non-game contexts” (Deterding, Dixon, Khaled, & Nacke, 2011, p. 10). Gamification in education differs from creating a full-fledged game as it focuses on extracting the factors that make video games fun and pleasurable and adapts those factors into course design (Deterding et al., 2011; Measles & Abu-Dawood, 2015). The purpose of educational gamification is to motivate students by creating an engaging learning experience that can keep students focused on the learning task (Abudawood, Measles, Madrigal, & Kaplan, 2015). Instructional designers may insert one or more game design elements like: (a) badges, (b) leaderboards, (c) points, (d) levels, (e) storylines, or (f) avatars to promote students’ interactions with each other and their interactions with the course content.

In education, most empirical gamification studies focus on the effectiveness of using game design elements in specific learning contexts (Dicheva, Dichev, Agre, & Angelova, 2015). Unfortunately, researching students’ attitudes towards gamification in online learning environments is limited. In addition, there is a lack of “validated psychometric measurements” created according to rigorous research methodologies (Ortiz, Chiluiza, & Valcke, 2016). Most of the gamification research in higher education that sought students’ perspectives was conducted after students’ involvement in a gamified learning experience (Chou & He, 2017; Denny, 2013; Domínguez et al., 2013; Fotaris, Mastoras, Leinfellner, & Rosunally, 2016; Kumar & Khurana, 2012; O’Donovan, Gain, & Marais, 2013; Pettit, McCoy, Kinney, & Schwartz, 2015). Because developing gamified online courses are costly endeavors (Bernik, Bubas, & Radosevic, 2015), using validated instruments to investigate students’ attitudes toward gamification in online learning environment before implementation is needed.

To overcome the lack of rigorous methodologies that investigated students’ attitudes before the implementation of educational gamification, this paper reports a research methodology to investigate graduate and undergraduate students’ attitudes toward gamification in online learning environments. This explanatory mixed-method approach employs both quantitative and qualitative methods to explore students’ perspectives toward the pleurability of different learning experiences. These learning experiences could be gamified and implemented in online courses using various game elements: (a) feedback, (b) points, (c) progress bar, (d) storytelling, (e) badges, and (f) levels. The current approach is based on: (a) the concept of pleurability, (b) the self-determination theory of motivation (SDT), and (c) situated learning. This approach applies two methods for investigation: (1) Pleasurable Learning Experiences Scale (PLLEXs) (A, 2016) to assess students’ attitudes toward video games and gamification quantitatively and (2) semistructured interviews to assess students’ attitudes toward gamification qualitatively.

This new approach proposes to identify the main key features of educational gamification from students’ perspectives with the objective of changing the way of identifying students’ needs before the implementation of educational gamification in online learning environments. This change in approach will inform our practices as instructors and instructional designers in the field of learning technologies to enhance students’ learning and performance in higher educational institutions.

## **Theoretical Background of Educational Gamification**

### **The Concept of Pleurability**

The concept of pleurability could be considered from two perspectives: (a) Human-computer Interaction (HCI) design and (b) video game design. From an HCI design perspective, the effective product design should meet three consumer needs proposed by Jordan (2003) as a three-level hierarchy: (1) functionality: refers to the product containing the necessary functions to perform the intended tasks, (2) usability: refers to the product being easy to use, (3) pleurability: refers to the product being a living interactive object that brings emotional joy when used.



The pleasurable of the product can be further classified into four types: (a) *physio* pleasure, (b) *socio* pleasure, (c) *psycho* pleasure, and (d) *ideo* pleasure (A, 2016; Jordan, 2003). These types of pleasure are defined as

- physio pleasure—the pleasure derived from our senses such as touch and feel,
- socio pleasure—the pleasure derived from having social relationship with others,
- psycho pleasure—the satisfaction derived from the feeling of competence when having the required skills and resources to accomplish a certain task, and
- ideo pleasure—the emotional pleasure derived from people’s values of a specific theoretical entity, like the emotional value of using environmental friendly products that goes beyond the functionality and usability of the product (A, 2016; Jordan, 2003).

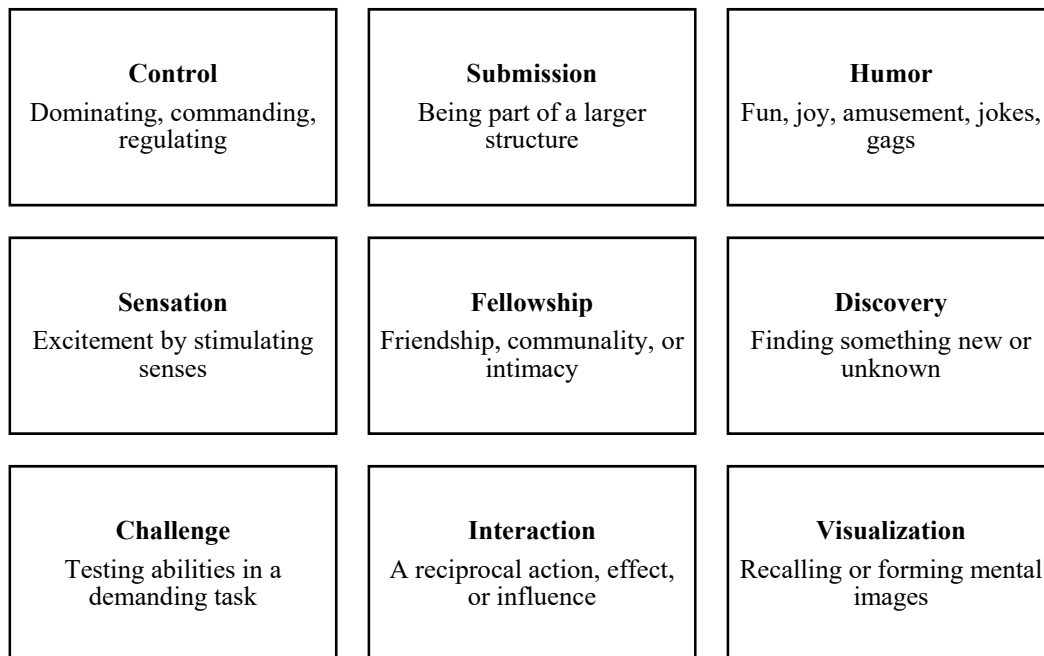
These four types of pleasure can be theorized from video game design perspectives to inform the design of educational gamification by utilizing various game elements that can evoke different pleasurable aspects of learning (A, 2016). Table 1 illustrates the four pleasurable aspects in video games using game elements.

*Table 1. Four Pleasurable Aspects of Video Game Elements*

Physio Pleasure	Socio Pleasure	Psycho Pleasure	Ideo Pleasure
Points Progress Tracking	Collaboration Feedback	Challenges Levels	Badges Leaderboards Storytelling

*Note.* A (2016)

Educational gamification aims to motivate and engage students in their learning. Designing gamified courses should make learning more pleasurable and fun (A, 2016). The Playful Experiences (PLEX) framework is a game design framework that classifies the fun and playful factors that one would experience while interacting with video games into 22 categories (Arrasvuori, Boberg, Holopainen, Korhonen, Lucero, & Montola, 2011). A (2016) found that only seven categories from the 22 PLEX categories were appropriate for use in learning contexts with two additional categories added (interaction and visualization). These nine categories formed the Pleasurable Learning Experiences Scale (PLLEXs), as illustrated in Figure 1.



*Figure 1. The Nine Categories of the Pleasurable Learning Experiences Scale (PLLEXs)*

## Self-Determination Theory of Motivation

Human motivation is vital to understanding why people are moved to do a certain task. There are two sources of human motivation that can drive someone to do a specific task: (a) the task itself being interesting and enjoyable, which refers to the task features, and (b) the satisfaction that individuals gain from performing a task, which refers to the satisfaction of innate psychological needs (Ryan & Deci, 2000). The *self-determination theory* (SDT) is a macro theory that focuses on understanding the innate psychological needs that spur a student's motivation (Ryan & Deci, 2000). In this theory, Ryan and Deci distinguished between two kinds of motivation: intrinsic motivation and extrinsic motivation (2000). When the task is intrinsically motivating, the person continues their involvement due to the feeling of enjoyment, rather than from attaining external rewards. According to SDT, a task becomes intrinsically motivating when three basic psychological needs are satisfied (Ryan, Rigby, & Przybylski, 2006):

- the need for autonomy, which means the task is done because of its personal value;
- the need for competence, which means the task is difficult but doable and doing it can enhance the feeling of self-efficacy; and
- the need for relatedness, which means the task can afford social connection (Ryan et al., 2006).

While intrinsic motivation is an independent construct from extrinsic motivation, they do not oppose each other because human motivation can also be theorized as a continuum from fully internal to fully external motivation (Ryan & Deci, 2000). Therefore, the balance between intrinsic and extrinsic motivators in designing gamified online learning environments is essential to sustaining student engagement.

Engagement focuses on sustaining student attention by creating an immersive learning environment that can motivate students to continue working on the learning task. SDT has been utilized in various contexts, including video game play, to understand how games work to satisfy players' psychological needs (Przybylski, Rigby, & Ryan, 2010). Playing video games can be an intrinsically motivating activity because players may feel competent, autonomous, and related as a result of their video game play (Ryan et al., 2006). These three needs have been found to be strong predictors of game enjoyment and of future game play (Ryan et al., 2006). In light of SDT, gamification in online learning environments should address these three innate psychological needs in order to maintain students' intrinsic motivation by providing (a) freedom of choice to allow for autonomy, (b) challenging but doable tasks to promote competence, and (c) communication and collaboration opportunities for social connection (Aparicio, Vela, Sánchez, & Montes, 2012).

While PLLEXs is based on the PLEX framework, considering the underlying psychological needs that can stimulate students' intrinsic motivation is important. Based on these three innate psychological needs—autonomy, competence, and relatedness—the proposed approach connects the PLLEXs subscales and categories to the associated psychological needs that should be satisfied to motivate students in gamified online learning environments, as illustrated in Table 2.

*Table 2. PLLEXs Subscales and Categories with Associated Psychological Needs According to SDT*

PLLEXs Subscales	PLLEXs Categories	Associated SDT Psychological Needs
Preferences for Instructions	Control	Autonomy: The gamified course provides freedom of choice to promote the feeling of the learner being in control of his/her learning path.
	Submission	Relatedness: The gamified course provides opportunities for learners to feel that their work is one part of a larger structure.
Preferences for Teaching Styles	Humor	Relatedness: The gamified course is designed in a way that reflects a sense of humor to promote the feeling of fun.
	Sensation	Competence: The gamified course promotes the feeling of competence by stimulating students' senses through the use of multimedia (video) to illustrate skills.

PLLEXs Subscales	PLLEXs Categories	Associated SDT Psychological Needs
	Visualization	Competence: The gamified course promotes the feeling of competence by using multimedia (video) to help students recall information or form a mental image of a concept or a skill.
Preference for Activities	Challenge	Competence: The gamified course promotes the feeling of competence by providing learning tasks that are challenging but doable.
	Discovery	Autonomy: The gamified course provides various opportunities for students to try new things.
	Fellowship	Relatedness: The gamified course provides opportunities for interaction and communication to promote the feeling of fellowship.
	Interaction	Relatedness: The gamified course provides opportunities for reciprocal action to promote interaction.
Preferences for Learning Effectiveness	Fellowship	Relatedness: The gamified course provides opportunities to build rapport.
	Control	Autonomy: The gamified course provides opportunities to control the flow of learning content.

*Note:* PLLEXs = Pleasurable Learning Experiences Scale (A, 2016); SDT = self-determination theory (Ryan & Deci, 2000)

## Situated Learning

*Situated learning* considers learning that occurs “in the same context in which it is applied, constructed socially by participants through their interactions and collaborations” (Abu-Dawood, 2016, p. 374). As a term, situated learning was invented by Lave and Wenger in 1991, when they described learning as “a process that takes place in a participation framework, not in an individual mind” (p. 15). According to this theory, learning is situated in an authentic context that encompasses knowledge and skills to be acquired. Through participation in such authentic contexts, learners become involved in a community of practice; this community embodies unique identities and behaviors and when learners acquire those behaviors, novice learners become experts as they move from the periphery of that community to its center (Lave & Wenger, 1991).

In video games, players learn how to play the game itself through rapid *cycles of expertise*, which means that players are involved in repeated cycles of practicing skills until these skills become nearly automated, then having these skills challenged in a new situation, which necessitates acquiring a new set of skills and continued practicing until reaching a higher level of mastery (Gee, 2004). This continuous involvement in the rapid cycles of expertise enables players to try different identities and transfer their gained experiences into new situations. Essentially, games are socially and culturally situated systems, which means that games are one component in complex social systems that include players as actors and social norms as resources that can enable or disable the course of play (Ramirez & Squire, 2014). This notion has implications for designing gamified online learning environments.

Educational gamification can provide opportunities for learners to take new roles and try new identities, such as doctors, lawyers, writers, or instructional designers. Because learning is situated in an authentic context, gamified online courses should provide opportunities for students to be involved in rapid cycles of expertise that shape failure as a necessary step to succeed until reaching level of mastery. The use of storyline can create learning situations where students can construct their experience through cognitive course content interactions and social interactions with others (Abu-Dawood, 2016). Gee (2008) discussed the projective identity in games using a situated learning matrix, in which “learning moves from identity to goals and norms, to tools and technologies, and only then

to content” (p. 37). This matrix signifies the necessary conditions to be met in order to construct these experiences; these conditions are not limited to individuals’ cognition but also consider the active participation in a social system as part of meaning making (Gee, 2008). The design of educational gamification should consider rethinking the roles of students and the assessment mechanism used to promote students’ competence and encourage them to try new identities and to have a wide range of experiences to create shared knowledge.

In this proposed approach, the use of storytelling as a game element is proposed and supported by situating learning theory. Students’ perspectives toward the pleurability of different learning experiences can be investigated where storytelling as a game element is mapped to more than one learning experience in PLLEXs. The use of storytelling in PLLEXs serves three goals: (a) as rules given to the learners, (b) as narratives used to present the learning content, and (c) as a scaffolding mechanism to provide supportive information as needed.

### A New Approach for Investigating Students’ Attitudes Toward Educational Gamification

The proposed new approach to investigate students’ attitudes toward the pleurability of educational gamification in online learning environments is based on *explanatory sequential design*, discussed by Creswell and Plano Clark (2011). This two-phase approach supports the use of both qualitative and quantitative methods for investigation. The first phase focuses on collecting quantitative data using PLLEXs to explore the pleurability of 22 learning experiences from students’ perspectives. The second phase focuses on collecting qualitative data by conducting semistructured interviews with selected students to get their insights regarding their rationales of considering certain learning experiences as pleasurable or unpleasurable ones. According to this approach, the collected data is integrated during the interpretation stage, as illustrated in Figure 2. The analysis for each method should be carried out independently; then, the quantitative results would be further explained by the qualitative findings. In this way, the statistical quantitative results are compared with the qualitative thematic findings to search for possible additional themes that might emerge. The quantitative phase informs the plan and the implementation of the qualitative phase. The results should be reported giving detailed description of participants’ experiences and the researchers’ interpretations to provide rich contextualized information to the reader. Both quantitative and qualitative methods will be discussed in detail.

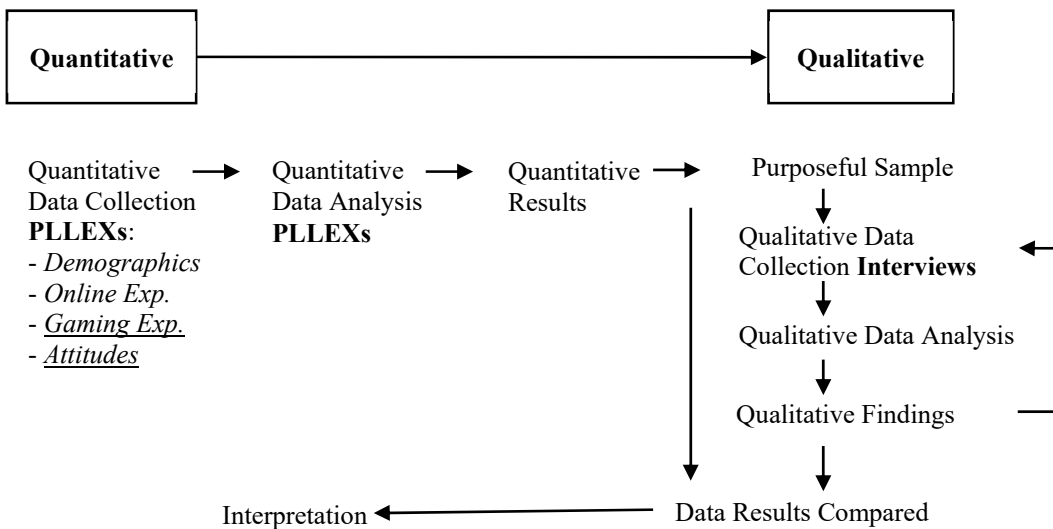


Figure 2: The Approach Design for Investigating Students' Attitudes Toward Educational Gamification

### Pleasurable Learning Experiences Scale (PLLEXs)

As this approach encompasses both quantitative and qualitative phases, the quantitative phase employs a nonexperimental one-time attitudinal survey (PLLEXs). The PLLEXs is a 4-point Likert scale created by A (2016) to fulfill the need for having a quantifiable measure to assess students’ attitudes toward the pleurability of different learning experiences. These learning experiences can be gamified using specific game elements, thus creating educational gamification. The PLLEXs is based on the Playful Experiences (PLEX) framework (Arrasvuori et al.,

2011). The PLEX framework encompasses 22 categories that describe the playfulness aspects that a user can experience while interacting with video games (Arrasvuori et al., 2011). However, PLLEXs consists of seven categories out of the 22, with two additional categories that emerged during the application of the scale in learning contexts (A, 2016), for a total of nine categories. According to A (2016), these nine categories demonstrate the pleasurable feelings that college students may experience in their learning environments. These categories were illustrated in Figure 1.

Due to the nonexperimental nature of this approach, the use of PLLEXs is not intended to test hypotheses but to gain useful insights regarding students' perspectives toward gamification and establish priorities as the research proceeds. PLLEXs includes two types of variables: (a) independent variables and (b) dependent variables. The independent variables occupy the first three parts of the survey: (a) demographics, (b) online learning experience, and (c) gaming experience. The questions in these three parts are designed to serve two goals: (a) describing the participants and (b) looking for possible correlations between participants' attributes and their attitudes. Because gamification is stemmed from video games, understanding students' gaming habits is essential to explore any possible correlation between video games experience and students' attitudes toward educational gamification. The descriptions of all independent variables that are related to students experience with video games are illustrated in Table 3.

*Table 3. Description of Gaming Experience Independent Variables*

Independent Variables	Description
Previous Gaming Experience	Students self-report whether they have played video games before.
Current Gaming Experience	Students self-report the number of video games they are currently playing: 0, 1-2, 3-4, 5-7, more than 7 games.
Gaming Frequency	Students self-report how frequently they play video games: daily, weekly, monthly, rarely, or never.
Numbers of Gaming Hours	Students self-report the number of hours they spend every week playing video games: 0, 1-3, 4-6, or more than 6 hours.
Gaming Motivation	Students self-report their reason for playing video games: to play with friends, to make new friends, as a mental challenge, as a physical challenge, to relieve stress, to get rid of boredom, none, or other (specify).
Level of Gaming Experience	Students self-report their level of experience in playing video games: no experience, novice, intermediate, or expert.
Game Genre	Students self-report their favorite types of video games: puzzle, casual, strategy, action, adventure, fighting, shooter, racing, sports, role-playing, MMOVGs, or none.
Player Type	Students self-report their type as players: explorer, achiever, winner, socializer, or none.
Gaming Likeness	Students self-report how much they like playing video games by dragging an indicator on a scale (0-10).

*Note.* MMOVGs = Massively Multiplayer Online Video Games.

The fourth part of the survey is a 4-point Likert scale that encompasses 22 items. These items are organized into four subscales, which constitute the four dependent variables:

- Preferences for Instructions (8 items),
- Preferences for Instructors (3 items),
- Attitudes towards Activities (6 items), and
- Preferences for Learning Effectiveness (5 items).

Each item represents a specific learning experience. Students can indicate their agreement/disagreement with the pleurability of each learning experience by choosing one answer from the four possible choices: (1) strongly disagree, (2) disagree, (3) agree, and (4) strongly agree. The more agreement the student shows on any item, the more weight will be assigned to that item. For example, if a student responds to the item "I like instructors

to provide clear rubrics.” by selecting “strongly agree,” the weight that will be given to that item is 4 and it could be inferred that the student perceived this experience as a fun and playful learning experience.

### **Semistructured Interviews**

Semistructured interviews are the second phase of this approach and will be conducted to provide rich details on students’ perspectives towards gamification in online learning environments. This qualitative phase of the current approach will help to further explain the correlations that might exist between dependent and independent variables and the reasons behind any such correlations. In this case, the interviewer is the instrument for qualitative data collection. The criteria for selecting individuals to interview necessitates that they must have had an experience with online learning environments. This information could be obtained from students’ responses on the survey question where they report the number of online courses they have had. Because this approach is based on SDT of motivation and situated learning, selecting individuals who have diverse gaming experience should be considered to provide differing points of view. Graduate and undergraduate students who are at different levels of video game experience could hold different perspectives toward the pleurability of gamification in online learning environments. To get a balanced view, the researcher can select some students whose answers on the attitudinal questions would represent more positive attitudes toward gamification and others who would be identified as exhibiting more negative attitudes toward gamification. This purposeful sampling of selecting outliers’ cases allows the researcher to target individuals who might be likely to provide in-depth information to further explain the quantitative research findings.

The semistructured interview protocol works best for this approach because it can be seen as more of a conversation that draws out rich, in-depth data (Qu & Dumay, 2011). The data gathered through interviews must be understood within its social context, rather than considering the interview itself as a tool for collecting data (Qu & Dumay, 2011). This comprehensive understanding of the social context will help instructional designers and instructors to include applications of educational gamification in online courses. In this regard, the design of online courses can tackle various motivational issues of teaching and learning in online environments. Since interviews are best done when the interviewer approaches the interviewee with “a respect for and curiosity about what people say, a willingness to acknowledge what is not understood, and the ability to ask about what is not yet known” (Rubin & Rubin, 2005, p. 13), a semistructured approach will allow the interviewer to follow the course of conversation as it emerges through the dyadic exchange.

A semistructured interview could start by asking some questions of the interviewee to initiate the discourse, such as: (a) “Tell me about your personal experience with video games.” (b) “Why did you perceive (item X) as the most pleasurable learning experience regarding instructions?” or (c) “Why did you perceive (item Y) as the least pleasurable learning experience regarding instructions?” However, the interviewer should let the participants lead the way with their own unique insight as well. For this reason, the interviewer must listen for cues from the interviewee to find areas where he/she can expand on the findings.

The interviewer could use both scheduled and unscheduled probe techniques during the semistructured interviews to elicit as much information from the participant as possible (Qu & Dumay, 2011). Scheduled probes can help to elaborate on interesting or unusual comments made by the interviewee by asking follow-up questions like: “Can you tell me more about that?” and “Can you give an example?” A semistructured interview is not a neutral process, but “a situated event in which the interviewer creates the reality of the interview situation” (Qu & Dumay, 2011, p. 247). Due to the subjectivity that might be imposed by the interviewer, the interviewer should report the interview process and findings with thick descriptions. This part of the process must include in-depth details of the interview setting, context, participants, and the interviewer’s actions to facilitate the transferability of the findings into other contexts (Yilmaz, 2013).

### **Conclusion**

Educational gamification is intended to design engaging learning experiences that can spur students’ motivation to learn. This type of persuasive design adapts the strategies that make video games pleasurable and fun into the learning task so students feel fully immersed in their learning. To accomplish this goal, educators and instructional designers in higher education institutions should explore what would make learning pleasurable and fun from students’ perspectives as a first step to designing effective educational gamification. Unfortunately, there is limited research that investigates students’ attitudes toward educational gamification before its implementation in online learning environments. Moreover, most of the studies that intended to analyze students’ needs lacked the use of validated tools that are based on theoretical foundation. This proposed approach is a research methodology to

investigate graduate and undergraduate students' attitudes toward gamification in online learning environments. This explanatory mixed-method approach employs both quantitative and qualitative methods to explore students' perspectives toward the pleurability of different learning experiences.

The current approach is based on: (a) the concept of pleurability, (b) the self-determination theory of motivation (SDT), and (c) situated learning. The concept of pleurability refers to joy that students would experience while engaging in gamified online courses. This experience can be classified into nine categories: (a) control, (b) submission, (c) humor, (d) sensation, (e) visualization, (f) challenge, (g) discovery, (h) fellowship, (i) interaction. These nine categories are associated with three psychological needs that should be satisfied to make learning internally motivating activity to the students. According to SDT, these needs are autonomy, competence, and relatedness. Because learning is situated in an authentic context that encompasses knowledge and skills to be acquired, gamified online courses should provide opportunities for students to try multiple identities and be involved in rapid cycles of until reaching level of mastery. In this approach, the use of storytelling as a game element can support situating learning by giving students clear rules, presenting the course content as a story that engages and empowers students, and providing scaffolding to students as needed.

This proposed approach employs two methods for investigation: (1) the Pleasurable Learning Experiences Scale (PLLEXs) (A, 2016), and (2) semistructured interviews. The PLLEXs is a survey that consists of four major parts: demographics, online learning experience, gaming experience, and attitudes toward gamification. The attitudinal questions are targeting students' preferences for: (a) Instructions, (b) Instructors, (c) Activities, and (d) Learning Effectiveness. These four constructs constitute the overall students' attitudes toward the pleurability of educational gamification. According to this proposed approach, data collection and analysis are done in two phases sequentially. The first phase focuses on collecting quantitative data using PLLEXs to explore students' attitudes toward video games and gamification quantitatively. The second phase focuses on collecting qualitative data by conducting semistructured interviews with selected students to examine their attitudes toward gamification qualitatively. The analysis of each phase would be carried out independently and the quantitative phase should inform the plan and the implementation of the qualitative phase. The collected data is integrated during the interpretation stage to provide in-depth information to the researcher. In this way, the approach could help to identify the key features of educational gamification from students' perspectives, which would change the way students' needs in online gamified education are identified and also change the way educational gamification could be implemented in online learning environments.

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# **Facilitating Higher Levels of Thinking and Deeper Cognitive Processing of Course Text Using Reciprocal Teaching Strategies in Asynchronous Discussion Forums**

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## **Abstract**

Twenty-five students enrolled in the asynchronous, online community college course Introduction to Education participated in this study. The course was taught at a community college in the Southeastern region of the United States. Students were placed in either a traditional discussion group or a reciprocal discussion group using a convenience sample based on enrollment in a section of the 16-week course. The reciprocal group served as the treatment group and received embedded reciprocal teaching training and used the four reciprocal teaching strategies and peer teaching in asynchronous discussion forums. The traditional group served as the control group and followed typical discussion forum protocol by posting in a teacher-led discussion forum and responding to two other students. Results showed the reciprocal discussion group had significantly higher-level thinking and deeper processing of course texts during discussions. The study found that reciprocal teaching could be successfully implemented in an online, asynchronous course.

Keywords: reciprocal teaching, interaction, cognitive strategies, metacognitive strategies, peer teaching, asynchronous online course, and discussion forum.

## **Introduction**

Reciprocal teaching is an interactive instructional procedure that improves students' text comprehension skills through scaffolded instruction of four comprehension-fostering and comprehension-monitoring strategies (Palincsar & Brown, 1984; Rosenshine & Meister, 1994). The four reciprocal teaching strategies are predicting, questioning, clarifying, and summarizing (Palincsar & Brown, 1984, 1986; Palincsar, Brown, & Martin, 1987). Reciprocal teaching involves student-led instruction, modeling, practice, and feedback in metacognitive, self-monitoring, and evaluating strategies (Brown, Campione, & Day, 1981). According to the literature, reciprocal teaching leads to improved reading comprehension. It has been studied in many contexts with multiple subjects.

In this study, reciprocal teaching was translated into an online, asynchronous course. Purposeful, strategy-rich discussion forums resulted and enabled students to negotiate meaning and deeply understand course texts. Reciprocal teaching supported the negotiation of meaning in a social learning atmosphere. Peer teaching resulted in generative processing through the reworking of a topic from the textbook into a lesson and questions for peers (Collins et al., 1989; King, 1991; Pressley et al., 1992; Rosenshine et al., 1996; Wood et al., 1990). The strategies and peer teaching engaged students in high-level, content-based discussions leading to deeper understanding course texts in the online, asynchronous context.

Following are the research questions that guided this study:

1. To what extent did the type of discussion forum strategies, traditional or reciprocal, effect levels of thinking during posts in asynchronous discussion forums?
2. To what extent did the type of discussion forum strategies, traditional or reciprocal, facilitate deeper understanding of the course textbook?
3. To what extent were reciprocal teaching strategies and peer teaching implemented in online, asynchronous discussion forums?
4. What impact did traditional discussion forums have on student reflections of the relationship between discussion forums and learning?
5. What impact did reciprocal teaching have on student reflections of the relationship between strategies, peer teaching and learning?

### Methods and Data Sources

Quasi-experimental, multiple methods were employed to compare the effects of traditional discussions and reciprocal teaching discussions. Outcome variables were level of thinking, understanding of course texts, online reciprocal teaching implementation, and students' reflections on the relationship between discussions, strategies, and learning. The instruments used to measure the dependent variables included: the SOLO Taxonomy, Midterm and Final Exam, Reciprocal Teaching Rubric, and the Learning Reflection Tool.

The SOLO taxonomy was first developed in 1989 to measure the quality of learning outcomes (Biggs, 1989). The SOLO taxonomy was used to measure level of thinking in this study. Table 1 shows the levels of thinking and numeric score associated with each level of the SOLO taxonomy.

*Table 1. Modes and Levels of the SOLO Taxonomy*

Mode	Structural level	SOLO
Next	Level 5: Extended abstract	The learner now generalizes the structure to take in new and more abstract features, representing a higher mode of operation.
Target	Level 4: Relational	The learner now integrates the parts with each other, so that the whole has a coherent structure and meaning.
Target	Level 3: Multi-structural	The learner picks up more and more relevant or correct features, but does not integrate them.
Target	Level 2: Uni-structural	The learner focuses on the relevant domain, and picks up one aspect to work with.
Previous	Level 1: Pre-structural	The task is engaged, but the learner is distracted or misled by an irrelevant aspect belonging to a previous stage or mode.

## Results

Results showed that reciprocal teaching strategies promoted significantly higher levels of thinking and deeper processing of course texts compared to traditional methods. Level of thinking SOLO scores for all discussion posts were higher in the reciprocal group ( $M = 4.1$ ,  $SD = 0.4$ ) than in the traditional discussion group ( $M = 2.8$ ,  $SD = 0.3$ ), and the difference between these discussion groups was statistically significant,  $F(1,23) = 94.699$ ,  $p < .001$ . There was a large effect size,  $\eta^2 = .81$ . Deeper understanding of course texts was measured by comparing scores of each group on a midterm and final exam. Total midterm scores were higher for the reciprocal group ( $M = 112.4$ ,  $SD = 4.7$ ) than for the traditional group ( $M = 103.3$ ,  $SD = 8.4$ ). The differences between the groups was statistically significant  $F(1,22) = 9.619$ ,  $p = .005$ . There was a large effect size,  $\eta^2 = .30$ . Total final exam scores were higher for the reciprocal group ( $M = 111.9$ ,  $SD = 4.5$ ) than for the traditional group ( $M = 98.7$ ,  $SD = 12.9$ ). The differences between groups on the total final exam was statistically significant, Welch's  $F(1, 19) = 18.576$ ,  $p < .01$ .

Results also showed that the reciprocal teaching strategies and peer teaching could be implemented in discussion forums. To determine the effectiveness of strategy use in the reciprocal environment, students were rated on each strategy forum post using the reciprocal teaching rubric. Rubric grades were awarded 25 points for an exemplary post, 20 points for a proficient post, 15 points for a developing post and 10 points for a beginning post. A frequency distribution of all strategy posts combined showed that the mean of the 381 posts over the 11 weeks was 24, ( $N = 381$ ,  $M = 24$ ,  $SD = 1.9$ ). Only one student scored at the beginning level, four students scored at the developing level, 65 students scored at the proficient level, and 311 students scored an exemplary on the rubric in the overall strategy forum analysis. The peer-teaching forum was found to be a very effective way for students to lead class discussions. The peer teaching forum was conducive to carefully planned lesson content and discussion questions posted by students and provided time for students to formulate a well-developed lesson and questions.

The qualitative analysis of the study was conducted through surveys where students reflected on the relationship between discussion forums, strategies and learning. The survey for the reciprocal group was divided by strategy to help gain insight into student perspectives on each strategy. Students felt predicting helped prepare them for reading. Students found questioning helpful, especially when the instructor or other students answered the questions they posted. Similarly, the responses in the survey related to clarifying showed that students found value in having a space to post items for which they needed clarification where they could receive answers from the instructor. Summarizing helped them understand, remember and organize thoughts. Students felt peer teaching was innovative, unique and fun. The enjoyed the challenge and looked forward to being the peer teacher. Overall both groups of students highly rated their discussion forum types.

## Discussion

Adding to findings reported in previous literature, reciprocal teaching supports text comprehension. Reciprocal teaching in the context of an online, asynchronous community college course supported interactions that led to higher levels of thinking and deeper understanding of course texts. All three types of interaction were present in the reciprocal teaching implementation. Student-content, student-teacher, and student-student interaction occurred as students used cognitive and metacognitive strategies to process the content in the course textbook during discussions. Student-content interaction was present in all of the forums as student posts were based on the content in the course textbook. The high prevalence of student-content interaction ensured there was not a lack of initial understanding of content prior to engaging in online discussions. The peer teaching forum facilitated student-student interaction as students asked and answered questions and responded to each other.

Relating back to the literature review, the results from this study showed that the full reciprocal teaching method could be effectively implemented in an online course leading to significantly higher levels of thinking and deeper processing of course texts.

## Limitations

The first limitation was the small sample size ( $n = 25$ ). There was a small number of students enrolled in the two sections of the course resulting in a small sample size. Research conducted with a larger sample size would increase the validity of the results and generalizability to all learners. A second limitation was the quasi-experimental design and sampling procedure. The study was conducted over two different semesters to obtain enough participants for a control and treatment group. Since the study was conducted over two semesters, there may have been a threat to external validity. A third limitation was the difficulty level of the course and textbook used in the study. Community colleges are two-year institutions and courses are not reflective of the difficulty level of bachelors or masters level courses. The course, *Foundations of Education* is a survey course and is not as difficult as more advanced upper-division courses. The introductory nature of the course may not have necessitated higher-level thinking. Another limitation was that there was not a pre-test or assessment of prior content knowledge given to participants. There was no way to determine whether the significant results of the reciprocal group were due to prior knowledge or higher aptitude than the traditional group. Another limitation came with the technology used by some of the peer teachers. Peer teachers were not trained to use the technology in Moodle and there was occasionally a struggle to get the lesson posted and viewed. Some of the students had difficulty accessing the lessons without intervention from the teacher. Finally, even though every effort was made for the ratings of discussion posts to be blind, the researcher and instructor could easily distinguish between the groups based on the questions asked in the forums. The familiarity with the course content and the instructor-led questions made it possible for the researcher and instructor to know the group from which the posts were written, possibly leading to experimenter bias.

## Conclusions

This study was unique in that the full reciprocal teaching method was implemented in an online, asynchronous course with fidelity including the four strategies and peer teaching. The discussion forums provided a social setting so that students could share the responsibility of making meaning through social negotiation using generative learning strategies (Glaser, 1990; Vygotsky, 1978; Wittrock, 1974, 1990). The reciprocal teaching strategies and peer teaching fostered high levels of student interaction with the content and with the teacher and other students having a significant positive influence on learning. Peer teaching resulted in generative processing through the reworking of a topic from the textbook into a lesson and questions for peers (Collins et al., 1989; King, 1991; Pressley et al., 1992; Rosenshine et al., 1996; Wood et al., 1990).

Based on the promising findings of this study, practitioners may want to adopt reciprocal teaching in their online courses. The first step is to teach students how to participate in reciprocal teaching. Direct instruction on the strategies and peer teaching can be embedded in learning management system during the first weeks of class using videos, presentations, and documents. The instructor may model the strategies and act as the peer teaching the first week to show students what is expected and how to participate. Grading criteria and rubrics should be presented early in the class.

There is a wide-open door for more studies in distance education focused on improving text comprehension through research validated strategies such reciprocal teaching. Researchers, instructional designers and teachers need to ensure that online courses are engaging, interactive and most of all optimally designed for learning. While this study was a step towards understanding how to increase learning through specific interaction strategies in an online, asynchronous course, there is a lot left to discover about learning in the realm of distance education.

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# Online Learning Design and Implementation Models: -A Model Validation Study Using Expert Instructional Designers

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## Abstract

Online learning continues to grow at unprecedented rates. In higher education over 7.1 million students took a course in 2013, which represented over 33.5% of the total student population. K-12 is growing at similar rates with over 275,000 students enrolled in full time virtual schools in 2011-2012 and over 2 million participating in at least one online course. Corporations are experiencing growth as well with technology based learning at 37.30% and online learning at 24.77%.

Despite this unprecedented growth, there is little research on model formation and model validation for online learning. Two research-based models were created: eSUCCESS and R2D2/C3PO to help project managers, instructional designers, and developers design and implement online learning solutions. Both of these models were created based on research findings using qualitative case study and design and development case study guidelines. Both models have a strong focus on culture, learning, and technology, and the change management strategies necessary for successful design and implementation of online learning in different contexts such as, K-12, higher education, healthcare, military, and corporate organizations.

The purpose of this descriptive qualitative study was to describe the process of model creation for both models and to systematically validate the two models using a survey and The Nominal Group Technique (NGT) with expert instructional designers. Participants were instructional designers who are experts in online learning across industries. Five participants were asked to review materials on the models and provide comments on the models pre-meeting. Following the individual model review, three participants attended a 1 1/2-hour focus group discussion responding to and commenting on each element in the models. The focus group session was professionally facilitated, digitally recorded, and transcribed verbatim.

The NGT is a five-step process whereby participants meet one another, generate ideas based on their pre-work review, share ideas with the group, discuss ideas, and vote and rank items based on original questions about the models. In addition to the discussion session, participants were asked to complete a survey ranking elements of the model using a Likert-scale.

Data analysis included the use of descriptive statistics generated in EXCEL from the survey. Themes generated from the focus group discussion session were analyzed using NVIVO software, which was used as a centralized database for all study materials. A preliminary list of start codes based on the elements of the model was used to begin the data analysis and was supplemented with new emerging themes from the analysis. Similar analysis was done with the individual response sheets the participants submitted as part of the pre-work. Finally, the data analysis showed the results of the voting and ranking at the NGT focus group discussion session. Results of the analysis are presented as a narrative, as a matrix summary to show the level of support for each of the model components, and as potential updates to the models.

The U.S. is behind other developed countries in many areas of academic education and students are finding it difficult to find gainful employment upon graduating from U.S. schools. The cost of education continues to escalate in the U.S. Online learning is a cost-effective way to deliver learning at affordable price points and often at faster rates than traditional classroom. Online education can be available 24X7X365 anywhere in the world where there is an internet connection. Companies and educational institutions are providing classes to diverse cultural populations around the world. Providing project managers, instructional designers, systems administrators, and

developers with research-based models that have been evaluated by experts will give these leaders the tools they need to successfully deliver online learning to cross cultural groups.

## **Introduction**

### **Problem Statement**

Online learning continues to grow at unprecedented rates. In higher education over 7.1 million students took a course in 2013, which represented over 33.5% of the total student population (Allen & Seaman, 2014). K-12 is growing at similar rates with over 275,000 students enrolled in full time virtual schools in 2011-2012 and over 2 million participating in at least one online course (Allen & Seaman, 2014). Corporations are experiencing growth as well with technology based learning at 37.30% and online learning at 24.77% (Miller, 2012).

Despite this unprecedented growth, there is little research on model formation and model validation for online learning (Richey & Klein, 2007; Richey, Klein, & Tracey, 2011). Two research-based models were created: eSUCCESS (Armstrong, 2007; 2008; 2016b) and R2D2/C3PO (Armstrong, 2014; 2016a) to help project managers, instructional designers, and developers design and implement online learning solutions. Both of these models were created based on research findings using qualitative case study and design and development case study guidelines. Both models have a strong focus on culture, learning, and technology, and the change management strategies necessary for successful design and implementation of online learning in different contexts such as, K-12, higher education, healthcare, military, and corporate organizations. The specific problem that was the focus of this study is validation of the two research based models.

### **Purpose Statement**

The purpose of this descriptive qualitative study was to describe the process of model creation for both models and to systematically validate the two models using a survey and The Nominal Group Technique (NGT) with expert instructional designers. For the purpose of this study, the NGT was based on Potter, Gordon and Hamer's (2004) adaptation of the technique. Participants were instructional designers and instructional technologists, who are experts in online learning across industries. Inclusion criteria included more than 5 years of instructional design/instructional technology experience and a doctoral degree in Instructional Design, Instructional Technology, or related field.

### **Research Questions**

The research questions were focused on validating the two models based on the experiences of expert instructional designers and align with Yin's (2014) assertions that case study questions should be "how" and "why" questions and Thomas' (1983) expert requirements that the questions be clear and stimulating for the participants.

**Research Question 1.** How do instructional designers believe the eSUCCESS model serves as a valid framework for design and implementation of online learning programs? Why do they hold these beliefs?

**Research Question 2.** How would the instructional designers augment the model?

**Research Question 3.** How do instructional designers believe the R2D2/C3PO model serves as a valid framework for design and implementation of online synchronous learning programs? Why do they hold these beliefs?

**Research Question 4.** How would the instructional designers augment the model?

### **Methodology and Design**

The methodology was qualitative and the design descriptive case study. Data collection techniques included document review of the models, expert survey responses, and a focus group interview using the NGT technique. Six participants were asked to review materials on the models and provide comments and complete a survey on the models pre-meeting. Five agreed to participate. Following the individual model review, three of the five participants attended a 1 ½ hour NGT focus group discussion responding to and commenting on each element in the models. The focus group session was professionally facilitated, digitally recorded, and transcribed verbatim.

Jones and Hunter (1995) emphasized the importance of recruiting participants who are subject matter experts on the topic. Experienced instructional designers having at least 5 years instructional design experience and



an advanced degree in instructional design, instructional technology, educational technology, or an equivalent degree were recruited. A purposive, convenience sample (Miles & Huberman, 1954) was used based on 25+ years of networking experience with instructional designs who met the inclusion requirement.

Several instruments were employed during the data collection process: 1) pre-data collection questionnaire, 2) pre-focus group model evaluation and survey, and a 3) focus group protocol based on the NGT. The model evaluation, model survey, and focus group data were used for convergence of data following Yin's (2014) call for triangulation to ensure the validity of the data. The Model Evaluation Surveys required participants to write down their own ideas that come to mind as they are reviewed each of the models. The Model Evaluation Survey also required the participants to rank the elements of the models using a Likert Scale.

The NGT is a five-step process whereby participants meet one another, generate ideas based on their pre-work review, share ideas with the group, discuss ideas, and vote and rank items based on original questions about the models. Delbecq and van de Ven (1971) stressed the importance of using an expert in the topic area during the NGT session and Gallagher et al. (1993) stressed that the facilitators must be highly skilled in group facilitation techniques. Both facilitators were experts on the topic having worked on the design and development of the models and both are trained and endorsed Dale Carnegie trainer/facilitators. The focus group was held online using a virtual classroom technology, GoToMeeting. Prior to the NGT focus group and following receipt of Informed Consent and Northcentral University IRB approval, participants received an introduction to the NGT protocol and several published articles that explained the models. Participants were then asked to rate each item in the models on the Model Evaluation Survey using a Likert scale from 1-4 to rank the importance of each element in the model, with 1 as unimportant, 2 of little importance, 3 important, and 4 very important. Space was available for comments and suggestions. Estimated time was 1 ½ hours. Following receipt of the surveys, an NCT focus group session was scheduled. Each of the steps in the NCT protocol was followed:

**Step 1. Introduction and explanation.** A focus group session was held online using the GoToMeeting virtual classroom technology. The session began with an introduction and explanation of the purpose, a review of the agenda (appendix C) and an overview of the procedures for the meeting (5 minutes);

**Step 2. Silent generation of ideas.** The second step for each model was quiet time for silent generation of ideas. Participants were asked to reflect on each model separately and generate ideas for what components that would add to each element of the model and to the model itself and to write these ideas on a sheet of paper (10 minutes);

**Step 3. Sharing ideas.** Participants were asked to share their ideas based on their review of the materials in Step 2 and prior to the NCT session. Brookfield and Preskill's (1999) Circle of Voices protocol (appendix D) was used so that each person could further explain their ideas, initially without interruption. In this step, no debate was allowed and everyone had an opportunity to make an equal contribution to the discussion (3-5 minutes per participant). Total time 15 minutes.

**Step 4. Group discussion.** Continuing with the Circle of Voices protocol, after each participant had shared their individual ideas, group discussion was opened up and cross talk allowed. (15 minutes)

**Step 5. Voting and Ranking.** Facilitators reviewed suggestions for enhancement to each model and presented the suggestions to the group. Participants voted on each suggestion and the results are in the results and findings. Each participant later emailed their silent generation of ideas sheets back to the facilitators.

Data analysis included the use of descriptive statistics generated in EXCEL from the survey. Results were calculated for the average, mean, mode, and standard deviation of each element of the models. Themes were generated from the following: 1) comment section of the surveys, 2) NCT focus group discussion session, and 3) silent generation of ideas sheets. Each data collection vehicle was analyzed using NVIVO software, which was used as a centralized database for all study materials. A preliminary list of start codes based on the elements of the model was used to create parent and child nodes and start the data analysis. The preliminary list of start codes, transferred to parent and child nodes, was supplemented with new emerging themes from the analysis. Finally, in the data analysis are the results of the voting and ranking at the NGT discussion session. Results of the analysis are presented as a narrative and as a matrix summary to show the level of support for each of the model components. This data will be used to update the models.

### Models Validated

The goal of this study was to use expert subject matter experts to validate two research-based models. The first model was the R2D2/C3PO model based on Bonk and Zhang's (2006) R2D2 model that focused on constructivist strategies for developing online instruction. Armstrong (2014; 2016a) expanded this model during

design and development case study research using a blend of synchronous and asynchronous delivery in higher education classes (Armstrong & Thornton, 2012). Five components were added to Bonk and Zhang’s original model along with tools, techniques, strategies, and activities for each component of the model.

**R2D2/C3PO.**

Table 1 shows the R2D2/C3PO model as an expansion of the original Bonk and Zhang (2006) R2D2 model. Each component is described, followed by instructional strategies and activities that can be used for each component. Finally, synchronous tools to support each of the learning activities and instructional strategies are described.

*Table 1. R2D2/C3PO Components, Instructional strategies/learning activities, synchronous tools*

<b>R2D2/C3PO Component</b>	<b>Instructional Strategies/Learning Activities</b>	<b>Synchronous Web-Conferencing Tools</b>
Read/Listening	<p>Reading materials online or offline.</p> <p>Creating participant manuals for each Live synchronous event.</p> <p>Listening to audio materials online or offline.</p> <p>Synchronous Expert Lectures/Presentations/Tutorials Demonstrations.</p>	<p>Downloadable participant manuals as pdf and/or word files.</p> <p>Downloadable audio files.</p> <p>Downloadable video/multimedia files.</p> <p>“Live” synchronous facilitator/faculty presentation/demonstrations/lectures.</p> <p>Facilitator/faculty tools include whiteboards, chats, application sharing, file transfer, share pods, screen sharing, PowerPoint slides, polls, and note boards for announcements, Q&amp;A, and FAQs.</p> <p>Links to websites.</p>
Reflect/Writing/Sharing	<p>Time allocated for reflection:</p> <ol style="list-style-type: none"> <li>1. Pre-work</li> <li>2. During synchronous event.</li> <li>3. Between synchronous events (multi-event course)</li> </ol> <p>Small Group Discussion.</p> <p>Focus Group Discussion.</p> <p>Online Role Play.</p> <p>Self-Assessment.</p> <p>Online Quizzes.</p> <p>Practice.</p>	<p>Downloadable participant manuals used to write reflections and journal.</p> <p>Chat pods used for sharing reflections with other participants.</p> <p>Polls used to capture self-assessment and compare anonymously with other participants.</p> <p>Breakout rooms used for small group discussions, debates, mock trials, role play, practice with partners, and focus groups.</p>
Display	<p>Visual Representations including: pictures, diagrams, graphs, multimedia, video, charts, animations.</p> <p>Demonstrations.</p>	<p>Downloadable participant manuals with visual representations of key concepts.</p> <p>Facilitator/faculty “live” presentation using a share pod with a PowerPoint presentation with robust visuals to help explain concepts.</p>

		<p>Visual of the facilitator/faculty presenting or demonstrating “live,” which enhances teacher presence.</p> <p>Links to videos on YouTube, TED Talks, Khan Academy etc.</p>
Doing	<p>Casettes (short cases).</p> <p>Case Studies.</p> <p>Practice.</p> <p>Project-based learning.</p> <p>Collaborative group project, paper, etc.</p> <p>Cognitive Apprenticeship.</p> <p>Assessment.</p>	<p>Downloadable participant manuals with case, project, collaboration, and apprenticeship instructions.</p> <p>Live facilitator/faculty presentation, demonstration, and modeling for all activities. Time allocated for reflection and Q&amp;A.</p> <p>Breakout rooms with whiteboards and chat pods for individual and collaborative work. Polls available, when needed.</p> <p>Breakout rooms for practice with partners or in larger groups, such as triads.</p> <p>“Live” individual or group presentations in the main room.</p>
Coaching	<p>Cognitive Apprenticeships.</p> <p>Scaffolding.</p> <p>Interactive feedback.</p>	<p>Facilitator/faculty feedback through “live” voice, chat, and private chat.</p> <p>Peer coaching in breakouts and private chats.</p>
Conviviality	<p>Ground Rules to encourage Collaboration, Cooperation, and Trust.</p>	<p>Participatory establishment of ground rules using “live” discussion, chats, whiteboard tools, and polls.</p>
Critical Incident Questionnaire (CIT)	<p>Use CIT for immediate student feedback between instructional events.</p>	<p>Downloadable form or Anonymous Poll.</p>
Planning/Organization	<p>Fast Start</p> <p>Quick Reference</p> <p>Participant Manual</p> <p>Timeline for all Activities.</p> <p>Time for Reflection during event and between events.</p>	<p>Fast Start and Quick Reference Guides on how to use the web conferencing tools.</p> <p>Participant manual containing content and exercise during the live session.</p> <p>Facilitator/faculty manual with suggested timelines for all activities.</p> <p>Reflection time built into all events.</p>

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**eSUCCESS.**

Following Christensen (2006) stages of model building Armstrong (2007; 2008; 2016b) observed Chief Learning Officers (CLOs) of some of the largest corporations in the world and interviewed these CLOs as they

rolled out large-scale learning management systems and online web-based learning courses for several hundred thousand employees. Following observation and interviews, data was categorized into themes and associations and connections reported (Armstrong, 2007; Armstrong, 2008). The analysis revealed five major categories and 30 indicators that ultimately became eSUCCESS. Reducing the data further, eight tenets were identified that embodied how CLOs described the necessary elements for successful implementation of an eLearning system. Table 2 shows the tenets and their descriptions.

*Table 2. eSUCCESS Tenets with Descriptions*

<b>Tenet #</b>	<b>Tenet Name</b>	<b>Description</b>
<b>1</b>	<b>eXecutive Sponsorship</b>	Time Money Resources Communications Vision Values Change Management Strategy
<b>2</b>	<b>Support from the Organization</b>	Line of Business Executive Learning Executive IT Executive Direct Manager Involvement Project Manager for eLearning Initiatives Strong Technology Infrastructure Help Desk “Built into the Organization” Communities of Practice Social Networks
<b>3</b>	<b>Understand and Motivate the Learner</b>	Benefit Communicated Included in Performance Plan Granted Additional Resources Continuing Education Requirement “Peer Pressure” “Mandated” by the Regulators Pre-requisite to Live Training Event Threat of Job Loss Certification and Accreditations
<b>4</b>	<b>Culture Fosters Learning</b>	Systems for Continuous Learning and Sharing Promote Dialogue and Inquiry Collective Mission Leader Collaboration and Team Learning Connecting to the Environment
<b>5</b>	<b>Content is Relevant to the Learner and Organization</b>	Job and Task Specific CEUs, PDU, CPEs Certifications Branded to the Culture and Environment Recognized SMEs/Experts Facilitating/Teaching “Hot Topics” in the Industry

6	Evaluate and Assess	Kirkpatrick Level 1 Kirkpatrick Level 2 Kirkpatrick Level 3 Kirkpatrick Level 4
7	Structure of Program is Engaging, Interactive, and Blended	On-the-Job Training (OJT) Coaching and Mentoring Web-based Technology Traditional Classroom
8	Simulate the Work Environment and Work Tasks	Goal-based Scenarios Problem-based Learning Case Studies Caselettes

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### Results and Findings

To meet the NGT requirement that evaluators were experts in the field, a pre-data collection questionnaire was used to ensure each participant met the study inclusion criteria. Inclusion criteria included more than 5 years of instructional design/instructional technology experience and a doctoral degree in Instructional Design, Instructional Technology, or related field. Table 3.0 shows participant demographics. All experts had at least 15 years instructional design experience with three having over 20 years. All experts had doctoral degrees in instructional design, instructional technology, or a related field. All experts worked in field where they applied instructional design and instructional technologies. Table 3.0 details participant demographics across the inclusion criteria for the study.

Table 3.0. Participant Demographics

Participant #	Years in Field	Title	Degree	Concentration	Conferences
P1	>20	Instructional Director for Training and Education	EdD	Leadership in Education	USDLA, FGDLA
P	>20	Instructional Designer	EdD	Human Resource Development Distance Education	Sloan-C
P3	15-20	Design Consultant	PhD	Applied Technology Training Development	ATD, ISPI, AECT
P4	15-20	Instructional Design Faculty	PhD	Educational Technology	AECT, ATD OLC
P5	>20	Program Director, Instructional Technology	PhD	Computing and Technology in Education	IDC, PLN

**Results from Participant Responses to R2D2/C3PO Model Evaluation Survey.** Table 4.0 shows the results from participant evaluations of the R2D2/C3PO Model Evaluation Survey (Appendix A). Each participant was asked to rank each component from 1-4, with 1 as unimportant, 2 of little importance, 3 important, and 4 very important. All components of the model received at least a 3, important, with the exception of 1b (create participant manuals for live synchronous events), 2b (reflection time allocated during synchronous event), 2e (focus group discussions), and 2f (online role play).

Table 4.0. Rankings by Participants: R2D2/C3PO Model Evaluation Survey

	<b>Ranking by Participants</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Mean</b>	<b>Mode</b>	<b>SD</b>
1	<b>Read/Listen</b>								
1a	Read materials online or offline	4	3	3	4	4	3.6	4	.44
1b	Create participant manuals for “live” synchronous events.	2	2	2	2	4	2.4	2	.69
1c	Listening to audio materials online or offline.	3	3	3	3	4	3.2	3	.35
1d	Facilitator for lectures/presentations/ Tutorials/demonstrations is a subject matter expert	3	3	3	3	4	3.2	3	.35
2	<b>Reflect/Writing/Sharing</b>								
2a	Time allocated for pre-work	3	4	3	3	4	3.4	3	.44
2b	Reflection time allocated during synchronous event	2	4	2	2	4	2.8	2	.87
2c	Reflection time allocated between events (multi-day)	3	4	3	3	4	3.4	3	.44
2d	Small group discussions	3	3	3	3	4	3.2	3	.35
2e	Focus group discussions	2	3	2	2	4	2.6	2	.71
2f	Online role play	2	3	2	2	4	2.6	2	.71
2g	Self-assessment	3	3	4	4	4	3.8	4	.35
2h	Online quizzes	3	3	4	3	4	3.4	3	.44
2i	Practice	4	3	4	4	4	3.8	4	.35
3	<b>Display</b>								
3a	Visual representations, such as: pictures, diagrams, graphs, multi-media, video, charts, animations	4	3	3	4	4	3.6	4	.44
3b	Demonstrations	4	3	3	4	4	3.6	4	.44
4	<b>Doing</b>								
4a	Caselettes (short cases)	3	3	2	3	4	3.0	3	.53
4b	Case studies	3	2	2	3	4	2.8	3	.64
4c	Practice	4	3	4	4	4	3.8	4	.35
4d	Project-based learning	4	3	4	4	4	3.8	4	.35
4e	Collaborative group project	4	2	2	4	4	3.2	4	.87
4f	Cognitive apprenticeship	4	2	3	4	4	3.4	4	.71
4g	Assessment	4	3	4	4	4	3.8	4	.35
5	<b>Coaching</b>								
5a	Cognitive apprenticeships	4	2	3	4	4	3.4	4	.71
5b	Scaffolding	4	3	3	4	4	3.6	4	.44
5c	Interactive feedback	4	3	4	4	4	3.8	4	.35
6	<b>Conviviality</b>								
6a	Ground Rules to encourage collaboration, cooperation, and trust	4	2	4	4	4	3.4	4	.71
7	<b>Critical Incident Technique (CIT)</b>								
7a	Use CIT for feedback between multi-day instructional events	4	2	2	4	4	3.2	4	.87
8	<b>Planning/Organization</b>								
8a	Fast Start	4	2	3	4	4	3.4	4	.71
8b	Quick Reference	4	2	3	4	4	3.4	4	.71
8c	Participant Manual	4	3	3	4	4	3.6	4	.44
8d	Timeline for all activities	4	2	3	4	4	3.6	4	.69
8e	Time for Reflection during events and between events	4	3	3	4	4	3.6	4	.44

**Results from participant responses to eSUCCESS Model Evaluation Survey.** Table 5.0 shows the results from participant evaluations of the eSUCCESS Model Evaluation Survey (Appendix B). Each participant was asked to rank each component from 1-4, with 1 as unimportant, 2 of little importance, 3 important, and 4 very important. All components of the model received at least a 3, important, with the exception of 3h (threat of job loss) and 7d (traditional classroom).

*Table 5.0. Rankings by Participants: eSUCCESS Model Evaluation Survey*

	<b>Question</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Mean</b>	<b>Mode</b>	<b>SD</b>
1	<b>eXecutive Sponsorship</b>								
1a	Time	3	3	4	3	4	3.2	3	.64
1b	Money	3	3	4	3	4	3.4	3	.44
1c	Resources	3	3	4	3	4	3.4	3	.44
1d	Communications	3	3	4	3	4	3.4	3	.44
1e	Vision	4	4	4	4	4	4	4	0
1f	Change Management Strategy	4	3	4	4	4	3.8	4	.35
2	<b>Support from the Organization</b>								
2a	Line of Business Executive	3	4	4	3	4	3.6	4	.44
2b	Learning Executive	3	4	3	3	4	3.4	3	.44
2c	IT Executive	3	4	2	3	4	3.3	3	.64
2d	Direct Management Involvement	3	4	3	3	4	3.4	3	.44
2e	Project Manager for eLearning Initiatives	4	4	2	4	4	3.6	4	.69
2f	Strong Technology Infrastructure	4	4	4	4	4	4	4	0
2g	Help Desk	4	4	4	4	4	4	4	0
2h	Built into the Organization	4	4	3	4	4	3.8	4	.35
2i	Social Networks	2	4	2	3	4	3.2	3	.64
3	<b>Understand and Motivate the Learner</b>								
3a	Benefits Communicated	4	3	4	4	4	3.8	4	.35
3b	Included in Performance Plan	4	2	4	4	4	3.8	4	.35
3c	Granted Additional Resources	4	2	4	4	4	3.6	4	.69
3d	Continuing Education Requirements	4	2	3	4	4	3.4	4	.71
3e	“Peer Pressure”	3	2	3	3	4	3.0	3	.53
3f	Mandated by the Regulators	3	3	4	3	4	3.4	3	.44
3g	Pre-requisite to Live Training Event	4	4	3	4	4	3.8	4	.35
3h	Threat of Job Loss	1	2	4	1	4	2.4	1	1.25
3i	Certification and Accreditations	3	3	3	3	4	3.2	3	.35
4	<b>Culture Fosters Learning</b>								
4a	Systems for Continuous Learning and Sharing	3	4	3	3	4	3.4	3	.44
4b	Promote Dialogue and Inquiry	3	3	3	3	4	3.2	3	.35
4c	Collective Mission	3	3	3	3	4	3.2	3	.35
4d	Leader	3	4	4	3	4	3.6	4	.44
4e	Collaboration and Team Building	3	3	4	3	4	3.4	3	.44
4f	Connecting to the Environment	3	3	4	3	4	3.4	3	.44
5	<b>Content is Relevant to the Learner and Organizations</b>								
5a	Job and Task Specific	4	3	4	4	4	3.8	4	.35
5b	CEUs, PDUs, CPEs	4	2	3	4	4	3.4	4	.71
5c	Certifications	4	2	3	4	4	3.4	4	.71
5d	Branded to the Culture and Environment	3	2	3	3	4	3.0	3	.53
5e	Recognized SMEs/Experts Facilitating/Teaching	4	2	2	4	4	3.0	4	.87

5f	“Hot Topics” in the Industry	2	2	4	4	4	3.2	4	.87
6	<b>Evaluate and Assess</b>								
6a	Kirkpatrick Level 1	2	2	2	2	4	2.4	2	.69
6b	Kirkpatrick Level 2	2	2	3	2	4	2.6	2	.71
6c	Kirkpatrick Level 3	4	3	3	4	4	3.6	4	.44
6d	Kirkpatrick Level 4	4	3	4	4	4	3.8	4	.35
7	<b>Structure of Program is Engaging, Interactive, and Blended</b>								
7a	On-the-Job Training (OJT)	4	3	3	4	4	3.6	4	.44
7b	Coaching and Mentoring	4	3	3	4	4	3.6	4	.44
7c	Web-based Technology	4	2	3	4	4	3.4	4	.71
7d	Traditional Classroom	1	2	3	1	4	2.2	1	1.07
8	<b>Simulate the Work Environment and Work Tasks</b>								
8a	Goal-based Scenarios	4	3	4	4	4	3.8	4	.35
8b	Problem-based Learning	4	3	4	4	4	3.8	4	.35
8c	Case Studies	4	3	3	4	4	3.6	4	.44
8d	“Caselettes”	4	3	2	4	4	3.4	4	.71

### Results of the Focus Group

Results from the NGT focus group yielded important addition suggestions for the two models which are presented in this section. The suggestions for the R2D2/C3PO follow and each is listed under the appropriate component in table 3 in **bold**.

**Read/Listening.** Adding “live authors” to the synchronous expert lectures was suggested based on experience from several of the experts.

**Reflect/Writing/Sharing.** Recommendations were made to enhance the reflection time by including “silent time” for reflection along with questions that encourage deep thought, such as “what was learned,” “how it was learned,” and “how the learning can be applied.”

**Display.** Recommendations to enhance the display component included additional technologies such as virtual worlds and mobile technology, along with detailed demonstration techniques such as process steps, concept maps, logic steps, and using real-world work examples. There was a recommendation for providing instructor live video-based feedback of work products.

**Doing.** Recommendation for adding adaptive learning and gaming to enhance interactivity and student engagement were suggested.

**Conviviality.** Adding to the model a focus on support for the instructor/facilitator by focused attention on instructor/facilitator workload pre-and post-learning event, as well as during the learning event.

**Planning and organization.** The importance of a component for both formative and summative assessment was emphasized, which can be readily accomplished through use of polls and observation. Adding a Facilitator/Instructor Manual that aligns with the Participant Manual would enhance the model and allow for greater consistency in delivery.

Table 3. R2D2/C3PO Components Updated, Instructional strategies/learning activities, synchronous tools

R2D2/C3PO Component	Instructional Strategies/Learning Activities	Synchronous Web-Conferencing Tools
Read/Listening	Reading materials online or offline.  Creating participant manuals for each Live synchronous event.  Listening to audio materials online or offline.  Synchronous Expert Lectures/” <b>Live Authors</b> ”/Presentations/Tutorials	Downloadable participant manuals as pdf and/or word files. Downloadable audio files. Downloadable video/multimedia files.  “Live” synchronous facilitator/faculty and “ <b>Live Author</b> ” presentation/demonstrations/lectures.



	Demonstrations.	Facilitator/faculty tools include whiteboards, chats, application sharing, file transfer, share pods, screen sharing, PowerPoint slides, polls, and note boards for announcements, Q&A, and FAQs.  Links to websites.
Reflect/Writing/Sharing	<p>Time allocated for reflection:</p> <ol style="list-style-type: none"> <li>1. Pre-work</li> <li>2. During synchronous event.</li> <li>3. Between synchronous events (multi-event course)</li> </ol> <p><b>“Silent Time” allowed for deep reflection</b></p> <p><b>In-depth Reflections</b>  <b>What was learned?</b>  <b>How learned?</b>  <b>How learning can be applied?</b></p> <p>Small Group Discussion.  Focus Group Discussion.  Online Role Play.  Self-Assessment.  Online Quizzes.  Practice.</p>	<p>Downloadable participant manuals used to write reflections and journal.</p> <p>Chat pods used for sharing reflections with other participants.</p> <p>Polls used to capture self-assessment and compare anonymously with other participants.</p> <p>Breakout rooms used for small group discussions, debates, mock trials, role play, practice with partners, and focus groups.</p>
Display	<p>Visual Representations including: pictures, diagrams, graphs, multimedia, video, charts, animations, <b>virtual worlds, mobile technology.</b></p> <p>Demonstrations.  <b>Process Steps</b>  <b>Concept Maps</b>  <b>Logic Steps</b>  <b>Real-world Work</b>  <b>Examples</b></p> <p><b>Instructor live video-based feedback of work products and student work.</b></p>	<p>Downloadable participant manuals with visual representations of key concepts.</p> <p>Facilitator/faculty “live” presentation using a share pod with a PowerPoint presentation with robust visuals to help explain concepts.</p> <p>Visual of the facilitator/faculty presenting or demonstrating “live,” which enhances teacher presence.</p> <p>Links to videos on YouTube, TED Talks, Khan Academy etc.</p>
Doing	<p><b>Adaptive learning.</b></p> <p>Caselettes (short cases).  Case Studies.</p>	<p>Downloadable participant manuals with case, project, collaboration, and apprenticeship instructions.</p> <p>Live facilitator/faculty presentation, demonstration, and modeling for all</p>

	<p><b>Gaming.</b></p> <p>Practice.</p> <p>Project-based learning.</p> <p>Collaborative group project, paper, etc.</p> <p>Cognitive Apprenticeship.</p> <p>Assessment.</p>	<p>activities. Time allocated for reflection and Q&amp;A.</p> <p>Breakout rooms with whiteboards and chat pods for individual and collaborative work. Polls available, when needed.</p> <p>Breakout rooms for practice with partners or in larger groups, such as triads.</p> <p>“Live” individual or group presentations in the main room.</p>
Coaching	<p>Cognitive Apprenticeships.</p> <p>Scaffolding.</p> <p>Interactive feedback.</p>	<p>Facilitator/faculty feedback through “live” voice, chat, and private chat.</p> <p>Peer coaching in breakouts and private chats.</p>
Conviviality	<p>Ground Rules to encourage Collaboration, Cooperation, and Trust.</p> <p><b>Consideration for instructor/facilitator workload in planning event.</b></p>	<p>Participatory establishment of ground rules using “live” discussion, chats, whiteboard tools, and polls.</p>
Critical Incident Questionnaire (CIT)	<p>Use CIT for immediate student feedback between instructional events.</p>	<p>Downloadable form or Anonymous Poll.</p>
Planning/Organization	<p>Fast Start.</p> <p>Quick Reference Guide.</p> <p>Participant Manual.</p> <p>Timeline for all Activities.</p> <p>Time for Reflection during event and between events.</p> <p><b>Evaluation and Assessment.</b> <b>Formative</b> <b>Summative</b></p> <p><b>Facilitator Manual.</b></p>	<p>Fast Start and Quick Reference Guides on how to use the web conferencing tools.</p> <p>Participant manual containing content and exercise during the live session.</p> <p>Facilitator/faculty manual with suggested timelines for all activities.</p> <p>Reflection time built into all events.</p> <p><b>Self and group assessments in polls.</b></p>

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The suggestions for the eSUCCESS model follow and each is listed under the appropriate component in table 4 in **bold**.

**Tenet 1: eXecutive sponsorship.** Adding mission to the description of vision and values was considered important.

**Tenet 2: Support from the organization.** More specificity around the concept of “built into the organization,” should be added including: needs assessment, continuous improvement in updated courses, and focus on learning transfer.

**Tenet 3: Understand and motivate the learner.** Going beyond a performance plan to a development plan that focused on motivation training and remediation was recommended.

**Tenet 4: Culture fosters learning.** Making sure that all leaders have leadership training and are required to attend various trainings with the “rank and file.” Emphasis on “futures” and visioning and change management strategies should be included. Offering badges was recommended for fostering extrinsic motivation.

**Tenet 6: Evaluate and assess.** Add Philips Level 5, Return on Investment (ROI), Return on Training (ROT), and continuous program evaluation and continuous needs assessments.

**Tenet 7: Structure of program is engaging, interactive, and blended.** Add mobile technologies.

**Tenet 8: Simulate the work Environment and work tasks.** Add guided practice with feedback, Ted Talks, YouTube videos, gaming, and virtual worlds.

Table 4. eSUCCESS Tenets Updated with Descriptions

Tenet #	Tenet Name	Description
1	eXecutive Sponsorship	Time Money Resources Communications Vision <b>Mission</b> Values Change Management Strategy
2	Support from the Organization	Line of Business Executive Learning Executive IT Executive Direct Manager Involvement Project Manager for eLearning Initiatives Strong Technology Infrastructure Help Desk “Built into the Organization” <ul style="list-style-type: none"> <li>✓ <b>Needs Assessment</b></li> <li>✓ <b>Continuous Improvement-Course Updates</b></li> <li>✓ <b>Learning Transfer</b></li> </ul> Communities of Practice Social Networks
3	Understand and Motivate the Learner	Benefit Communicated Included in Performance Plan <b>Included in Development Plan</b> <ul style="list-style-type: none"> <li>✓ <b>Motivation Training</b></li> <li>✓ <b>Remediation</b></li> </ul> Granted Additional Resources Continuing Education Requirement “Peer Pressure” “Mandated” by the Regulators Pre-requisite to Live Training Event Threat of Job Loss

		Certification and Accreditations <b>Badges</b>
4	Culture Fosters Learning	Systems for Continuous Learning and Sharing Promote Dialogue and Inquiry Collective Mission Leader ✓ <b>Leadership training</b> Collaboration and Team Learning <b>Leaders/Managers attend training with rank and file</b> Connecting to the Environment <b>Futuring and Visioning</b> <b>Change Management Strategies</b>
5	Content is Relevant to the Learner and Organization	Job and Task Specific CEUs, PDU, CPEs Certifications Branded to the Culture and Environment Recognized SMEs/Experts Facilitating/Teaching “Hot Topics” in the Industry
6	Evaluate and Assess	Kirkpatrick Level 1 Kirkpatrick Level 2 Kirkpatrick Level 3 Kirkpatrick Level 4 <b>Phillips Level 5-ROI</b> <b>Return on Training – ROT</b> <b>Continuous Program Evaluation</b> <b>Continuous Needs Assessment</b>
7	Structure of Program is Engaging, Interactive, and Blended	On-the-Job Training (OJT) Coaching and Mentoring Web-based Technology Traditional Classroom <b>Mobile Technologies.</b>
8	Simulate the Work Environment and Work Tasks	Goal-based Scenarios Problem-based Learning Case Studies Caselettes <b>Guided practice with feedback</b> <b>Ted Talks</b> <b>YouTube Videos</b> <b>Gaming</b> <b>Virtual Worlds</b>

### Significance of the Study

Many models in instructional design and instructional technology and media are developed based on experience in practice and/or hearsay, rather than on rigorous empirical study (Richey, Klein, & Tracey, 2011). Richey and Klein (2007) explained that these models should be validated using design and development research. Both the R2D2/C3PO model and the eSUCCESS model emerged from rigorous research. The goal of this study was to further validate the models by intensive review by instructional designers and instructional technologists who had extensive and intensive experience in the field as well as doctoral degrees in the field. The models can serve as a

guide for practitioners as they seek to develop online learning programs. The expert validation strengthens the models and their use in practice.

### Conclusion

Expert validation confirmed that the major components of the model were predominately important or very important, with a small fraction being of little importance. While the experts did not add major elements to either model, minor enhancements were made to most components of both the R2D2/C3PO and eSUCCESS models and will further augment the models and provide stronger frameworks for professionals to use as a guide for implementing online learning and synchronous online learning in their organizations. Two data collection techniques, expert Survey and expert NGT focus group, were primary in providing trustworthiness, transferability, credibility, confirmability, and dependability to the results and findings.

### Future Research

The field of Instructional Design and Instructional Technology is relatively new and growing rapidly as technology is changing at an ever-increasing rate. Often models, frameworks, and processes are created based on experience in practice or limited research. Future research using a quantitative correlational analysis of the different components of both models would further validate the major categories and components of each model, thereby, enhancing their importance to researchers and practitioners alike. Applying the models in practice and reporting on the findings in a design and development model research study would be another way to extend the research. Additions to model components or categories from that research would serve to further enhance the instructional design knowledge base.

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Appendix A

MODEL EVALUATION SURVEY 1

R2D2/C3PO Model

Please rate each element in the R2D2/C3PO model as to its importance in the model on a scale of 1 to 4. 1 is unimportant. 2 is of little importance. 3 is important. 4 is very important.

	<b>Question</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
1	<b>Read/Listen</b>				
1a	Read materials online or offline				
1b	Create participant manuals for “live” synchronous events.				
1c	Listening to audio materials online or offline.				
1d	Facilitator for lectures/presentations/ Tutorials/demonstrations is a subject matter expert				
1e	Management usually keeps us informed about things we want to know				
2	<b>Reflect/Writing/Sharing</b>				
2a	Time allocated for pre-work				
2b	Reflection time allocated during synchronous event				
2c	Reflection time allocated between events (multi-day)				
2d	Small group discussions				
2e	Focus group discussions				
2f	Online role play				
2g	Self-assessment				
2h	Online quizzes				
2i	Practice				
3	<b>Display</b>				
3a	Visual representations, such as: pictures, diagrams, graphs, multi-media, video, charts, animations				
3b	Demonstrations				
4	<b>Doing</b>				
4a	Caselettes (short cases)				
4b	Case studies				
4c	Practice				
4d	Project-based learning				
4e	Collaborative group project				
4f	Cognitive apprenticeship				
4g	Assessment				
5	<b>Coaching</b>				
5a	Cognitive apprenticeships				
5b	Scaffolding				
5c	Interactive feedback				
6	<b>Conviviality</b>				
6a	Ground Rules to encourage collaboration, cooperation, and trust				

7	<b>Critical Incident Technique (CIT)</b>				
7a	Use CIT for feedback between multi-day instructional events				
8	<b>Planning/Organization</b>				
8a	Fast Start				
8b	Quick Reference				
8c	Participant Manual				
8d	Timeline for all activities				
8e	Time for Reflection during events and between events				

**Comments.** Please use the space below to comment on any of the components of the model. Add any suggestions you have for elements that should be added to the model.



## Appendix B

### MODEL EVALUATION SURVEY 2

#### eSUCCESS Framework

#### ESUCCESS Framework

Please rate each element in the ESUCCESS Framework as to its importance in the model on a scale of 1 to 4. 1 is unimportant. 2 is of little importance. 3 is important. 4 is very important.

	<b>Question</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
1	<b>eXecutive Sponsorship</b>				
1a	Time				
1b	Money				
1c	Resources				
1d	Communications				
1e	Vision				
1f	Change Management Strategy				
2	<b>Support from the Organization</b>				
2a	Line of Business Executive				
2b	Learning Executive				
2c	IT Executive				
2d	Direct Management Involvement				
2e	Project Manager for eLearning Initiatives				
2f	Strong Technology Infrastructure				
2g	Help Desk				
2h	Built into the Organization				
2i	Social Networks				
3	<b>Display</b>				
3a	Visual representations, such as: pictures, diagrams, graphs, multi-media, video, charts, animations				
3b	Demonstrations				
4	<b>Understand and Motivate the Learner</b>				
4a	Benefits Communicated				
4b	Included in Performance Plan				
4c	Granted Additional Resources				
4d	Continuing Education Requirements				
4e	“Peer Pressure”				
4f	Mandated by the Regulators				
4g	Pre-requisite to Live Training Event				
4h	Threat of Job Loss				
4i	Certification and Accreditations				
5	<b>Culture Fosters Learning</b>				
5a	Systems for Continuous Learning and Sharing				
5b	Promote Dialogue and Inquiry				
5c	Collective Mission				
5d	Leader				
5e	Collaboration and Team Building				
5f	Connecting to the Environment				

6	<b>Content is Relevant to the Learner and Organizations</b>				
6a	Job and Task Specific				
6b	CEUs, PDUs, CPEs				
6c	Certifications				
6d	Branded to the Culture and Environment				
6f	Recognized SMEs/Experts Facilitating/Teaching				
6g	“Hot Topics” in the Industry				
7	<b>Evaluate and Assess</b>				
7a	Kirkpatrick Level 1				
7b	Kirkpatrick Level 2				
7c	Kirkpatrick Level 3				
7d	Kirkpatrick Level 4				
8	<b>Structure of Program is Engaging, Interactive, and Blended</b>				
8a	On-the-Job Training (OJT)				
8b	Coaching and Mentoring				
8c	Web-based Technology				
8d	Traditional Classroom				
9	<b>Simulate the Work Environment and Work Tasks</b>				
9a	Goal-based Scenarios				
9b	Problem-based Learning				
9c	Case Studies				
9d	“Caselettes”				

**Comments.** Please use the space below to comment on any of the components of the model. Add any suggestions you have for elements that should be added to the model.

## Appendix C

**Focus Group  
Nominal Group Technique-Model Validation  
eSUCCESS  
R2D2/C3PO  
Agenda**

### **Welcome and Overview (2 minutes)**

#### **Process for each model**

Step 1. Review of Model Components and Silent Generation of question(s) to be addressed. What components might you add to each element in the model? And, to the model itself? (10 minutes)

Step 2. Sharing Ideas. Each participant shares their ideas about additions. No debate at this stage (2-3 minutes each). (10 minutes)

Step 3. Group Discussion. (20 minutes)

Step 4. Voting. (3) minutes

## Appendix D

### Brookfield's Discussion Techniques

#### Circle of Voices

Individuals reflect on the discussion topic (1-3 minutes)

Participants go around the circle in order - each person has up to 1 minute of uninterrupted air time to give their viewpoint on the topic. No interruptions are allowed.

Move into free discussion with the ground rule that every comment offered must somehow refer back to a comment made by **someone else** in the opening circle of voices. This need **NOT** be agreement - it can be a disagreement, a question, an elaboration or extension, an illustration, and so on.

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# Tracking the Design and Development of a Six Module miniMOOC for Quality Graduate Supervision

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Descriptors: MOOCs, Graduate Supervision, Design and Development

## Introduction

The Quality Graduate Supervision miniMOOC is an innovative design solution for faculty development that provides an accessible and flexible online learning environment for graduate supervisors. Many professors tend to develop graduate supervision skills on the job versus through active and intentional training. While many faculty welcome seminars on graduate supervision, the act of balancing demanding research, teaching and service roles and responsibilities can leave little discretionary time for scheduled faculty development seminars or workshops. To support both new and experienced graduate supervisors in continual professional learning to enhance their graduate supervision skills and knowledge, we designed a mini Massive Open Online Course (miniMOOC) on Quality Graduate Supervision at the University of Calgary (Alharbi & Jacobsen, 2016b). The first offering of the QGS miniMOOC is labelled “mini” because the first iteration is being offered as a closed pilot for research.

This paper reports on the design and development phases in the production of the Quality Graduate Supervision miniMOOC. This innovative design solution is part of an overall design based research investigation into the design, implementation and evaluation of online faculty development for graduate supervisors. This paper builds upon the analysis and exploration phase of the miniMOOC (Alharbi & Jacobsen, 2016a) and describes the design elements that were determined to be relevant and necessary for the development of this online faculty development experience. Second, this paper describes the process and challenges experienced during the development of the QGS miniMOOC. Outcomes from the design based research project can inform the design and development of online faculty development and learning opportunities in higher education. Findings from this research are relevant for graduate students, academic faculty across disciplines, senior leadership in higher education, and educational developers.

## Background

Graduate supervision is defined as “a complex pedagogical practice. It is a partnership between an experienced and an aspiring scholar, which shifts over the number of years it takes for the research to be done and the thesis to be written” (Kamler & Thomson, 2014, p. 1). Most graduate supervisors develop their practice experientially, that is, by just in time learning early in their academic careers (Alharbi & Jacobsen, 2016b). Some graduate supervisors approach graduate supervision in the ways that they were supervised, while others actively take steps to supervise students in different or better ways. It is clear that the quality of graduate supervision experienced by students varies (Beaudin, Emami, Palumbo & Tran, 2015). The relationship that develops between graduate supervisors and graduate students is one of the important factors in the success of students in their graduate studies (Adkins, 2009; Skarakis-Doyle & McIntyre, 2008). One issue in developing learning opportunities for graduate supervisors is the paucity of literature on how to best support graduate supervisors. A few pioneers in higher education are paying attention to the types of support and informal learning experiences that help to prepare graduate student for research and new faculty members for graduate supervision (see The Thesis Whisperer <https://thesiswhisperer.com>, and The Supervision Whisperers <https://thesupervisionwhisperers.wordpress.com>).

Research on student satisfaction with graduate supervision has been carried out (Beaudin, et al., 2015; Erichsen, Bolliger & Halupa, 2014), and advice is provided on helping graduate students with writing (Kamler & Thomson, 2014) and with teaching (Altman, Stein & Stowell, 2015); however, there is a paucity of research on how to be a good supervisor beyond identifying some characteristics of good supervisors (Ismail, Hassan & Masek, 2014). Dangel and Tanguay (2014) wrote, "there is conceptual and empirical literature that points to the need for quality supervision; however, there is less information on how to best support supervisors in their work" (p. 4).

On campus workshops, seminars and sessions focused on graduate supervision can also enhance the skills of newer and more experienced supervisors, and help them to develop expertise beyond their individual experiences being supervised. The busy schedule of faculty members, volume of work, logistical issues such as the times and locations of sessions, lack of recognition or financial awards for teaching, and lack of direction from the university are some of the reasons behind the lack of participation of faculty members in faculty development opportunities available at institutions (Taylor & McQuiggan, 2008). It is important to provide faculty development opportunities that are accessible, flexible and responsive to faculty members' demanding work weeks. Furthermore, the design of a faculty development opportunity that focus on improving the skills of graduate supervisors should emphasis on the idea of creating a safe space for supervisors to discuss, critique and debate this private pedagogical relationship "supervision" (Manathunga, 2010).

The use of MOOCs for faculty development offer one approach to addressing the accessibility and flexibility issues and thus may encourage greater participation among faculty members. Researchers have recommended the use of MOOCs as a workable solution for faculty professional development (Bond, 2013; Fini, 2009). Fini (2009) explains that most people attend MOOCs for professional development reasons. Zhenghao et al. (2015) report that 52% of respondents who were surveyed after enrolling in one of Coursera's MOOCs pointed out that the main reason they took a MOOC was to build their career by enhancing or improving their current jobs, or to find new ones. These studies indicate that MOOCs can provide accessible professional development opportunities and also have benefits for those who engage in the professional development.

Furthermore, the use of MOOCs could be a solution for busy faculty members to participate in faculty development opportunities as they can determine the amount of time and effort they put into their learning and the time that better fit their schedule and it could help to blur the line between professional practice and professional development if the MOOC join communication, teaching and mentoring of faculty members (Bond, 2013).

This research is guided by two assumptions: 1) that higher education can benefit from the use of MOOCs for faculty development, and 2) a MOOC can be designed that focuses on quality graduate supervision and creating a learning community among participants.

This design based research is guided by three research questions.

1. What design elements are necessary in the development of a Quality Graduate Supervision miniMOOC?
2. What scaffolding and support is necessary to support faculty members to effectively use the Quality Graduate Supervision miniMOOC?
3. In what ways can a Quality Graduate Supervision miniMOOC support and benefit faculty members in the ongoing development of their graduate supervision practices?

## **Methodology**

The present research is a design based approach to designing, developing and evaluating a faculty development miniMOOC for quality graduate supervision. Wang and Hannafin (2005) define design-based research as "a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories" (p. 6–7). This paper focuses on the development of an innovative solution, which is the second of four phases in this design-based research initiative: (1) analysis of practical problems by researchers and practitioners; (2) development of solutions; (3) evaluation and testing of solutions in practice; and (4) reflection to produce 'design principles' (McKenney & Reeves, 2012; Reeves, 2006). In this project, the development of an innovative solution for flexible and accessible faculty development was a six module, QGS miniMOOC, which was offered first as a closed pilot at a Canadian university to evaluate and test the solution in practice. The first offering of the QGS miniMOOC is labelled "mini" because this first iteration was being offered as a closed pilot for the initial evaluation phase of the research.

Several factors, considerations and elements informed the design of the QGS miniMOOC. A conceptual framework for quality supervision emerged from a literature review and three learning theories: constructivism, connectivism and learning community. Principles of constructivism have been incorporated into the design to promote interactive learning, collaborative learning, facilitated learning, authentic learning, learner-centered

learning and high quality learning (Huang, 2002). Connectivism theory emphasizes that “instead of knowledge residing only in the mind of an individual, knowledge resides in the distributed manner across a network” (Siemens, 2006, p.8). Therefore, the design of the miniMOOC emphasizes opportunities for knowledge exchange, discussion, networking and communication among faculty members from diverse disciplines and fields of study (Alharbi & Jacobsen, 2016b). Learning communities in higher education can emerge from the careful design of collaborative learning environments (Tennant, McMullen & Kaczynski, 2010). The development of a learning community in online faculty development can increase learner success; thus, the miniMOOC was designed to support faculty in engaging in and forming a learning community (Taylor & McQuiggan, 2008). The discussion board in the miniMOOC was designed to create a learning community among participants to discuss issues related to graduate supervision and to contribute to the ongoing discussions by giving advices and/or examples based on their expertise in graduate supervision along with the guidance of the discussion moderators.

### Process of the Design and Development of the miniMOOC

Designing and offering professional development opportunities must be strongly tied to the institution’s strategic vision (Camblin & Steger, 2000). The design of the QGS miniMOOC is aligned with two goals of the university’s academic strategic plan: 1) to focus on innovative teaching and learning, 2) to promote the inter-institutional and inter-disciplinary collaboration and internationalization. The university is invested in supporting academic faculty members in developing strong graduate supervision practices and also recognizes excellence in graduate supervision through an established reward structure. The Faculty of Graduate Studies, University of Calgary, has established the “My Supervisor Skills” program to support graduate supervisors with various seminars and workshops throughout the year. Every new academic faculty member must complete an orientation seminar in order to be granted graduate supervision privileges. A faculty member’s supervisory privileges are evaluated every five years. Most faculties, including the Werklund School of Education, offer an annual Distinguished Graduate Supervision Award; the university offers the Teaching and Learning Award for Graduate Supervision each year; the Faculty of Graduate Studies grants GREAT Supervisor Awards each year during Great Supervisors Week; and the Graduate Students Association offers the Excellence in Supervision Award. An established reward structure is an important institutional component in the success of any faculty development as the lack of recognition from institutions may be a factor that discourages faculty from participating in faculty development (Taylor & McQuiggan, 2008). To that end, the support that the university offers for faculty members, along with visible recognition through awards for quality supervision, provided a strong foundation for the design and development of the Quality Graduate Supervision miniMOOC at the University of Calgary.

The design process was also informed by a series of consultations with experts about elements of the design. In the analysis phase, questionnaires were sent to all graduate supervisors and graduate program directors at the University of Calgary to gather feedback about the challenges faced by graduate supervisors, the need for faculty development opportunities and on the desired topics that such faculty development should address (Alharbi & Jacobsen, 2016a). Key themes from the questionnaire data informed the development of the themes and the learning objectives for the six modules in the QGS miniMOOC. The six learning module themes and the sub-topics are listed in Table 1.

*Table 1. The six learning Modules of the QGS miniMOOC and Sub-Topics*

<b>Week</b>	<b>Topic</b>	<b>Sub-Topics</b>
1	Introduction to Graduate Supervision	- Introduction to the Quality Graduate Supervision miniMOOC, and supervision resources from the University of Calgary - Introduce the research and invite faculty to be involved.
2	Best Supervision Practices	- Elements of caring and effective supervision - Faculty of Graduate Studies guidelines for supervisor and student best practices - Supervision policy and regulations - Graduate program design and requirements - Supervisor-student checklist
3	Relationship Building	- How to establish good communication from the beginning - Creating shared expectations: -- Frequency of meetings -- Agenda and purpose for meetings -- Timelines and benchmarks

		<ul style="list-style-type: none"> <li>- What does the first meeting look like?</li> <li>- Supervision and mentoring across cultures</li> </ul>
4	Mentoring New Researchers	<ul style="list-style-type: none"> <li>- Supporting students' coursework and program goals</li> <li>- Coaching and guiding through the various stages of the writing process, through grant applications</li> <li>- Strategies to motivate and support graduate students</li> <li>- What resources are available for graduate students?</li> </ul>
5	Anticipating and Addressing Challenges	<ul style="list-style-type: none"> <li>- Identifying students who are struggling</li> <li>- Conflict identification and prevention</li> <li>- Conflict resolution (what to do and where to go?)</li> </ul>
6	Promoting Excellence and Wellness in Graduate Education	<ul style="list-style-type: none"> <li>- Supporting students with knowledge mobilization and grant writing</li> <li>- Developing research teams</li> <li>- Striving for balance</li> <li>- Supporting wellness and wellbeing in graduate students and faculty</li> <li>- Participant reflection on key learning and highlights</li> </ul>

Each of the six modules includes an overview, learning objectives, resources, videos and a discussion board. In the design and development phase, the first author finalized the design of each module with a faculty committee, and set to work developing each of the modules along with the expertise of members of the miniMOOC team. In addition to resources and guides available from the Faculty of Graduate Studies, a design decision was made to include videos of expert supervisors. One of the challenges at this stage of the research was to attract sufficient funding for the development the miniMOOC and in particular for high quality video production. Acknowledgement is given to the Faculty of Graduate Studies for providing a development grant for the QGS miniMOOC that enabled the team to work with a professional videographer and editor in the creation of the expert videos for the miniMOOC.

Questions were developed in relation to each of the six module themes and were used as a guide for the expert supervisors during the videotaped interviews. The expert supervisors were selected based on having won Faculty of Graduate Studies GREAT Supervisor awards and Faculty Distinguished Supervision Awards. The supervisors included three males and three females from such disciplines as psychology, biochemistry, medicine, education and nursing. The videographer set up a studio in a quiet office space to capture high quality video and sound. Using the prepared questions as a guide, the interviews with each expert supervisor enabled the design team to capture the diverse qualities and practices of excellent graduate supervision in relation to all six of the topics. Each video interview took approximately one hour. The source video was edited so that each of the final expert videos for each question in a module included perspectives from three different supervisors. The selection of the supervisors' responses to each question was based on two considerations: 1) how informative was the answer, and 2) how diverse were the supervisor's answers to the guided questions. The goal was to include composite expert videos for each module that presented diverse and rich responses to questions such as, what constitutes best practice in graduate supervision, how do you identify students who are struggling, and how do you motivate students? For example, in module three, a composite expert video on "how to establish good communication with your graduate students from the beginning" was posted along with two other composite expert videos related to this module's topic. Another video on the course home page combines perspectives from all six expert supervisors on what is most satisfying about being a graduate supervisor (Figure 1).



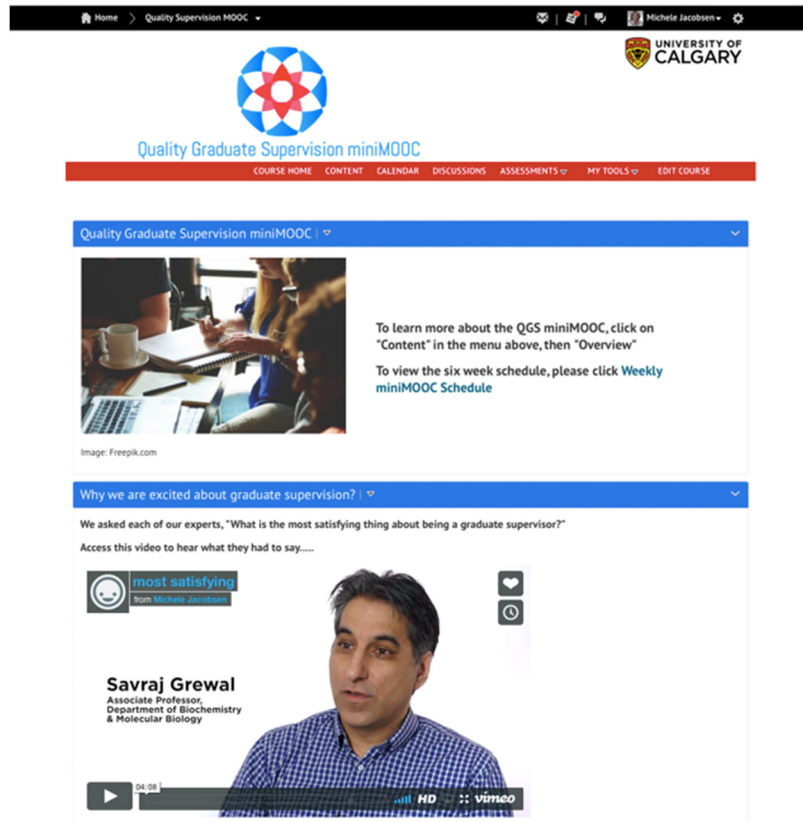


Figure 1. Home Page of the Quality Graduate Supervision miniMOOC

Questions and prompts posted in each module’s discussion forum are aligned with the questions asked of the expert supervisors in the videos. In module five, the discussion board offers case scenarios that the participants were invited to discuss and debate with others. Four of the six experts’ supervisors who participated in the video interviews, and an Associate Dean from Faculty of Graduate Studies, were recruited to moderate the discussion forum for a week to answer questions and participate in the discussion. One discussion moderator requested the opportunity to guide the discussion for two weeks in a row after having a very informative experience in the first week. A summary of the design elements and components implemented in the QGS miniMOOC is in Table 2.

Table 2. Design Components Implemented in the QGS miniMOOC

Design Components	Design and Construction
Overview and Learning Objectives	An introduction was developed for each topic of the QGS miniMOOC along with weekly learning objectives.
Experts Supervisors’ Videos	<ul style="list-style-type: none"> <li>- A series of interview questions were developed in relation to each module topic to provide a guide for filming the expert supervisors.</li> <li>- Expert supervisors included three males and three females from such disciplines as psychology, biochemistry, medicine, education, counselling psychology and nursing.</li> </ul>
Discussion Board	<ul style="list-style-type: none"> <li>- Questions and prompts posted in each module’s discussion forums are aligned with the questions asked of the expert supervisors in the videos</li> <li>- Discussion moderators were involved in guiding, promoting and summarizing discussion each week</li> </ul>
Resources	Resources and content were collected from the Faculty of Graduate Studies at the University of Calgary and from other online sources and was aligned with the weekly topics in the QGS miniMOOC.

The development process to ready the QGS miniMOOC for initial launch took approximately four months, including consultation with the miniMOOC team at every step of the design, gathering formative feedback on each module as well as the overall design and navigation, altering the design of the modules, consulting and getting more feedback, and making multiple changes and improvements through many iterations. The build using the learning management system took approximately two months. As part of the design and development phase, the QGS miniMOOC was accessed by three faculty members who were invited to serve as peer reviewers to evaluate the design, give feedback and suggestions before the miniMOOC was launched. Each of the reviewers who were recruited were selected for their recognized excellence in teaching and or in graduate supervision.

The Quality Graduate Supervision miniMOOC was first offered as a closed pilot at one university in Winter 2017. A link to a recruitment video and email invitation to participate in the QGS miniMOOC was sent to all graduate supervisors at the University of Calgary. Diverse faculty members from computer science, education, political science, medicine, veterinary medicine, sociology, art, engineering, physics & astronomy, nursing and physiology & pharmacology chose to take part in the first offering of the QGS miniMOOC (Alharbi & Jacobsen, 2017). The QGS miniMOOC was launched via three orientation sessions (online and on-campus) for the 23 graduate supervisors from eleven different disciplines who initially signed up. The purpose of the orientation was to introduce the faculty members to the QGS miniMOOC, provide a brief demo, and introduce them to the study. Each supervisor was provided with a binder that included an overview of the six modules, the FGS Supervisor Handbook produced by the Faculty of Graduate Studies, a copy of the orientation slides, and several printed resources from the first two modules. Supervisors were encouraged to print and save resources in their binder that they found to be helpful from the QGS miniMOOC. A demo was provided to show faculty members how to login the miniMOOC and navigate the different modules. An online seminar was provided for faculty members who could not attend in person. Graduate supervisor participants were unanimously very enthusiastic during the orientation about the QGS miniMOOC learning experience and were eager to get started – more than half viewed the videos, accessed the rich resources and engaged in the discussion forums during the first few days that the QGS miniMOOC was open.

The instructor sent the 23 graduate supervisor participants a group email at the beginning of each week to guide them on how to engage in the miniMOOC activities and with the learning resources (see Table 3).

*Table 3. Example of Instructor’s Weekly Email to miniMOOC Participants*

<p>Good Morning Graduate Supervisors!! <b>Welcome</b> to Module 4 and Week 4 in the Quality Graduate Supervision miniMOOC! Our topic this week is <b>Mentoring New Researchers</b>.</p> <p><b>Module 4, Mentoring New Researchers:</b> This module has several objectives: to gather ideas about how to support students with coursework and program goals, to access strategies for coaching and guiding students through the writing process, to learn strategies from others about how to motivate students to make timely progress in their programs, and to access the plethora of resources available to support students and supervisors. For example, I recently learned about this treasure trove of helpful resources by Canadian and UK researchers: <a href="http://doc-work.mcgill.ca">http://doc-work.mcgill.ca</a> I will be adding this reference to Module 4, and also accessing it heavily for my own graduate supervision.</p> <p><b>Keeping yourself on track:</b> Academic faculty are organized, right? The <b>value</b> of online learning is the <b>accessibility</b> and <b>flexibility</b> to make it work for YOUR busy schedule! However, it works best when you <u>schedule</u> MOOC learning into your week! If you have not done so already, I encourage you to add "miniMOOC" to your calendar, and login several times per week to access resources, watch the videos, and to engage with others in the discussion forum.</p> <p><b>Learner Expectations for this module:</b> As with the first three modules, you are expected to: 1) Access and review the rich resources, 2) Watch the expert videos (and take jot notes!), 3) Engage in the Community of Practice by contributing to the Discussion Forum, and 4) Respond to discussion contributions made by others. Optional Portfolio - you can complete any activities and add useful resources you have found to your FGS Supervision Handbook.</p> <p><b>Discussion Forum &amp; Moderator:</b> I am thrilled to introduce the Discussion Moderator for this week, <b>Dr. Name</b> Professor, Department Name. Many of you may feel you already know Dr. Name from the Expert Videos! <i>Dr. Name will be on hand this week to answer questions and w will also be taking part in the discussion forum!</i></p> <p>I will be checking in with our group regularly, either through email or by taking part in the discussion forum. All the best in continuing your active learning journey in the miniMOOC.</p>
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Of the 23 faculty members who signed up for the Quality Graduate Supervision miniMOOC, a total of 15 graduate supervisors completed all six of the modules and were presented with a certificate of completion. Of the 15 faculty members who completed, 2 had requested and benefitted from extra time beyond the six weeks to complete the final modules. As for timing, the pilot was offered in March and April, and the final two modules overlapped with the end of semester grading and reporting period. In future offerings, the development team will offer the miniMOOC earlier in the semester, like October and November, or February and March, or even in Spring or Summer semesters, so that the final two modules do not overlap with the demands of end of semester.

As part of the overall design based research project, data was collected using interviews, surveys and observations with participants during and at the end of the course to evaluate the implementation phase, to learn about what worked and what needs to be changed, and to inform the design principles for faculty development MOOCs. While data is currently being analyzed, and full research findings from the entire design based research project will be shared in a doctoral dissertation and subsequent presentations and publications, it is fair to conclude that the QGS miniMOOC pilot was a successful learning experience for faculty participants and that this project will continue to expand to a wider audience at the University of Calgary, and eventually, beyond our campus to graduate supervisors from the wider higher education community.

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## **Diversity Training in Organization Settings: Effective and Ethical Approaches for Change Leaders**

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### **Abstract**

A review of literature was conducted to determine effective diversity training practices in organizations for change leaders as well as the ethical implications of completing such training. The research resulted in an updated definition of diversity; depicted factors that impact the effectiveness of diversity training, and provided specific strategies and tactics that can be used for effective diversity training in organizations. Research showed that effective and successful diversity training focuses on ethical treatment of diverse individuals while minimizing and addressing resistance, through tactics such as coaching and staffing, as well as promoting training practices through open communication. Diversity training includes strategies to address ethics, including: 1) a workplace atmosphere of harmony and democratic citizenship, 2) acceptance of differences and civility toward one another, and 3) using and valuing diversity attributes to benefit the individual and the organization. An ethical framework for implementing diversity training was designed around those three strategies and includes such tactics as coaching, intercultural competency training, migration management, workplace management, and open communications.

### **Diversity Training in Organization Settings: Effective and Ethical Approaches for Change Leaders**

Diverse workplaces require leadership practices that meet the needs of a diverse population (Byeong, 2006). As both the definition of diversity and the number of diverse individuals in the workforce expand, diverse organizations have grown to encompass all organizations (de Jong, 2016; Derderian-Aghajanian, 2010; Molina-Girón, 2016). Diversity training initiatives can increase the efficiency and effectiveness of organizations while also increasing employee satisfaction and civil treatment through the development and implementation of diversity training to create a culture of diversity understanding (Banks, 2007; Byeong, 2006; de Jong, 2016; Guerra, 2012; Molina-Girón, 2016; Von Bergen & Collier, 2013).

Diversity training should incorporate such strategies as: the facilitation of acceptance and civility; value and utilization of diversity attributes, and the creation of a harmonic workplace atmosphere that facilitates an effective workplace with ethical treatment (Banks, 2007; Blum, 2007; Byeong, 2006; de Jong, 2016; Molina-Girón, 2016; Von Bergen & Collier, 2013). These three strategies, and five specific tactics for implementing them, are shared in this research paper. The strategies and tactics for diversity training are shared in the form of a diversity training implementation framework, which is used to create a workplace culture of diversity understanding that considers ethical implications for the individual as well as the organization.

## Statement of the Problem

### Purpose

Diversity in United States workforce is increasing with people from different regions, races, socioeconomic status, religion, gender, sexual orientation, and other person identifiers entering and becoming more active in the workplace (Blum, 2007; Byeong, 2006; De Leon, 2014; Guerra, 2012). According to Guerra (2012), the application of outdated diversity approaches (e.g. archaic diversity training, equal employment opportunity practices, training to modify negative workplace behavior and hiring for diversity in traditionally-marginalized groups) do not fully meet the needs of diverse individuals. This idea is further supported by Blum (2007) and Coates (2014), who provide examples of the inability for current diversity approaches to effectively meet the needs of all people. Through current diversity approaches, both employees and organizations are not fully considered (Blum, 2007; Guerra, 2012; Von Bergen & Collier, 2013). Diverse workplaces and their respective personnel are provided with inadequate training as well as diversity changes and improvement practices that cause employees to feel uncomfortable and undervalued in organizations as well as within society (Blum, 2007; Byeong, 2006; Coates, 2014; Guerra, 2012; Von Bergen & Collier, 2013).

### Definition of Diversity

For the purposes of this research, diversity is defined as any difference that exists within a person that can be classified by gender, race, sexual orientation, ethnicity, culture, language, religion, socioeconomic status, geographic location, mental and physical disabilities, political affiliation, subculture, and any other personal identifiers (de Jong, 2016; Derderian-Aghajanian, 2010; Fleming, Ledbetter, Williams, & McCain, 2008; Molina-Girón, 2016; Marshall & Theoharis, 2007). The research team of Fleming et al. (2008), shaped this definition through their research, which surveyed engineering students from four different universities; these students defined diversity as “gender roles and identity, and racial identity” as well as “gender, race, culture, and ideology” and, though less common, “major [academic areas of study], geography, socio-economic status, and political affiliation” (Fleming et al., 2008, p. 2).

Other researchers shaped the definition of diversity by offering more traditional examples of differences. de Jong discovered that diversity includes aspects such as age, gender, sexuality, ethnicity, and migration origin locations (2016). Molina-Girón (2016), shaping the definition of diversity to include traditionally-marginalized groups, defines diversity as any occurrence where a person (or people) is “racially, ethnically, culturally, and linguistically diverse” (p. 142). Derderian-Aghajanian (2010) contributed to this definition by defining diversity as minorities and those with culturally diverse backgrounds. Marshall and Theoharis (2007), another research team adding to this definition of diversity, found diversity to be based on “race, social class, religion, ability/disability, or sexual orientation” (p. 1). Considering these different definitions of diversity and the variety of aspects that diversity is noted to encompass, a new definition of diversity is created. This new definition implies that all people are diverse and, therefore, all organizations are diverse organizations. All people, then, should value and emulate diversity understanding, as all are directly impacted by diversity practices (Banks, 2007; Parker, 2003; Patrick & Kumar, 2012).

### Need for Effective and Ethical Diversity Training

There is a need to obtain effective approaches to diversity training within organizations to enable change leaders to reach diverse personnel and ensure that they feel understood, valued, and accepted (Von Bergen & Collier, 2013) while also “protect[ing] and nurture[ing] cultural pluralism and equality (Parker, 2003, p. xvii). Considering this need, the purpose of diversity training should be to: 1) discover effective ways for leaders to implement diversity training in organizations, 2) consider the ethical implications of diversity training and diverse workplace environments on individuals, the workplace and society 3) create a framework for the implementation of effective diversity training that considers individuals, the organization and the society to which the individuals belong.

Diversity is on the rise in the United States (Pope, 2012; De Leon, 2014). Understanding different people and the ways in which they interact is an important part of being a citizen in the United States, as “to live and function in increasingly multicultural, democratic societies” has become necessary (Molina-Girón, 2016, p. 143). Professionals “today acknowledge the importance of intercultural competence in conducting work ethically and efficiently, especially when serving racial minorities and diverse populations” (De Leon, 2014, p. 17). Due to

increased diversity and the additional aspect of the onset of the Tech Century and Society 3.0, which facilitate globalization and a world-wide workforce within organizations (Moravec, 2013; van den Hoff, 2014), organizations and the people working within them are called upon to be global citizens and function effectively and ethically in diverse settings with diverse cultures around the world (Bresselink, 2013; De Leon, 2014; Moravec, 2013). Additionally, an influx of people entering the workforce of the United States hailing from diverse cultures and locations requires organizations and their employees to understand and appreciate the uniqueness of every employee while functioning as a group to accomplish organizational objectives (Byeong, 2006; De Leon, 2014).

Since the 1960s, diversity acceptance has become a key political and social issue (Blum, 2007; Coates, 2014; Gorski, 1999). Though some improvements have been made for some groups of diverse people (e.g. same sex marriage, freedom to practice varying religions, the inclusion of women in male-dominated industries, and interracial schools), there is still a sizable gap between our current status and truly accepting diverse people (Blum, 2007; Coates, 2014; Molina-Girón, 2016). The needs of traditionally-diverse (e.g. traditionally-marginalized) individuals should be treated with equal consideration as those of individuals who are not traditionally-diverse (Blum, 2007). Social justice must be universally applied but not “encased in standards or slogans that make one feel good but take away the responsibility of doing what is right” (Guttek, 2014, p. 126).

Diversity in the workplace is increasing (Byeong, 2006; De Leon, 2014; Guerra, 2012). Fleming et al. (2008) found that there are “more women and minorities in the field” than there have been in the past, and employers are looking for effective “ways to attract and retain” them (p. 1). Professionals must be “able to relate to many cultures with the knowledge, skills, and attitudes” to effectively work with and understand diverse people (Derderian-Aghajanian, 2010, p. 154). A lack of diversity understanding leads to issues for diverse people, particularly in career development, with challenges that include communication and understanding, discrimination, cultural barriers, religious barriers, and access to resources (Blum, 2007; Coates, 2014; Pope, 2012).

Organizational diversity is an issue that is still not readily addressed (Guerra, 2012; United States Equal Employment Opportunity Commission, 2017; Von Bergen & Collier, 2013). Most of the organizations that employ diversity training and attempt to meet diverse employee needs do so with equal employment opportunity (EEO) laws and regulations that do not effectively provide diversity training or resources for diverse employees (Guerra, 2012; Molina-Girón, 2016). While no specific EEO claims have significantly lessened over the last five years, race and gender-based EEO claims have gone down slightly, with approximately 1,000 less claims and 3,000 less claims, respectively (United States Equal Employment Opportunity Commission, 2017). Other claims, such as retaliation, equal pay, and disability, have shown an increase in charges (United States Equal Employment Opportunity Commission, 2017). This shows that though EEO is in place within organizations, it is not alleviating diversity-related negative claims in organizations, according to the charge statistics provided by the United States Equal Employment Opportunity Commission (2017). Additionally, workplaces with diverse employees and organizations that work with global clientele currently strive to train employees with the goal of diversity tolerance or validation (which was found to be inadequate) rather than acceptance and civility (Von Bergen & Collier, 2013).

## **Methods**

### **Research Method**

A review of literature is the research method employed. Literature from a variety of sources was read and analyzed pertaining to diversity, ethics of diversity training, treatment of diverse people, and effective diversity training methods for change leaders. The review of the literature will be critically analyzed to create a framework for the effective implementation of diversity training in organizations.

### **Research Questions**

The researcher focused on strategies and tactics for diversity training in organizations. Additionally, the researcher considered the ethical implications of such practices as well as the impacts of diversity training on organization personnel. Two primary questions shaped this research:

1. What specific leadership strategies and tactics are effective for diversity training in organizations?
2. What ethical implications should be considered by change leaders in diversity training?

## Research Foundations

A review of literature served as the method for this research. A qualitative analysis of philosophical ideas and theoretical foundations within both anecdotal and social research settings provided the data.

The existentialist educational philosophy was applied to this research. Existentialists do not consider there to be an “ultimate reality” or “structure of the universe” (Gutek, 2014, p. 105); rather, existentialist educational philosophers consider reality to be subjective and individually-created based on “the perspective of the individual human person” (Gutek, 2014, p. 106). Existentialists are inclusive and do not consider individual attributes to be right or wrong (Gutek, 2014). The philosophy values individual choice and acceptance of people’s choices free from judgement and focused on social justice and inclusiveness (Gutek, 2014). Education and training, from an existentialist perspective, does not lead to the presentation of a correct or incorrect way in which to live (Gutek, 2014), but existentialism does value education and training as a “way to examine life from multiple perspectives and to use these perspectives to raise consciousness about our [humanity’s] situation” (Gutek, 2014, p. 117). This is directly applicable to diversity training in organizations, as it, too should seek to provide views on differences and promote an idea of acceptance and civility with a raised consciousness rather than a judgement of what is right or wrong, good or bad, and correct or incorrect (Byeong, 2006; de Jong, 2016; Molina-Girón, 2016; Von Bergen & Collier, 2013).

While no educational theory directly meets the needs of diversity training, there are aspects of critical theory that meet some requirements. Diversity training, with its required understanding of the globalization of different businesses and the influx of employees from different parts of the world (Bresselink, 2013; De Leon, 2014; Moravec, 2013), and critical theory, with its negative judgment toward globalized workforces and neo-liberal globalization ideals, do not align with one another (Gutek, 2014). However, other aspects of critical theory do align with diversity training in organization settings. The lack of exploitation, equality for all people, raised consciousness of individuals, social goals of education, respect for all people, and encouragement of individual beliefs are all valuable aspects of diversity training (Blum, 2007; Byeong, 2006; de Jong, 2016; Derderian-Aghajanian, 2010; Gutek, 2014; Hansen, 2007; Molina-Girón, 2016; Von Bergen & Collier, 2013). Critical theory emphasizes individual choice from “the results of interface and sharing of people whose voices have an equal right to be heard” rather than “imposition from those in power” (Gutek, 2014, p. 440). The critical theory values of equality, understanding, respect, dialogue (e.g. communications), lack of exploitation, sharing of opinions, and education to create social justice all align with diversity training (Byeong, 2006; de Jong, 2016; Gutek, 2014; Molina-Girón, 2016; Von Bergen & Collier, 2013). Globalization is the area in which critical theory does not fully address the needs of diversity training (Byeong, 2006; de Jong, 2016; Gutek, 2014; Molina-Girón, 2016; Moravec, 2013; Von Bergen & Collier, 2013).

Diversity training for globalized organizations is considered under the neo-liberal educational ideology. Neo-liberalism, a modern ideology, considers organization-based markets on a global scale (Gutek, 2014). Globalization, with international organization markets and an international economy, occurs in the twenty-first century and includes such aspects as: a global market, global entertainment, global information and communication, and global education (Gutek, 2014, Moravec, 2013; van den Hoff, 2014). Organizations today are both diverse and globalized (Moravec, 2013; van den Hoff, 2014), and an ideological understanding of globalization and its economic, educational, communications, and entertainment aspects (Gutek, 2014) allows diverse organizations to embrace globalized workforces and better meet organizational and personnel needs (van den Hoff, 2014). Whether personnel require cultural training, technology training, or other personal and professional development, diversity requirements must be both considered and met to facilitate effective globalized organizational practices (Moravec, 2013; van den Hoff, 2014), including diversity training for globalized workforces.

The authors would like to acknowledge personal and professional bias that may impact this research. The question of effective, ethical diversity training was approached with an existentialist educational philosophy at its foundation of beliefs. Existentialists believe that everyone will continually shape their own ideas of reality, no specific approach to life is “right” or “wrong,” ethics should always be considered, and all people (both outside and within traditionally-marginalized populations) deserve respectful, equal, civic treatment (Banks, 2007; Gutek, 2014). A neo-liberal ideology also influences the data analysis and strategies and tactics selected for the diversity training. Neo-liberal approaches consider the world on a global market level (Gutek, 2014) and the ways in which diversity impacts global organizations and their respective, diverse employees.



## Review of Literature

The review of literature showed that diversity training can be effectively accomplished by change leaders with the implementation of three strategies: creation of a foundation of acceptance and civility (Blum, 2007; Hansen, 2007; Von Bergen & Collier, 2013), the utilization and value of diversity (Blum, 2007; Molina-Girón, 2016), and the fostering of a harmonic atmosphere (Byeong, 2006). These strategies can be implemented effectively through such tactics as coaching and mentoring (Hansen, 2007; Yirci, Karakose, & Kocabas, 2016), effective and open communications (Blum, 2007; Thakur & Thakur, 2008), staffing and intercultural competency development (Dimitrov, Dawson, Olsen, & Meadows 2014); migration management and retention (de Jong, 2016), and workplace management (Byeong, 2006). The strategies and tactics align with the ethics present within the existentialist education philosophy, critical theory of educational philosophy, and neo-liberal ideology (Gutek; 2014).

### Strategies

The strategies of acceptance and civility, valuing diversity, and creating a harmonic workplace atmosphere alleviate obstacles and promote effective diversity training and, therefore, understanding within diverse organizations (Banks, 2007; Blum, 2007; Byeong, 2006; de Jong, 2016; Molina-Girón, 2016; Von Bergen & Collier, 2013). The strategies discovered emphasize civil behavior, global applications, acceptance of differences, and just and equal treatment of individuals (Byeong, 2006; de Jong, 2016; Guerra, 2012; Gutek, 2014; Molina-Girón, 2016; Von Bergen & Collier, 2013). Each of these strategies considers social justice, equal treatment and acceptance of difference, and globalized diversity considerations, as do existentialism, critical theory of education, and neo-liberal ideologies, respectively (Gutek, 2014).

A literary review of research on diversity training revealed that organizations and their leaders must work to foster environments of acceptance and civility (Blum; 2007; Von Bergen & Collier, 2013). Diversity interactions are described by Von Bergen and Collier (2013) in three ways: tolerance, acceptance, and validation. While Von Bergen and Collier view tolerance as asking too little of employees (it creates negative feelings and forces people to endure one another) and validation as asking too much (it creates negative emotions as people feel as though they are forced to resign their own values and personal beliefs), the authors view acceptance as the ideal middle ground, where employees can value one another without negative feelings of endurance or sacrifice. Acceptance of differences is coupled with respectful, civil, equal treatment of one another (like that depicted within existentialism and critical theory of education) to build the foundation of appropriate workplace interactions among personnel regardless of differences (Gutek, 2014; Von Bergen & Collier, 2013). Von Bergen and Collier (2013) reframe positive workplace behavior in diverse settings as acceptance and civility, noting that it increases workplace efficiency and learning while creating a foundation of respect, self-regulation, and appropriate public behavior.

Understanding diversity is valuable to all people, whether they are traditionally-marginalized and diverse or not, and applying diversity training to facilitate ethical, equal, respectful, civil, accepting, valuing behavior toward all people regardless of differences should be a priority for everyone (Banks, 2007; Blum, 2007; Byeong, 2006; de Jong, 2016; Molina-Girón, 2016; Patrick & Kumar, 2012; Von Bergen & Collier, 2013). Molina-Girón (2016) details the importance of understanding diversity and using differences to promote success with organizational changes. Banks (2007), Parker (2003), and Molina-Girón (2016) stress the importance of balancing unity and diversity while promoting democratic citizenship among employees, regardless of their born cultures and geographic locations. This idea is present within existentialist thinking as well as both critical theory and neo-liberal globalization ideals (Gutek, 2014). Molina-Girón (2016) notes that an environment of total unity can make diverse employee qualities less apparent and less utilized with individuals in the workplace (e.g. language proficiency, amount of eye contact given to others, competency and awards recognition, empathy, etc.); it is important to continue valuing individual diversity while functioning as a unit in order to be successful in diverse workplaces (Banks, 2007; Molina-Girón, 2016). This enables diversity in the local and global workplace to be harnessed, as it is valued and celebrated (Blum, 2007; Byeong, 2006; Gutek, 2014; Molina-Girón, 2016). The utilization and value of diversity helps leaders create efficient workplaces in which positive changes can occur and diversity, along with personnel, can flourish (Molina-Girón, 2016; Patrick & Kumar, 2012).

A continued review of literature revealed that organizations take one of three approaches to diversity (Byeong, 2006); they either have diversity, manage diversity, or value diversity (Byeong, 2006). While managing and having diversity are helpful when implementing diversity training, valuing diversity, such as acceptance of difference and a willingness to understand others (e.g. existentialism and critical theory), is where organizations will see continued success and growth as well as more productive employees and better workplace environments (Byeong, 2006; Gutek, 2014). This continued value of individual diversity helps leaders promote a collective effort

in order to successfully implement changes and foster an existentialist-based harmonic workplace atmosphere (Blum, 2007; Byeong, 2006; Gutek, 2014). Merged with a foundation of acceptance and civility in addition to the employment of diversity and democratic organization citizenship, an atmosphere of harmony, and the value of diversity helps leaders promote effective diverse workplace changes (Blum, 2007; Byeong, 2006; Gutek, 2014). Each of these actions, or strategies, are directly reflective of existentialist, critical theory and neo-liberal market values (Gutek, 2014), exemplifying their ability to reach all people and meet their respective, diverse needs (Byeong, 2006; de Jong, 2016; Guerra, 2012; Gutek, 2014; Molina-Girón, 2016; Von Bergen & Collier, 2013).

## **Tactics**

The review of literature provides five specific tactics for effective diversity training. When implemented with the above-mentioned three strategies, these tactics (coaching, communications, intercultural competency development, migration management, and workplace management) create effective diversity training within organizations. These five tactics, like the three strategies defined above, align with the values of ethical treatment, respect, civil behavior, globalized markets, understanding, and freedom, which are expressed through existentialist, critical theory, and neo-liberal ethics (Gutek, 2014).

According to Cohen (2005) and Kotter (2002), coaching works to promote employee proficiency and development within a person (internal or external) by encouraging employees and providing a first-hand, one-on-one or small group demonstrations of best practices within a given area (e.g. diversity training). Yirci, Karakose, and Kocabas (2016) address such aspects as the benefits of coaching, impacts on job performance, principles of practice, and the overarching purpose of coaching for training purposes. Yirci, Karakose, and Kocabas (2016) stated that these positive effects are not possible without addressing cultural needs and diversity within organization settings. Consideration and adaptation of practices into the cultural context while addressing diversity is an important factor in training success (Yirci, Karakose, & Kocabas, 2016). Additionally, Hansen (2007) notes the importance of coaching regarding moral development and understanding, depicting the existentialist and critical theory values of acceptance and individual freedom (Gutek, 2014). Coaching, mentoring, and attentiveness, according to Hansen (2007), help teach morals to students and assists in their ability to appropriately “respond to and treat one another, especially with regard to one another’s ideas and endeavors” (p. 353), thus promoting understanding of diversity.

Communication tactics, such as those noted by Thakur and Thakur (2008) attribute success to cultural and diversity training. Communication, in general, is successful within diverse workplaces and organizations that conduct business with diverse clients, when personnel are trained on diversity and diversity is considered and understood (Thakur & Thakur, 2008). Communication between different cultures has a large impact on organizational networking, communication, foreign activities, and psychology (Thakur & Thakur, 2008), and a thorough understanding of the diverse persons involved with the organization in any way should be attained prior to communicating with them (Thakur & Thakur, 2008). Due to the possibility of distorted communication between diverse people, and the importance of communicating across the global marketplace, this understanding is essential for both respectful and accurate transmission of thoughts, materials, content, and other items (Gutek, 2014; Thakur & Thakur, 2008). Ultimately, Thakur and Thakur (2008) determined that organizations must consider differences in people, including their cultures and their communication practices, to effectively communicate across diverse planes and global business markets, such as those expressed in the neo-liberal ideologies (Gutek, 2014).

Dimitrov et al. (2014) note intercultural competence development and staffing as tactics that are effective when diversity exists within a workplace. Competency development is a form of training through human resources that views employee differences and educates employees to better conduct business across multiple cultures (Dimitrov et al., 2014). Aspects of existentialism and critical theory ethics, as expressed by Gutek (2014), are emphasized in diversity competency development as noted by Dimitrov et al. (2014). These skills include communication, relationship development, tolerance, openness, understanding, positive attitude, cultural knowledge, culturally-appropriate strategies, and the ability to model these actions (Dimitrov et al., 2014; Gutek, 2014). International and intercultural skills are essential for success in the workplace, as is an inclusive environment that is free from judgement (Dimitrov et al., 2014). Skills such as increased cultural awareness, understanding of cultural limitations, awareness of contextual differences, and avoidance of misunderstandings are successfully developed with the consideration of diversity through intercultural competence training (Dimitrov et al., 2014). Additionally, appropriately staffing individuals and placing them in positions in which they can flourish helps facilitate diversity training and competency development while also promoting individual employee growth and success (de Jong, 2016; Dimitrov et al., 2014).

Migration management and employee retention also attribute to the success to diversity training in the workplace (de Jong, 2016). These tactics, as noted by de Jong (2016), focuses on approaches for handling increased

migration from geographically-diverse employees into an organization while also providing a better perspective on managing a diverse workforce. It considered the global marketplace as well as valuing individuals for their differences and providing personnel with the freedom to be themselves and value for doing so (de Jong, 2016; Gutek, 2014). Migration management and diverse employee retention work to obtain a triple-win (value for employers, employees, and customers), as noted by de Jong (2016). Focuses on flexibility, proactive decisions, phenomena management, depoliticization, international partnership understanding, diversity management, risk protection, and increased expertise and knowledge are all part of this human resources tactic (de Jong, 2016). de Jong (2016) notes that organizations must synthesize migration and diversity management into an overarching program that directly address diversity training needs and puts the right person in the right place (e.g. staffing).

Workplace management, as noted by Byeong (2006), addresses diversity and helps employers and employees to understand, value, and harness diversity to become successful organizations and create an environment of efficiency and effectiveness. Since workplaces are constantly changing, an understanding of different cultures and diverse perspectives allows organizations to achieve change success while also employing personnel to their fullest potential (de Jong, 2006). Valuing and understanding diversity are essential to diverse organization success, according to de Jong (2016), and simply having and managing diversity is not enough (de Jong, 2006). Diversity must be valued and understood in an accepting environment where individuals are free to be themselves while respecting each other's differences, noted ethical aspects of existentialism and critical theory (Gutek, 2014), to obtain such benefits as fresh ideas, skill development, competence, flexibility, responsiveness, enthusiasm for change, growth, enhanced image, and the gain of new, valuable employees (de Jong, 2006). de Jong (2006) found that diversity training, understanding, and adaptation are important to the success of diverse workplace management.

## **Framework**

### **Diversity Training Framework**

The findings of the review of literature depicted leadership strategies and tactics for successful diversity training implementation in workplaces that consider ethical implications and practices based on existentialism, critical theory of education and neo-liberal globalized marketplaces (Gutek, 2014). From these strategies, tactics and ethical considerations, a training framework, called the Diversity Training Framework, was created. The function of the Diversity Training Framework is to facilitate effective diversity training in organizations while actively considering ethics and individual values and freedoms. The ethical framework is based on a foundation of acceptance and civility, a workplace atmosphere of harmony and democratic citizenship, and the value and use of diverse attributes employees possess to benefit each employee and the organization (Byeong, 2006; de Jong, 2016; Gutek, 2014; Molina-Girón, 2016; Von Bergen & Collier, 2013).

The Diversity Training Framework is depicted as a pyramid. When implemented by change leaders, the three strategies (forming the base of the pyramid) and five tactics (forming the top layers of the pyramid) complete the Diversity Training Framework while considering ethics (e.g. those aligned with existentialist, critical theory, and neo-liberal values).

The framework has six levels:

1. Foundation (acceptance and civility; atmosphere of harmony; valuing diversity)
2. Open Communications (dialogue; communication of values and ideas; sharing of mission, goals and purpose)
3. Intercultural Competency Development (relationships; multi-cultural interactions; value different ideas and abilities)
4. Migration Management (value for employees, employers and clients; proactive decisions; flexibility)
5. Workplace Management (staffing; value individual diversity; enable fullest potential for employees)
6. Coaching (individual attention and motivation; moral guidance; best practices and effective methods)

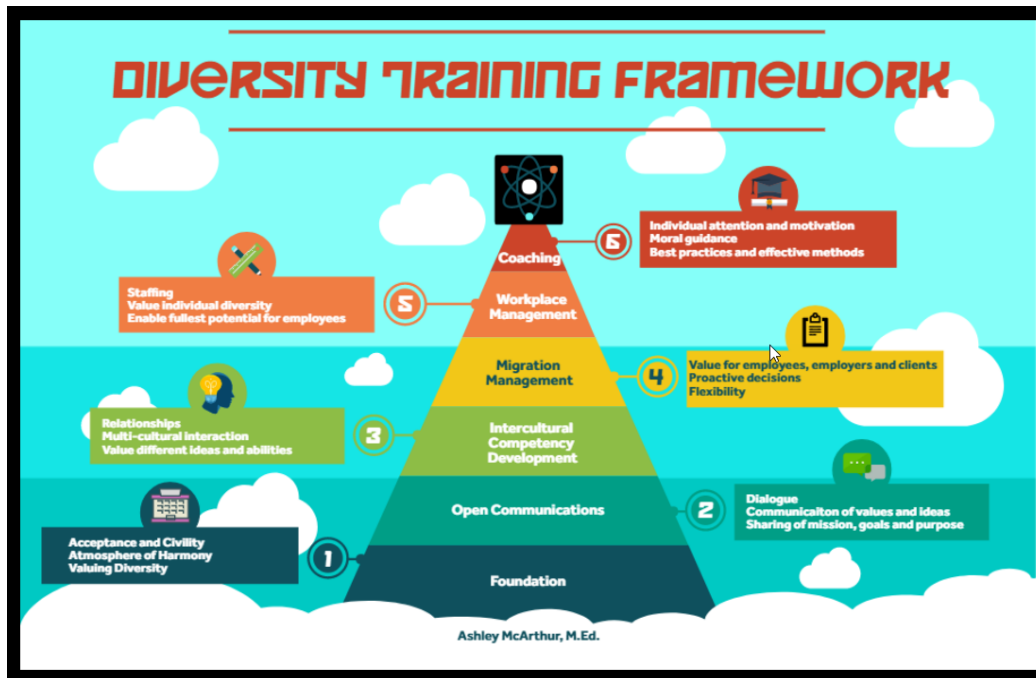


Figure 1. Diversity Training Framework.

### Analysis and Ethical Implications

Change leaders should understand diversity and apply ethical diversity training practices that reach beyond what is seen on the surface, delving into differences that are not immediately visible (Banks, 2007; Guerra, 2012; Gutek, 2014; Molina-Girón, 2016). Differences effect the entire person (Gutek, 2014), and understanding diverse things such as such eye contact, humility, sharing of accomplishments, motivation, ethics, and other hidden factors are necessary to successfully implement ethical diversity training in diverse workplaces and promote diversity acceptance (Guerra, 2012; Gutek, 2014; Molina-Girón, 2016; Von Bergen & Collier, 2013).

Research shows that ethical strategies and tactics, as well as ethical individual considerations, effectively facilitate diversity training and understanding, resulting in more effective and ethical workplaces (Byeong, 2006; de Jong, 2016; Gutek, 2014; Molina-Girón, 2016; Von Bergen & Collier, 2013). The Diversity Training Framework, which focuses on: creating an atmosphere of harmony; facilitating acceptance and civility; valuing diversity, and implementing such practices as coaching, communication, migration management, workplace management, and intercultural competency development, can facilitate ethical and effective diversity training and create a more effective diverse workplace (Byeong, 2006; de Jong, 2016; Dimitrov et al., 2014; Gutek, 2014; Thakur and Thakur, 2008; Yirci, Karakose, & Kocabas, 2016). When used together, each of the strategies and tactics within the Diversity Training Framework enable effective diversity training that addresses the ethical (as represented by existentialist, critical theory, and neo-liberal values) needs of employees and the organization, including civility, acceptance, harmony, democratic citizenship, respect, and equal, appropriate public behavior (Byeong, 2006; de Jong, 2016; Derderian-Aghajanian, 2010; Guerra, 2012; Gutek, 2014; Molina-Girón, 2016; Von Bergen & Collier, 2013).

Existentialist ethical values, such as individual experiences and a contextual, ever-evolving reality that calls for acceptance and a lack of judgment (Gutek, 2014), are illustrated in the Diversity Training Framework. Strategies that focus on acceptance, civil treatment, harmonic workplaces, and valuing individual abilities and diversity factors (Bank, 2007; Byeong, 2006, de Jong, 2016; Molina-Girón, 2016; Von Bergen & Collier, 2013) are directly reflective of existentialist ideals, such as those shared by Gutek (2014). They align with the ideas of multiple perspectives and raised consciousness through knowledge of differences and understanding as well as a lack of “right” or “wrong” judgment of differences (Bank, 2007; Byeong, 2006, de Jong, 2016; Gutek, 2014; Molina-Girón, 2016; Von Bergen & Collier, 2013). Additionally, the Diversity Training Framework attributes emphasize social justice and inclusiveness (Gutek, 2014), based on tailoring approaches to meet individual needs (Hansen, 2007; Yirci, Karakose, & Kocabas, 2016), managing social interactions (de Jong, 2016), and developing competency in regards to differences present in the workplace as well as in society (Dimitrov et al., 2014).

Critical theory ethics are present within the Diversity Training Framework as well. Critical theory values such approaches as: dialogue, respect, support, equality, appropriate social interactions, individual beliefs and freedom (Guttek, 2014). Acceptance and civility, harmonic interactions and democratic citizenship, and valuing individual diversity are all framework strategies that align with critical theory ethical values (Bank, 2007; Byeong, 2006, de Jong, 2016; Guttek, 2014; Molina-Girón, 2016; Von Bergen & Collier, 2013). Additionally, the framework tactics exhibit critical theory ethics as well. Communication, intercultural competency development, and coaching practices are directly aligned with dialogue, as they all foster open, respectful communication and knowledge and skill development (Dimitrov et al., 2014; Hansen, 2007; Guttek, 2014; Thakur & Thakur, 2008; Yirci, Karakose, & Kocabas, 2016). Migration and workplace management exemplify the critical theory ethics of freedom, respect, support, social interactions freedom through diversity encouragement and democratic workplace citizenship as well as equal, respectful treatment (Banks, 2007; de Jong, 2016; Guttek, 2014). Though critical theory may consider the globalized market aspect of the Diversity Training Framework to exploit people in other cultures (Guttek, 2014), the framework practices actively work to do the opposite, as the framework implements equality across geographic barriers (as well as other diversity barriers) to foster democratic citizenship and respectful, ethical equal treatment for all (Banks, 2007; Molina-Girón, 2016; Parker, 2003; Patrick & Kumar, 2012).

Since critical theory does not meet the globalized needs of the Diversity Training Framework, considered ethics also expand into the neo-liberal ideology and the impacts of a globalized market (Guttek, 2014). Neo-liberal ideology focuses on globalization of, among other aspects of society, the economy and organization marketplaces (Guttek, 2014). With the modern version of organizations operating at international levels (Moravec, 2013; van den Hoff, 2014) diversity training practices, including those in the Diversity Training Framework, must consider diversity and organizations on a globalized scale and according to neo-liberal ideologies in order to embrace this globalization and meet the diverse needs of global citizens (Bresselink, 2013; De Leon, 2014; Guttek, 2014; Moravec, 2013; van den Hoff, 2014). Diversity Training Framework approaches, such as acceptance and civility, open communications across diversity obstacles and differences, democratic citizenship, and specialized training (e.g. coaching) to meet specific needs, address the concerns of a global organization and its respective diversity training needs (Banks, 2007; Dimitrov et al., 2014; Molina-Girón, 2016; Parker, 2003; Patrick & Kumar, 2012; Thakur & Thakur, 2008; Yirci, Karakose, & Kocabas, 2016).

## Conclusion

It is not enough for change leaders to implement diversity training that employs the current approaches (e.g. equal employment opportunity, hiring in traditionally-marginalized population, training for behavior changes after negative interactions) to meet diversity needs within organizations, as this reactive approach alone does not ensure such ethical implications as equal, civil, accepting, effective organizations (Banks, 2007; Blum, 2007; Coates, 2014; Guerra, 2012; Guttek, 2014). Diversity training, and the change leaders that implement diversity training, must be both ethical and proactive and train personnel to value diversity, promote atmospheres of acceptance and civility in the workplace, provide a continued value of individual diversity and promote a collective effort to successfully implement diversity training (Byeong, 2006; de Jong, 2016; Guerra, 2012; Molina-Girón, 2016; Von Bergen & Collier, 2013). Diversity training with ethical and effective strategies and tactics, such as those noted in the Diversity Training Framework, enable a diverse organizational environment that allows for continuous diversity evolution and ethical, positive workplace interactions (Byeong, 2006; de Jong, 2016; Dimitrov et al., 2014; Guerra, 2012; Molina-Girón, 2016; Thakur and Thakur, 2008; Yirci, Karakose, & Kocabas, 2016).

An effective diversity training framework that can be applied within organizations is important to organization effectiveness and all personnel (Derderian-Aghajanian, 2010). Organizations should train personnel, while considering ethics, and create a culture of diversity understanding, which values diversity and diverse employee contributions, facilitates acceptance and respectful, civil behavior toward all employees and promotes cohesion and harmony among employees (Byeong, 2006; de Jong, 2016; Guerra, 2012; Molina-Girón, 2016; Von Bergen & Collier, 2013). A framework that meets these ethical and practical needs and enacts specific strategies and tactics, such as the Diversity Training Framework, can be applied within organizations to facilitate ethical and effective diversity training. This framework, and the strategies and tactics included within it, assist change leaders in creating an organization that values individuals as well as ethics while fostering a workplace that is effective, civil, ethical, moral, positive, accepting, and socially-just (Byeong, 2006; de Jong, 2016; Guttek, 2014; Molina-Girón, 2016; Von Bergen & Collier, 2013).

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# Hey, want to Play? ‘Kahooting’ to Win the Learning Game

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## Introduction

Using digital games in education or Digital Game Based Learning (DGBL) is becoming increasingly feasible due to the rise in variety and availability of digital educational and commercial games, as well as their consumption by contemporary users (Gros, 2007; Hainey, Connolly, Stansfield, & Boyle, 2011; Pivec, 2007). For example, in 2015, one hundred and fifty-five million Americans played video games, with at least two players in each game-playing household (ESA, 2015). Gaming is inherently motivating, which may allow learners to gain skills and knowledge, by leveraging entertainment and weaving it within learning environments (Becker, 2008; Bopp, 2006; Gee, 2005; Gee, 2003; Killi 2010; Killi, 2007; Miller, 2008; Paraskeva, Mysirlaki & Papagianni, 2010; Rieber, 1996; United States Department of Education, 2010; Van Eck & Hung, 2010). Research studies as well as conceptual literature indicate that video or digital games in particular have great engagement and education related benefits (Bogost, 2007; Griffiths, 2002; Paraskeva, Mysirlaki & Papagianni, 2010; Zarraonandia, Diaz, Aedo & Ruiz, 2014).

Currently, Digital Educational Games (DEGs) are emerging as interesting options for instruction, although they are not being used to their optimum potential in Higher Education (Godwin-James, 2014; Law & Sun, 2012). To institutionalize and adopt DGBL more extensively in Higher Education, it is important to research how using DEGS in Higher Education curriculum may affect learners’ experiences and learning (Epper, Derryberry, & Jackson, 2012). Using a report published by National Foundation for Educational Research, Perrotta, Featherstone, Aston & Houghton (2013) indicate that although there is evidence that game-based learning can improve engagement and motivation, there is a gap pertaining to knowledge about its effects on performance outcomes.

This mixed methods study seeks to contribute to literature by examining the value of using a DEG as compared to traditional teaching methods. The selected DEG, Kahoot, is gaining popularity in the educational arena, and according to Johan Brand (2016), CEO at Kahoot, 1.6 million Kahoots were played by 14 million players in over 100 countries in one month of January 2015 alone. However, at present there is no literature on the use of Kahoot. Thus, it would be useful to investigate this DEG in the context of improving student performance outcomes in Higher Education.

Additionally, in order to understand why such improvements, if any, took place, the perceptions of learners with respect to the interest and challenge factors pertaining to the DGBL learning, must also be examined. Based on this, the study answered the following questions:

1. Do learners have higher performance outcomes when exposed to activities involving Kahoot versus not using it?
2. What factors within Kahoot do learners find interesting and challenging and why?

The paper’s Background section provides overviews of key concepts pertinent to the study, including the theoretical frame. The Methodology section discusses elements of the study design, as well as the rationale for selecting Kahoot. Thereafter, Findings (quantitative and qualitative) are discussed. Finally, limitations and practitioners as well as research implications and conclusions are provided.

## Background

DGBL refers to the inclusion of digital games as part of a curriculum and using them for different educational purposes like instruction and assessments (Nadolny & Halabi, 2015; Prensky, 2001; Van Eck, 2015). Within DGBL environments, learners usually participate in gameplay, explore various aspects of the game to satisfy the learning contexts created by the course designer or instructor, and engage in problem solving activities (Killi, 2005; Nadolny & Halabi, 2015; Pivec, 2007; Pivec, Oziabenko & Schinnerl-Beikircher, 2014; Tsai & Fan, 2013).

McClarty, Orr, Frey, Dolan, Vassileva, & McVay (2012) define DEGs as digital games that represent a technology-based system within which players engage in game generated competition that are guided by rules and have quantifiable outcomes. Such games seek to promote learning in an entertaining way by fusing educational content with gameplay and stories, while giving learners the opportunity to strategize with higher order thinking



(Kickmeier-Rust & Albert, 2012; Kickmeier-Rust, Göbel & Albert, 2008; Paraskeva, Mysirlaki & Papagianni, 2010; Pivec, Oziabenko & Schinnerl-Beikircher, 2014) Currently DEGs are being used in a variety of instructional settings, primarily in military and medical training (Alexander, Brunyé, Sidman, & Weil, 2005; Binsubaih, Maddock & Romano, 2009; Graafland, Schraagen & Schijven, 2012; Nicolaidou et al, 2015; Ulicsak, 2015; Wykes, 2012). Although many researchers support the use of DEGs (Bogost, 2007; Godwin-James, 2014; Griffiths, 2002; Law & Sun, 2012; Paraskeva, Mysirlaki & Papagianni, 2010; Zarraonandia, Diaz, Aedo & Ruiz, 2014), others focus on the issues within DEGs, such as low entertainment value that makes such games less interesting for learners (Belotti, Ott, Arnab, Berta, deFreitas, Killi, & Oliver, 2011), and the dilution of effectiveness when education and entertainment are combined (Khine, 2011). Thus, when selecting any DEG, a judicious mix of entertainment and educational value must be considered, which is why Kahoot was the ideal choice for this study, as it is gaining in popularity, is easy to use, is free and has components of DEGs as described above.

Additionally, after examining three DEG options (Kahoot, Quizziz and Socrative) that could be a fit for in-class activities, Kahoot was found to be the best choice, based on the criteria as shown in Table 1, and rationale provided by the participant instructors as adapted from Roediger (2015).

Table 1. Comparing Kahoot, Quizziz and Socrative based on selection criteria for study use

Criteria and Rationale	Kahoot	Quizziz	Socrative
Must have an account to administer and save games, preferably free, so that instructors can share the same account and any edits and usage may be monitored.	Yes	No	Yes
The Q and A should not appear on one screen. This was required to avoid the ‘Blackberry Prayer’ effect (Michaluk et al., 2010) where users are so glued to their device screens that they do not look up and /or participate in collaborative activities.	Yes	No	No
Ability to include images	Yes	Yes	Yes
Ability to be used as a competitive game	Yes	Yes	Yes
Ability to be self-paced or timed	Yes	Yes	Yes
Teacher controlled as the purpose of use was to facilitate learning, and not assessment. Having teachers control the pace was essential.	Yes	No	Yes
Ability to search for games made by others that may act as extra resources if needed	Yes	Yes	No
Help and support is available	Yes	Yes	Yes

Kahoot is inherently entertaining and educational web based software for learning purposes that allows instructors and course designers to integrate instructional content through a quiz-like, gameplay construct. According to Singer (2016) it can be described as a television game show fused within a video game, where teachers act as game hosts and engage students. It provides players the opportunity for strategizing, problem solving, social interaction and collaborative learning within face-to-face class settings. The gameplay structure in Kahoot allows for quantifiable outcomes by mimicking quiz-based gameplay. To use Kahoot, teachers create learning games known as ‘Kahoots’, using a series of multiple choice questions that can include videos, images and diagrams. Players answer on their own devices, while games are displayed on a shared screen and earn points for selecting the correct answer and potentially more points for how quickly they select the correct answer. The Kahoot games are point-based with winners and losers. Additionally, Kahoot can be used as an application on mobile devices. It provides an entertaining way to conduct in-class assessment, allowing teachers and students to evaluate student learning.

Kahoot is gaining popularity within K-12 classrooms to enhance instruction in elementary math and junior high social studies and English (Knodel, 2016). According to Singer (2016), the company manufacturing Kahoot reported that 20 million out of 55 million elementary and secondary students in the United States used Kahoot in 2016. Kahoot offers increased collaboration over conventional DEGs that rely on individual play modes (Stewart et al. 2013), and wherein. “subject mastery is generally emphasized over complex problem-solving” (Johnson, Smith, Levine & Haywood, 2010, p.18). As a quiz-based game, Kahoot can mesh with any discipline or subject matter as opposed to those DEGs that are designed for specific subjects (Johnson, Levine, Smith & Stone, 2010; Johnson, Smith, Levine & Haywood, 2010; Stewart et al, 2013). Despite its perceived value for education based on such reports, there are no studies on Kahoot’s value and viability in a Higher Education setting.

## Methodology

### Mixed-Methods

A mixed-method approach (Creswell, 2014; Creswell & Plano-Clark, 2007), using True Experimental methodology for quantitative and Phenomenology methodology for qualitative data, was used to examine learner performances and experiences within a DGBL environment. Mixed-methods have been known to provide deeper, more comprehensive data and result in superior research (Halkier, 2011; Johnson & Onwuegbuzie, 2004; Schröder, 2012). For this study, following Creswell's (2014) convergent-parallel mixed-method approach, collection of quantitative and qualitative data was done at approximately the same time and then analyzed by converging information from the data. The three key identifiers of the True Experimental design are randomization, control and manipulation (Johnson & Christensen, 2014; Berry & Yost, 2013), which the study incorporated. The class sections were selected randomly and the duration of usage of Kahoot was controlled within the experimental groups. Participants were randomly placed in experimental (using Kahoot) and control (not using Kahoot). Additionally, the study used a Phenomenological approach for Qualitative data that was drawn from participant interactions and reactions to a DGBL based learning environment, as suggested by several researchers of this methodology (Creswell, 2014; Holroyd, 2001; Husserl, 1931; Sadala & Adorno, 2001).

### Setting and Participants

Participants were selected from one Midwestern Community College Campus with an approximate population of 5,100. The sample population were 96 students from Introduction to Business courses, enrolled in Associates Degree programs, recruited from five sections taught by three instructors who agreed to participate. Based on information from the course instructors and Introduction Discussion forum posts, participants were approximately 18 to 60 years of age and were mixed in terms of ethnicity. Based on survey data, 90% of the population had little to no experience with Kahoot. All of the instructors had no prior experience with DGBL or gaming in general; although they were knowledgeable in computer usage and basic educational technology.

### Data Gathering

Course identifying numbers for the participating instructors were randomized to select sections for the experiment. Quantitative data was collected using the scores participants received for their Final exams. Within the experimental sections, students were taught course materials using lectures that were complemented by Kahoot based activities, versus in the control group where instruction was limited to lectures. The control group courses did not use Kahoot at all.

Instructors created 'Kahoots' or interactive and problem-solving based question and answer activities, using material from their lectures and the common text books assigned to the course. In the classrooms, these Kahoots were used as different group activities. These were usually done after a lecture. For example, some days, students played a Class-Jeopardy game. On other days, they played a group contest game based on which group had more correct answers or which group was more prompt in responding to the questions. At least once during the experiment, students played a round table game wherein groups designed their own questions based on the ideas generated by the Kahoot, and quizzed other groups. The focus of these gameplays was on interactive and collaborative learning. For each activity, groups played against other groups for points.

The final exam scores were compared to examine the effects of the Kahoot intervention. The exam questions for both groups were same. The final exam was held at the end of the semester, and had 100 multiple choice questions, worth one point each. This exam covered all materials for the entire semester for the course. Students had two hours to complete this exam. Students were not allowed to use any notes or consult the text book for this exam.

Qualitative data was collected using one survey with three questions, and entries made in one reflection journal. The survey questions were: "Have you experienced Kahoot type of learning technology before? If yes, what technology was it? If not, say NA. Write down three words or sentences that identify your feelings about using Kahoot? Would you like to engage in Kahoot based activities again? Why or why not? Explain clearly, but briefly".

### Analysis

For the exams. Independent sample t-Tests were conducted, and Cohens *d* effect size was calculated. Survey data was 'quantitized' (Johnson & Christensen, 2014, p, 504) using term and phrase frequencies showing a

comparative analysis of the perceptions of Kahoot as expressed in specific words/phrases. First, a list of all words/phrases used by participants was drawn. Since several of these were overlapping and more than one participant used them, the number of responses per word/phrase was counted, then codified based on the frequency, and represented using a clustered bar graph.

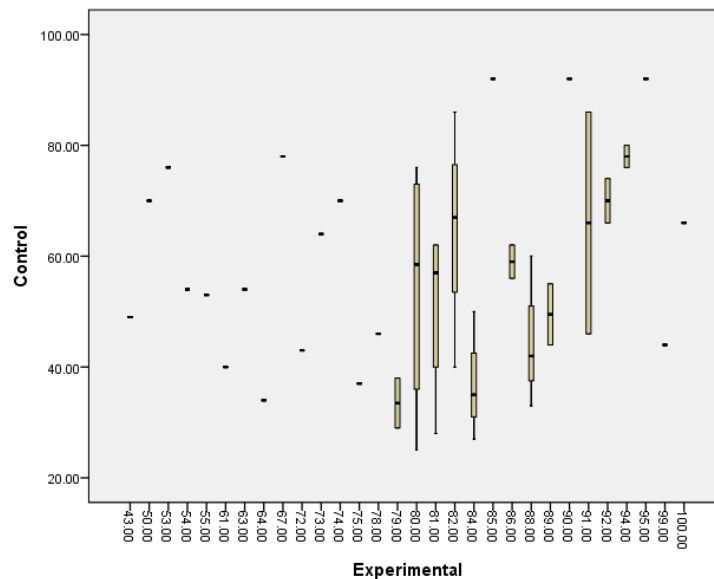
## Results

### Research Question # 1: Performance Outcomes

The H0 was that there will be no significant difference between the exam scores of learners using Kahoot and students from control groups. The HA was that learners using Kahoot will have significantly higher exam scores than control groups. Due to directional approach for the HA, one-tail, independent sample t- Tests was used. Alpha-level for both tests were set at 5% ( $\alpha = .05$ ). Confidence level was set at 95%. Based on the results of the t-Test and Cohen's d, the null hypothesis (H0) was rejected. Table 1 highlights the results of the t-Test using numbers and graph.

Table 1. Descriptive Statistics and T-Test Results

T-Value is 6.90809	P-value is < .00001	Significant at $p < .05$			
	N	Minimum	Maximum	Mean	Std. Deviation
Experimental	48	43.00	100.00	79.5625	13.10174
Control	48	25.00	92.00	56.8333	18.65400
Valid N (listwise)	48				



The effect size using Cohen's  $d$  was large:  $Cohen's\ d = (56.83 - 79.56) / 16.116121 = 1.410389$ .

### Research Question # 2: Interesting and Challenging Factors

Data revealed that none of the participants had played Kahoot in their classrooms before; although, some had minimal experience with other in-class gaming. This supported the researchers' findings from literature that Kahoot has been underutilized in Higher Education, despite its perceived value for educational purposes as found in K-12 environments. All participants found the use of Kahoot to be extremely beneficial, and 100 percent of them agreed that they would like to engage in Kahoot based activities again. When answering questions about using words/phrases to identify their feelings about Kahoot and why they would like to use it again, participants came up with 35 words/phrases in total, many of which were repeated by different participants, bringing the total number of words/phrases submitted to 103. Based on the codification, these were divided into seven categories that identified

the general perceptions about the interesting and challenging aspects of Kahoot. Figure 1 provides a cluster graph of the results. As revealed in Figure 1, participants found Kahoot to be highly entertaining, motivating, exciting and helpful in providing assistance to their learning.

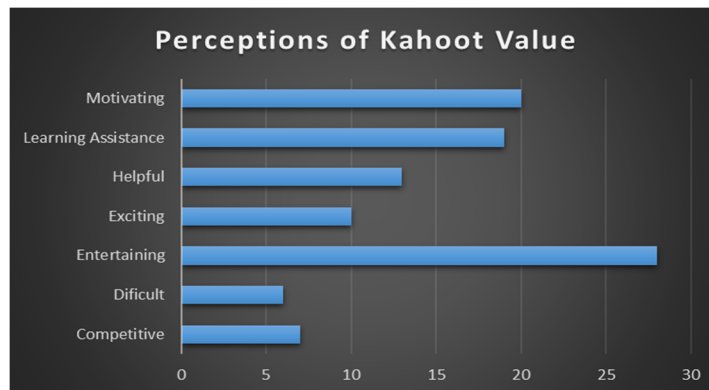


Figure 1 Number of words/phrases submitted per category.

Most participants did not find using Kahoot difficult or challenging. Finally, only some participants found Kahoot to be competitive, even though it was used to create competition among groups in class. In this study, participants appear to have been more involved due to the entertainment factors and the perceived value they found in using DEG based activities for their learning purposes. This was further collaborated by participants' journals, excerpts from which are given below using pseudonyms.

One of the values seen was the ability of such activities to help review course materials and help them prepare in a better way for the exams. For instance, Emma stated, "I like the Kahoot technology, I think it is a better way to review the material, and get ready for the tests". Kyle noted "It was fun and seemed to have helped refresh the reading". Some participants felt that this helped them retain information better, thus assisting their working memory. For instance, Sherry explained how "Kahoot was very helpful it just refreshed what I learned and put it in my long-term memory". In a similar vein Darren mentioned, "About the kahoot i like that it reinforced the stuff we were learning and made it more likely to be remembered". Additionally, participants' ability to read and take notes were also facilitated. Charlene confided how, "Before using Kahoot I mostly read the power points and took short notes, but after we started playing I would take better notes and read over them to make sure I understood the definitions". Finally, using Kahoot facilitated more robust participation, even by shy students. For instance, Sam mentioned that, "I liked playing Kahoot in class. It involved people in class that are scared to speak out to tell the right answer when you ask questions", while Emma stated, "It is also a good way to get people to participate in the class".

### Integration of Qualitative and Quantitative Findings

A mixed method approach complemented quantitative data with qualitative findings to gain a comprehensive understanding of the phenomenon of using Kahoot based intervention in classrooms. While the quantitative data indicated that there were definite improvements in performance outcomes for the experimental group versus the control group, the qualitative analysis provided several pointer as to why this could be. The key factor in this was the element of motivation that the Kahoot usage provided that could be deemed as the catalyst for the improved performances. Despite some issues and concerns regarding technology based instruction (Ariffin, 2012; Ertmer, 2005), technology integration is seen as a criterion for pedagogical expertise and superior instructional design (Borthwick et al, 2008; Jaipal-Jamani & Figg, 2014; Pierson, 2001).

Table 2 provides a synthesis of the key qualitative findings and how they relate to the quantitative findings of higher performance, with supporting literature. When examining the qualitative data from this study the following factors were offered by participants as crucial to their engagement with the games, that perhaps steered their motivation to higher performance.

Table 2. Quantitative and Qualitative Findings Synthesis

Qualitative	Quantitative
Interesting Kahoot contents, including audio-visual components, that helped students repeatedly read content and the associated engagement factors led to repeated interaction with such contents.	Repeated readings can lead to higher performance (Chafouleas, Martens, Dobson, Weinstein, & Gardner, 2004; Granic, Lobel, Engels, Anderson, N. B., 2014; Schlickum, Hedman, Enochsson, Kjellin, & Felländer-Tsai, 2009; Therrien, 2004).
Socializing options within video games can enhance motivation.	Socializing based motivation has a higher compelling impact on learners' efforts and performances (Boggiano & Pittman, 2010; Lee, Hwa Hsu & Chang, 2013; Peterson, 2013). Having a competitive essence in an activity may enhance engagement and allow learners to develop more effective problem-solving skills and participate more robustly in uninteresting or mundane educational activities, which may lead to higher learning (Annetta, Minogue, Holmes, & Cheng, 2009; Burguillo, 2010).

### Discussion

As is evident from the results, the use of Kahoot positively affected learners' performances. The effects were seen with respect to higher performance in exams and greater cognitive retention, a fact that several participants discussed in their reflection on the game. For the final exam, contents from fourteen weeks were used. Thus, for the final exam, students had substantial cognitive load when compared to the rest of the semester, where assignments covered smaller chunks of subject matter. However, for seven weeks preceding the final exam, content was taught using Kahoot. Additionally, since it is possible that after a gap of several weeks, students would have forgotten some of what they learned during the first half of the semester (which did not use Kahoot), in order to perform well, students may have had to put in more effort for the final exam. It is possible that this effort was boosted by the use of Kahoot.

Cowan (2010) discussed storage- specific measuring in the context of the nature of working memory limitations, and posited that forgetting some of the acquired learning may lead to shallower understandings, and learners would thus need to go back and reread materials. He also stated that the limits of working memory ability differ, based on how much a person can store and how effectively working memory is used. For instance, "An important example is in the use of attention to fill working memory with the items one should be remembering (say, the concepts being explained in a class) as opposed to filling it with distractions (say, what one is planning to do after class)" (Cowan, 2010, p. 52). With respect to the participants for this study, the time gap between learning activities would be enough to create several distractions, thus reducing their working memory capacity. Yet, the experimental students' performance in the overall final exam was better than the control groups'.

Qualitative results strongly indicated that participants were engaged by the use of Kahoot in the classroom. This supports evidence in the literature that students find digital game related activities more entertaining and motivating, and that these factors in turn may assist learning (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005; Bogost, 2007; Griffiths, 2002; Hainey, Connolly, Stansfield & Boyle, 2011; Paraskeva, Mysirlaki & Papagianni, 2010; Zarraonandia, Diaz, Aedo & Ruiz, 2014). One unexpected result was that despite the game-show aspect of Kahoot and its focus on competition between teams, participants did not identify the game as a competitive experience. This is different than what is talked about in some studies and conceptual literature that emphasizes the competitive value of games as being key to participants' interest and motivation (Annetta, Minogue, Holmes, & Cheng, 2009; Burguillo, 2010; Jayakanthan, 2002; Ladd, & Fiske, 2003; Papastergiou, 2009; Vorderer, Hartmann & Klimmt, 2003). Despite the lack of competition, students clearly were engaged, and not only by the gaming experience, but also their perception of the value of the game for learning.

## Implications, Limitations, Conclusion

In terms of research implications, there are strong indications that the DGBL based intervention using Kahoot was successful in delivering higher performance scores and inciting high interest and engagement in participants as opposed to traditional teaching methods. A limitation of the study is that it only examined the use of one DEG, However, when viewed through the lens of this study's findings, it can be extrapolated that DGBL strategies using DEGs may positively affect performances. Investigation of other DEGs in this context may be beneficial. Based on the success of the study and suggested value of Kahoot as a DEG for enhancing performance outcomes, it is recommended that the study be continued to replicate the experiments. Additional limitations are that this study focused on learners, and did not include the teachers' perceptions, which may be crucial to get a deeper view of the value of this Kahoot based intervention. Furthermore, it will be useful to examine the effects of Kahoot DEG usage in different time slots. For instance, it will be useful to see learner reactions when Kahoot is used only for the first half of the semester in some courses and vice versa in others. Finally, it will also be valuable to examine the use of Kahoot in a variety of subject areas and as assessment tools, since this study's focus was on using it as a knowledge regulator.

In terms of practitioners' implications, instructors should look to DGBL interventions as tools that can potentially increase engagement to a point where performance is positively impacted. To conclude, the ability of Kahoot to help learners with motivation and performance is highly encouraging and significant. Kahoot provides an example of a free game with limited barriers to use in traditional classroom environments. It and games like it are, therefore, worthy of further examination as they hold strong potential for accelerating the incorporation of DGBL in the classroom.

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# An Examination of Prior Knowledge and Cueing Effects in an Animation

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Descriptors: multimedia learning, prior knowledge

## Abstract

A 2 x 2 factorial design experimental study was conducted to investigate the effects of prior knowledge and visual cues in a complex animation on learning and mental effort. It also examined whether the effect of visual cueing is moderated by the prior knowledge. Data were collected from 102 undergraduate students from various majors in the Southwest University. The results showed that effects of cueing in a complex animation change depending on learners' level of prior knowledge. Specifically, low prior knowledge learners benefited more when visual cues were provided, whereas cues did not facilitate learning for high prior knowledge learners.

## Theoretical Background

Multimedia learning environments have the ability to present the information in textual, graphical, and audible forms (Mayer, 2001). This allowed the instructional designers to create more effective and richer learning environments. However, the design of multimedia instruction is crucial in order to provide effective instruction to the learners. According to multimedia principle, people learn better when the information is presented with text and pictures than with words alone (Mayer, 2005). In some situations, using only words with pictures is not necessary to enhance the learning. According to Cognitive Load Theory (CLT) and Cognitive Theory of Multimedia Learning (CTML), the human mind has limited capacity of processing the information in the working memory at the same time (Mayer, 2001; Sweller, 2005; Sweller, van Merriënboer & Pass, 1998). Therefore, only presenting the information with multiple modalities is not enough to ensure the superior performance when we consider the limitations of the human cognitive system (Ginns, 2005; Sweller et al., 1998). As an initiative to ensure the superior performance in multimedia learning environments, recent research studies have begun to focus on the use of strategies to reduce extraneous cognitive load and enhance the intrinsic cognitive load.

With the advances in the computer technology and software, instructional designers have been widely used to create more effective and interactive learning environments to help the learners enhance their recall of complex dynamic systems and their understanding of the materials (Lowe, 2004). Animations provide several advantages, such as increasing interactivity of instructional materials, enhancing engagement, object trajectory, depicting motion and making abstract information concrete (Betrancourt, 2005). However, including animations in multimedia learning environments is not enough by itself to ensure superior performance unless we consider the limitations of the human cognitive system.

Figure 1 represents the human information-processing system according to the CTML. It is represented as a series of boxes and arrows. The big rectangular boxes indicate the memory stores that are sensory memory, working memory and long term memory. Two rows represent the dual-channels, with the auditory/verbal channel in the first row and visual/pictorial channel at the bottom. The arrows represent the cognitive processes. The arrow from word to eye indicates the action of the printed text entering through the eyes.

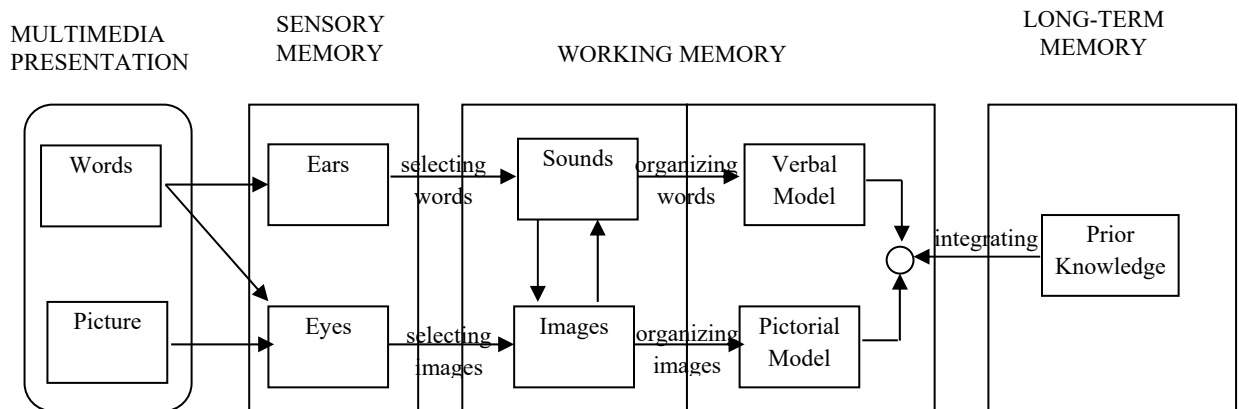


Figure 1. Cognitive theory of multimedia learning. Adapted from Multimedia learning (p.61), by R.E. Mayer, 2009, New York: Cambridge University Press. Copyright 2009 by the Cambridge University Press. Adapted with permission.

CTML defines five cognitive processes which are required for meaningful learning to occur animation with narration. These are selecting relevant words, selecting relevant images, organizing selected words, organizing selected images and integrating word-based and image-based representations (Mayer, 2009). Due to the limited capacity of the working memory, it is essential to select relevant words and images to process. The learner is responsible for judging the images and words and choosing the most relevant one in order to understand the presented information. However, learners might difficulty in selecting the essential information from the visual display which corresponds to the narration within a limited time due to the transience nature of the animation. Learners are required to keep the narrated information in the Working Memory (WM) while searching to the relevant information from the visual. This causes a cognitive load in the WM. Moreover, learner might miss the information, if they cannot find the relevant information within a limited time. Therefore, educational researchers have paid considerable amount of attention to learning from animations (Ploetzner & Lowe, 2004).

To make animations effective for learning, the cognitive load caused by the transience should be counteracted. Several researchers (Boucheix, Lowe, Putri & Groff, 2013; Sheiter & Eitel, 2015) have stressed the importance of guiding learners' attention to the relevant information in animation. This can be done by the use of cues. Cueing guides the learner's cognitive processing, helps the learner to select the relevant information, organize the information logically, and integrates the information with prior knowledge by providing cues (Mautone & Mayer, 2001).

Besides cueing, individual difference needs to be considered in instructional design (Betrancourt, 2005; Kalyuga, 2009; Kalyuga, 2014; Mayer, 2001). Henderson (2003) stressed that prior knowledge in the long-term memory (LTM) can control the learners; visual attention. "The selection of essential visual information of a display depends not only on the manner in which the information is presented, but also on the quantity and specificity of the pre-existing knowledge" (Khacharem, 2016, p.2). Prior knowledge plays an important role on distinguishing the relevant and irrelevant information, so it helps the learners to direct their attention to the essential information (Jarodzka, Scheiter, Gerjets, & van Gog, 2010). Expertise reversal effect also stressed that design principles that are effective for low-knowledge learners may not help or hinder high-knowledge learners (Kalyuga, 2014).

Guidance effect of cueing have been highlighted by several research studies (e.g., Ozcelik, Arslan-Ari, & Cagiltay, 2010; Jamet, 2014). However, there are limited number of studies examining the interaction between prior knowledge and cueing, which is one of the limitations of cueing research in multimedia learning (Richter, Scheiter & Eitel, 2016). Though few studies (Johnson, Ozogul, & Reisslein, 2015; Khacharem, 2016) found a significant interaction effect when cues were provided with the features of animated pedagogical agents and arrows in a static diagram, very little is known whether visual cueing in a narrated animation interact with prior knowledge to affect learning. Thus, the purpose of this study was to examine the effects of prior knowledge and visual cueing in a complex animation on learning and mental effort. It also investigated whether the effect of visual cueing is moderated by the prior knowledge.

## Methodology

A total of 102 volunteer undergraduate students from various majors in a large Southwestern university participated in the study. To categorize the participants as low prior knowledge (LPK) and high prior knowledge (HPK), 33th and 66th percentiles of their prior knowledge scores were used as cut-offs. The students whose prior knowledge scores were in the 33th percentile or below were assigned to a LPK group (n=36) whereas the students whose prior knowledge scores were in the 66th percentile or above were assigned to a HPK group (n=37). Therefore, only 73 participants (39 females, 34 males) were included in the data analysis. Their ages ranged from 18 to 34 with a mean of 20.34 and standard deviation of 2.81. An independent t-test revealed that the prior knowledge of two groups were significantly different,  $t(71) = -29.32, p < .01$ .

Participants were randomly assigned to either no cueing (n=36) or visual cueing (n=37) conditions. This resulted in four experimental groups: no cueing/LPK (n=19), no cueing/HPK (n=19), visual cueing/LPK (n=17), and visual cueing/HPK (n=20).

Two versions of an instructional material about photosynthesis, light dependent and light independent reactions were used. The content was adapted from a college level plant biology textbook presented with four separate animation. The cued animation was identical to the uncued one except the presence of the visual cues (see Figure 2). The animations took totally 9 minutes and 47 seconds. In cued animation, each corresponding terminological label (e.g. Photosystem I, P700, plascocyanin) became red during the narration of the sentence in which the item was mentioned. After each animation, two buttons, "Continue" and "Replay", appeared. The learners were not allowed to go backward or to skip around within the program.

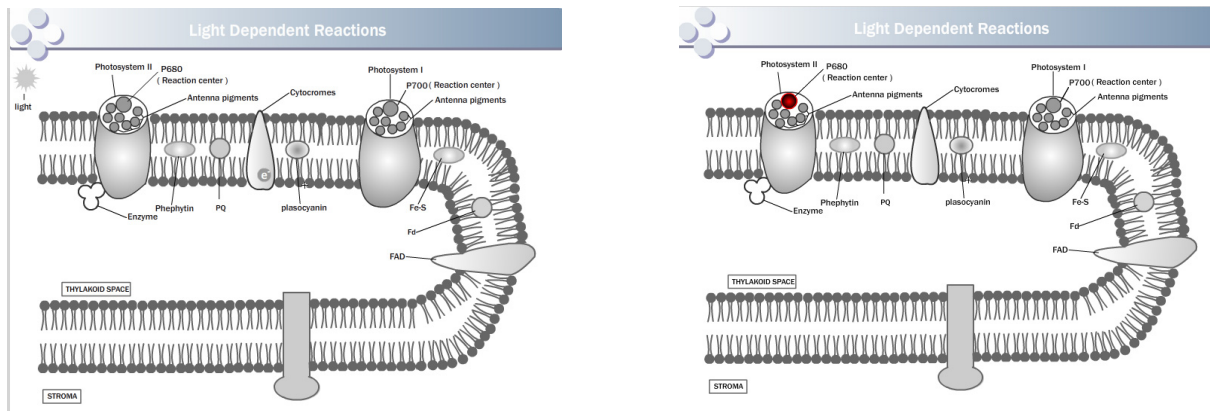


Figure 2. Sample screenshot of no cueing (left) and visual cueing (right) conditions/

This experimental study was conducted in a computer laboratory (15-24 participants per session). After the participants were given introductory information about the study, they were asked to complete a demographic questionnaire and prior knowledge test. Then, they studied the instructional material at their own pace and completed the computer-based tests consisting of the mental load scale, retention test, the transfer test, and the matching test sequentially. There was no time limit to study the material and to complete the tests.

## Results & Discussion

A two-way MANOVA was conducted to determine the effects of prior knowledge and cueing on retention, transfer and matching. MANOVA revealed a nonsignificant main effect for cueing ( $Wilks's \lambda = .99, F(3, 67) = .23, p = .88$ ) and a significant main effect for prior knowledge ( $Wilks's \lambda = .880, F(3,67) = 5.75, p < .05, \eta^2 = .21$ ). However, the interaction between prior knowledge and cueing was also significant ( $Wilks's \lambda = .84, F(3, 67) = 4.14, p < .05, \eta^2 = .17$ ). Given multivariate significance, the univariate effects were examined. Univariate testing indicated this interaction to be significant for transfer ( $F(1,69) = 6.93, p < .05, \eta^2 = .06$ ) and matching ( $F(1,67) = 5.38, p < .05, \eta^2 = .07$ ).

Follow-up pairwise comparisons indicated that LPK learners in the visual cueing group had significantly higher transfer scores than the LPK students in the no cueing group,  $p < .05$ . Although there was no significant difference in matching scores, the examination of the mean scores indicated that LPK learners in the visual cueing group (M=55.66) outperformed those in the no cueing group (M=44.42) on the matching test.

For HPK learners, matching ( $p=.35$ ) and transfer scores ( $p=.17$ ) did not significantly differ between no cueing and visual cueing groups. However, HPK learners did better on the transfer and matching test when the animation does not include cues.

When there was no cueing, HPK learners had significantly higher matching and transfer scores compared to LPK learners,  $p<.05$ . However, when visual cues were introduced, although it is not statistically significant, LPK learners had higher transfer and matching scores than HPK learners.

The follow-up univariate tests' results revealed a nonsignificant interaction effect on retention  $F(1,69) = .07, p = .79$ .

The results of the two-way ANOVA revealed that there were no significant effects of prior knowledge ( $F(1,69) = .94, p = .34$ ), cueing ( $F(1,69) = .17, p = .69$ ), or interaction effect ( $F(1,69) = .22, p = .64$ ) on mental effort.

These results indicated the moderating effects of prior knowledge on the impact of cueing in learning from instructional animations. In this study, LPK learners benefited more from cueing. The findings are consistent with the expertise reversal principle that emphasizes instructional design principles for multimedia learning which enhance LPK learners' performance may not be equally effective for HPK learners (Kalyuga, 2014). These design strategies may even hinder the performance of high prior knowledge learners. Providing external visual guidance in an animation might impose an unnecessary load on the WM of high prior knowledge learners and diminish resources necessary to gain and integrate new information because they still need to relate the existing knowledge base with externally provided guidance (Kalyuga, 2008).

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# **Teacher Perceptions of the Adaptation of the New Computer Science (CS) Curriculum: An Evaluation of CS Curriculum Implementation.**

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## **Abstract**

The purpose of this study is to assess the adaptation of the newly developed Computer Science (CS) curriculum in middle schools and address teachers' challenges during its implementation. Since CS has been introduced as a new subject in K-12 schools in the U.S., it is essential to determine the current implementation of CS curriculum from teachers' perspectives in order to enhance the CS education movement. Considering the fact that curriculum implementation interacts with multiple factors in K-12 school systems, this study assesses the current status of CS curriculum implementation in middle schools based on four categories: (1) teacher, (2) curriculum, (3) context, (4) students. The participants were middle school teachers who taught Introduction to Programming course in the Southwestern United States. The findings showed that teachers had positive attitudes toward CS education and received enough opportunities for professional development in CS. However, teacher sought effective instructional strategies to enhance students' understanding of CS concepts and better engage their students in CS learning. As for the curriculum, teachers perceived the scope, sequence and learning objective of the CS curriculum were appropriate for the purpose, whereas they needed more time to enhance students' understanding of CS concepts. In addition, the findings suggested that some schools do not have appropriate equipment or facilities. Based on our findings, recommendations for implementing CS curriculum to support CS education and implications for future research are presented and discussed.

## **Introduction**

Computer Science (CS) is becoming an essential component of students' educational development for computational thinking skills including problem-solving skills, analytic thinking skills, and creativity (Atmatzidou & Demetriadis, 2016; Papasterigiou, 2009). In an effort to promote these skills, there are numerous CS education initiatives. Nationally, Computer Science for All called for a \$4.1 billion budget to support K-12 teacher professional development and provide high-quality instructional resources (Office of the Press Secretary, 2016). Further initiatives including Code.org, CS first, and Code Academy have expanded access to instructional materials to support K-12 CS education.

In recent years, new CS curricula have been developed and implemented in K-12 schools in the U.S., and school policy has been changed to categorize CS as a part of the math and science core curriculum across states (Alba & Huett, 2017; Nager & Atkinson, 2016). For example, at the high school level, CS counts as a core graduation requirement in 23 states and the District of Columbia (Stanton et al., 2017). Specifically, Arkansas, Texas, Virginia, and West Virginia now require public high schools to offer at least one CS course. At the middle school level, CS education has also grown. For example, several states including Nevada and Indiana, aim to promote student access to CS education through computing courses in elementary and middle schools (Stanton et al., 2017). Despite some efforts and initiatives to enhance middle school CS education, less attention has been given to middle schools compared to the high school level. Thus, to promote CS education in middle schools, CS curriculum for middle schools' students needs to be developed and further supported.

In addition to school policy, the current adaptation and implementation of new CS curriculum should be evaluated to better support the new movement. Several researchers have noted that teachers may face challenges throughout the new curriculum implementation process (Brown et al., 2013; Finger & Houguet, 2009; Sentance &

Csizmadia, 2017; von Wangenheim, Alves, Rodrigues, & Hauck, 2017). For example, it requires them to changes in both subject matter and pedagogical knowledge (Alba & Huett, 2017; Thompson et al., 2013). Since this may be an unfamiliar area for some teachers, they may not have enough experience to teach CS contents, or they may feel ill-equipped to teach new contents knowledge. As a result, they may need to seek appropriate pedagogies for teaching CS, such as algorithms, or programming, to facilitate students' computational thinking skills. However, we have yet to understand how teachers have adopted the newly-developed CS curriculum and how they perceive their adaptation. In order to understand the current status of the CS curriculum and identify areas of improvement, the challenges that teachers encounter must be examined.

Furthermore, since school systems interacts with multiple variables when implementing a new curriculum in classrooms, we need to highlight other relevant factors, such as students and context, which may affect the new CS curriculum in K-12 school settings. For example, possible issues would be lack of students' readiness for learning CS, lack of students' engagement, appropriateness of scope and sequence of developed curriculum, and lack of infrastructure across schools (Sentance & Csizmadia, 2017; Wangenheim et al, 2017). Considering that teachers, students, and school contexts vary and interact together in dynamic ways when implementing a new curriculum across schools (Remillard, 2005), it is critically important to explore multiple factors influencing the CS curriculum implementation so that we can provide a holistic diagnosis of the current status of CS education initiatives.

### **Purpose of the Study**

The purpose of this study is to assess the current adaptation of newly developed CS curriculum and identify teachers' challenges and the research questions of this study are:

1. How have teachers adopted the new CS curriculum?
2. How do teachers perceive their adaptation to the new CS curriculum?
3. What are the challenges to implementing the new CS curriculum?

### **Method**

#### **Context and Participants**

The "Introduction into Programming" was developed as a CS education initiative by the College of Education with the support of an urban school district funding in 2016. It was implemented in the 30 public middle schools within the school district. Participants in this study were 12 middle school teachers (25% males, 75% females) who taught the course using the newly developed curriculum in 2016.

#### **The CS Curriculum Design**

The "Introduction into Programming" curriculum includes various activities, such as storytelling, animation, and games using Scratch, Google CS First, and Code.org. This eighteen-week long curriculum consists of 75 lessons, and the first and second six weeks focus on different CS concepts with unplugged activities and programming projects, and the third six weeks focus on HTML and CSS (See Figure 1).



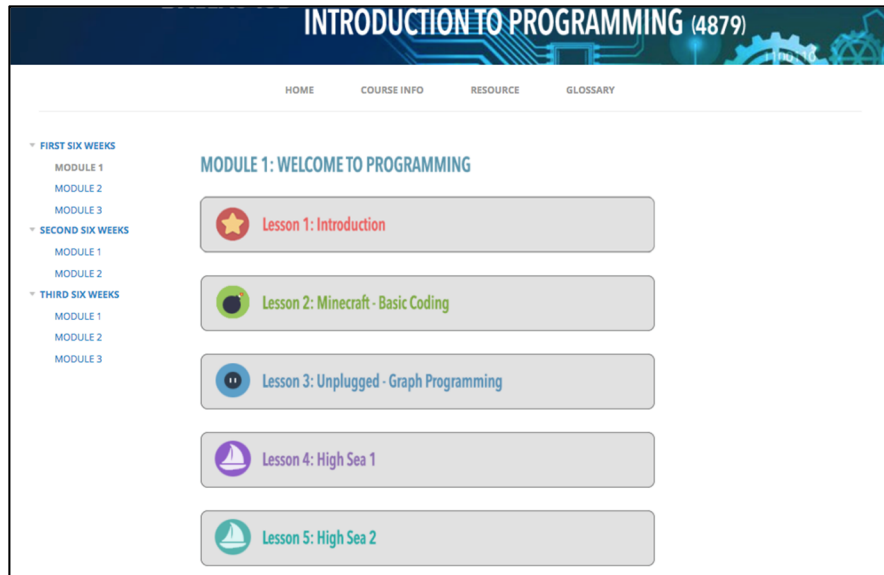


Figure 1. Students CS Website

## Data Collection and Analysis

*Online-Survey.* By referencing the components of the teacher-curriculum relationship proposed by Remillard (2005), we developed four constructs to assess the curriculum implementation. Our proposed framework includes these four categories: (1) teacher, (2) students, (3) curriculum, (4) context. The survey items adapted from previous studies (Friday Institute for Educational Innovation, 2012; Sharp, Hopkin & Lewthwaite, 2011; Ko & Lee, 2003; Ross, McDougall, Hogaboam-Gray & Lesage, 2003) which were modified to fit our research context in order to measure the CS curriculum implementation. The online survey consisted of 83 Likert-scale items with 15 open-ended questions. The survey included questions about how teachers used the curriculum in their teaching and how they perceived the CS curriculum implementation using the four categories. The open-ended questions explored teachers' challenges in implementing the CS curriculum.

*Data Analysis.* Descriptive statistical analyses were performed on the survey data to investigate the implementation of the new CS curriculum and teachers' perceptions to the new curriculum. Content analysis was used to examine data from open-ended responses in the survey to identify teachers' challenges in teaching CS.

## Procedure

The online survey was distributed to thirty middle schools by means of the school district office in spring 2017. Among 30 middle school teachers, 12 teachers completed the survey and their responses were included in the analysis.

## Results

### Use of the New CS Curriculum in Teaching

To answer the first research question, we investigated how the CS teachers used the new curriculum in their instruction. As shown Table 1, out of the 8 modules, teachers used the first five modules, but only two teachers used the module to introduce HTML, and no one used the last two modules.

Table 1. Used modules in CS course ( $N=12$ , Multiple responses)

Modules	Used Module (N)
<b>First Six Weeks</b>	
M1- Welcome to programming	11
M2 – Tell your story	10
M3 – Be an artist	10
<b>Second Six Weeks</b>	
M1 – Game Design	12
M2 - Animation	9
<b>Third Six Weeks</b>	
M1 – Getting Started with HTML	2
M2 – Getting Organized with HTML	0
M3 – Getting Stylish with CSS	0

In addition, teachers were asked which module was the most interesting and challenging for their students. An analysis of survey data showed that 75% teachers responded that the “Game design” module was the most interesting, and 25% of teachers replied that “Game design” and “Animation,” respectively, were the most challenging modules for their students (See Table 2).

Table 2. The most interesting and challenging modules for students ( $N=12$ )

Modules	The most interesting module	The most challenging module
<b>First Six Weeks</b>		
M1- Welcome to programming	2 (16.67%)	1 (8.33%)
M2 – Tell your story	1 (8.33%)	0 (0.0%)
M3 – Be an artist	0 (0.0%)	1 (8.33%)
<b>Second Six Weeks</b>		
M1 – Game Design	9 (75.0%)	3 (25%)
M2 - Animation	0 (0.0%)	3 (25%)
<b>Third Six Weeks</b>		
M1 – Getting Started with HTML	0 (0.0%)	2 (16.7%)
M2 – Getting Organized with HTML	0 (0.0%)	1 (8.33%)
M3 – Getting Stylish with CSS	0 (0.0%)	1 (8.33%)

### Teachers Perceptions of Their Adaptation to the New CS Curriculum

The second question was about how teachers perceived their adoption of the new CS curriculum. The four categories (i.e., teacher, curriculum, student, context) were used to evaluate the CS curriculum implementation. In the teacher category, our analysis of survey data showed that teachers had positive attitudes toward CS education ( $M = 4.83$ ,  $SD = .39$ ). For example, 83% responses strongly agree with the statement: “I support the inclusion of Computer Science education in middle school curriculum” ( $M = 4.83$ ,  $SD = .39$ ). Moreover, all teacher responses either agree or strongly agree with the statement, “I am confident that I can explain key Computer Science concepts to students with examples” ( $M = 4.5$ ,  $SD = .52$ ), suggesting that teachers showed high confidence in teaching CS (See Table 3).

Table 3. Results of teachers' perceptions of their adaptation: Teacher (N=12)

Construct	Number of Items	Cronbach's $\alpha$	M	SD
Attitude toward CS education	3	1.00	4.83	.39
Subject Knowledge	5	.53	4.37	.40
Teaching Efficacy	3	.96	4.56	.50
Intention	3	.76	4.03	.87
Total	14	.711	4.43	.35

Regarding the curriculum, the results showed that teachers overall perceived the scope, sequence and learning objective were appropriate for the purpose (See Table 4). Among the constructs, the mean scores of materials was high ( $M = 4.06$ ,  $SD = .66$ ), indicating that teachers perceived the student curriculum website was useful for students and their teaching. On the other hand, instruction time was the lowest score ( $M = 2.83$ ,  $SD = 1.10$ ). For example, in response to the survey item, "Each lesson's learning activities could be completed within the given instructional time," over 42% of the responses either strongly disagreed or disagreed.

Table 4. Results of teachers' perceptions of their adaptation: Curriculum (N=12)

Construct	Number of Items	Cronbach's $\alpha$	M	SD
Scope	3	.97	3.86	.86
Sequence	3	.93	3.69	.82
Learning Objectives	3	.98	3.67	.99
Standards	3	1.00	3.83	.83
Complexity	3	.96	3.58	.95
Time	3	.98	2.83	1.10
Materials	3	.899	4.06	.66
Promoting Higher-Order Thinking	3	.82	3.75	.74
Assessment	3	.95	3.19	.99
Total	27	.96	3.61	.64

In contrast to the teacher side, the mean of teacher perceptions of students was the lowest in the four categories ( $M = 3.33$ ,  $SD = .29$ ). An analysis of survey data indicated that the students lacked prior programming skills ( $M = 2.33$ ,  $SD = .72$ ). For example, over 66% of teachers either strongly disagree or disagree with the statement: "My students have prior programming experiences" ( $M = 2.08$ ,  $SD = .79$ ). To gain in-depth understanding of students' challenges, we asked teachers what challenges their students faced in the CS course. An analysis of open-ended questions suggested that students' lack of prior programming skills may impact individual students understanding of CS concepts and instructional time. In open-ended responses, many teachers mentioned that their students have no prior programming experience and have a hard time understanding the idea of essential concepts. For example, one teachers commented, "They are unable to use the concepts introduced by the CS First activities to create original programs on their own" [Teacher 3].

Table 5. Results of teachers' perceptions of their adaptation: Student (N=12)

Construct	Number of Items	Cronbach's $\alpha$	M	SD
Prior Computer Skills	3	.93	4.11	.78
Prior Programming Skills	3	.64	2.33	.72
Interests	3	.96	3.67	.71
Difficulty*	3	.80	3.22	.87
Total	12	.71	3.33	.29

\* Reversed items

Results also revealed that teachers needed more time to enhance students' understanding of CS concepts. As some teachers stated, teachers spent instructional time in explaining basic information rather than engaging them in programming activities. As a result, teachers felt they did not have enough time to complete the designed activities. As one teacher mentioned, "Majority of students minus a handful of 130 students have no experience in any capacity with regards to programming, coding, coding concepts, or all of the above. I had to baby step them in more slowly than the curriculum called for but in the end it worked out well....." [Teacher 4].

As for the context, overall, the teachers perceived that they received enough opportunities for professional development in CS ( $M = 4.11$ ,  $SD = .73$ ), and have received appropriate administrators support ( $M = 3.89$ ,  $SD = .76$ ) and technological support ( $M = 3.47$ ,  $SD = .74$ ).

Table 6. Results of teachers' perceptions of their adaptation: Context ( $N=12$ )

Construct	Number of Items	Cronbach's $\alpha$	M	SD
Admin Support	3	.90	3.89	.76
Technical Support	3	.86	3.47	.74
Professional Development	3	.76	4.11	.73
Resources [Facility/Materials]	3	.90	3.86	.90
Total	12	.62	3.83	.39

### Teachers' Challenges Implementing the New CS Curriculum

Teachers challenges of implementing the CS curriculum were identified from open-ended questions in the four categories (i.e., teacher, student, curriculum, context), and these are discussed below.

*Teacher.* The analysis of teachers' open-ended responses indicated that they feel challenges in (1) lack of teaching methods for differentiate instruction, and (2) lack of CS content knowledge. Over 50% of teachers reported the level of programming skills of their students vary, and they have different grade level students in the same class. Some teachers struggled with addressing diverse students' needs and they sought effective pedagogical approaches, specifically differentiated instruction to better engage students in CS learning. Some teachers examined:

*"Managing the speedy students who complete everything quickly and the slower students who struggle to complete their programs on-time" [Teacher 3].*

*"Having 6th, 7th, and 8th grade together in the same class...." [Teacher 6.]*

Although many teachers perceived they have received appropriate professional development, a few teachers felt a lack of CS content knowledge and sought further training, specifically on the topic of HTML and CSS. For instance, one teacher stated: "For me it will be the HTML and CSS until I can fully understand it" [Teacher 10].

*Curriculum.* Although it was not frequently mentioned, a few teachers expressed concern regarding assessing students' learning outcomes. For example, when asked about teachers' challenges implementing the CS curriculum, one teacher mentioned: "Assessing students' computational thinking skills" [Teacher 3].

*Student.* In the student category, our analysis revealed that teachers were struggling in teaching CS due to their students' lack of (1) basic computer skills, and (2) motivation and engagement. Most teachers mentioned that many students have no basic computer skills. For example, one teacher stated that: "Some students have NO experience working with a computer at all...." [Teacher 6]. Some teachers also reported that their students are not motivated and not engaged in their learning.

*Context.* In context, approximately 40% of teachers reported they do not have enough headphones and have network issues in their classroom. For instance, one teachers explained, "We need new computers, a class set of headphones, fewer restrictions on student accounts, and better server setup for more consistent access to online software" [Teacher 1].

### Discussion

This study investigated the current status of the adoption of the newly CS curriculum in middle schools, as well as the challenges that teachers faced in teaching CS. Based on our findings, we proposed some suggestions for implementing CS curriculum.

First, teacher competency development needs to be enhanced. The findings showed that although many teachers perceived that they received sufficient professional development opportunities, some teachers commented that they need additional training on certain topics such as HTML and CSS. Because some teachers may not have been adequately prepared to acquire the contents knowledge and teach the topic. Thus, regular professional development sessions should be offered to CS teachers based on the teachers' specific needs. In addition, further support needs to be provided to foster effective teaching practices. Result indicated that teachers face difficulties to better engage their students in learning activities due to students' mixed abilities in one classroom. Many teachers also reported that students lack motivation and engagement. To enhance students' learning experience in CS

classrooms, we could encourage teachers to develop CS-specific instructional strategies, especially differentiated instruction, via professional networks or local-based communities, which may facilitate conversations among teachers, researchers, practitioners and administrators. There are number of studies on case-based learning indicating that reviewing other teachers' teaching practices using videos may enhance teaching competency (Gamoran & van Es, 2002; Seidel, Blomberg & Renkl, 2013). Thus, CS teachers could receive the same benefits by reviewing exemplary teaching practices for their areas. The examples could include a developed activity, or video cases capturing classroom practices. Authentic examples will provide teachers with more valuable contextual knowledge and support for adopting the curriculum in their context. For this, multiple exemplary materials and resources related to teacher training should be developed in CS education.

Second, regarding curriculum, we should revisit the scope and sequence of curriculum, and revised it based on gaps identified in our analysis. The results of this study indicated that many students lack basic computer skills and programming experience. To promote students' basic understanding of the content and practices, teachers used their instruction time, and as a result, they could not complete the CS activities as they were originally designed. Building students' basic computer skills, which are required to learn CS, could be addressed in advance in other courses, such as Technology Application, or elementary school level. Our findings showed that the "game design" module was both students' favorite and most challenging module in the curriculum. This implies that its complexity and entertaining content may facilitate students' engagement and motivation, and, at the same time, challenge them to complete the activity. Accordingly, to better engage students and facilitate their problem-solving processes, scaffolds can be designed in advance in anticipation of students' difficulties (Saye & Brush, 2002). Thus, to facilitate students' motivation and engagement, additional scaffolds can be designed and embedded in the activity. With respect to differentiated instruction, the current curriculum needs to be redesigned to support these teachers' needs and enable them to customize the curriculum in each school.

Lastly, regarding context, school and district administration needs to provide on-going support, especially infrastructure. The results of this study suggested that some schools may not have appropriate equipment or facilities, such as headphones, software, or networks, which hinder efforts to offer a high-quality of CS education.

The findings of this study provide useful insights and understanding about the implementation of CS curriculum with respects to four specific areas. The results can be used for building common shared goals among teachers, students and their parents, and school and district administrators to strengthen the new CS education initiatives.

Based on our findings, further research needs to be conducted on several research topics. First, more in-depth study to evaluate the newly developed CS curriculum implementation will help to identify areas of improvement. Conducting a case study based on teachers' and students' interviews, as well as observations may bring deeper understanding of individual schools' contexts. Second, rigorous measurements which can assess students' content mastery and computational thinking skills should be developed. Our findings imply that teachers experience difficulty in developing assessments. Furthermore, to improve the current CS curriculum, students' learning outcomes and performance should be identified and reflected in the revision of CS curriculum in the future.

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# **Multimedia Video Resolution, Camera Angle, and the Impact on Instructor Credibility and Immediacy**

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## **Abstract**

Instructional designers often provide leadership to their institutions and organizations, especially with respect to creating effective learning content, systems, and environments. This quantitative experiment provides empirical, research-based evidence regarding the impact of various video resolutions and camera angles on student perceptions of subject matter credibility and effective immediacy of instructors. Feedback from randomly assigned participants indicated that instructor credibility and immediacy increased when the instructor was recorded and presented using eye-level, high-definition cameras as compared to lower resolution cameras located above eye level. The findings suggest that credibility and immediacy can be enhanced when instructors are able to make virtual eye contact with learners in multimedia designs and presentations. Instructors, instructional designers, and e-learning administrators can use these findings to improve multimedia presentations, especially with respect to the use of audiovisual techniques in online and e-learning programs.

## **Introduction**

This project investigated how the instructional message design elements of video resolution and video recording angle of an online instructor affects student perceptions of instructor credibility and immediacy. This study builds on previous research into multimedia learning theory by filling several gaps in the instructional design knowledge base. Multimedia learning theory describes and applies cognitive load theory, dual-coding theory, and working memory models to define specific heuristics that can be used to effectively present content to learners (Mayer, 2009; 2014). Students learn more efficiently when they process integrated visual and auditory content. Similarly, motivation and learning are affected by other factors such as instructor credibility and immediacy in multimedia environments that include instructor presence or recordings (Jayasinghe, Morrison, & Ross, 1997). Credibility is the learners' perception of an instructor's genuine concern for their students, subject matter knowledge, and ability to be an effective teacher (Myers & Martin, 2006). Immediacy is the learners' perception of the presenter's verbal and nonverbal communication skills (McCroskey, J., Richmond, & McCroskey, L., 2006). Based on this previous research, it appears that both credibility and immediacy variables can be positively or negatively impacted by message design, especially multimedia designs that integrate video imagery of the instructor.

## Research Questions

The specific purpose of this research project was to study the impact of variations of video resolution and camera angle during the creation and delivery of audio and video multimedia modules for undergraduate and graduate students in online classes at a mid-sized, public, metropolitan university:

RQ1: What is the effect of high-resolution and eye-level camera angle, low-resolution and eye-level camera angle, high-resolution and high-camera angle, and low-resolution and high-camera angle on perceptions of instructor *credibility*?

RQ2: What is the effect of high-resolution and eye-level camera angle, low-resolution and eye-level camera angle, high-resolution and high-camera angle, and low-resolution and high-camera angle on perceptions of instructor *immediacy*?

## Research Design

One hundred and eight student volunteers were randomly assigned into one of four treatment groups, resulting in at least 25 participants in each of the four trials. The consistent instructional content used during each treatment was designed specifically to be part of an online teaching with technology course, wherein, the instructor gave a brief mini-lecture on the history of social networking. The instructor's authentic 20-minute audiovisual module for their online e-learning course was recorded from two cameras (eye-level or above) and was viewed by participants in one of two video resolutions (low or high). The combination of these two variables resulted in four treatment groups that included a high-resolution and eye-level camera angle, a low-resolution and eye-level camera angle, a high-resolution and high-camera angle, and a low-resolution and high-camera angle group. The first camera used to record the presentation was located at eye level with the instructor. The second camera was located 15-degrees above eye level to simulate being mounted higher on a classroom wall and closer to the ceiling. The videos were presented to student participants in either 1920x1080, high-definition or a lower, 320x240 resolution. The result was four variations of the same multimedia presentation where the instructor, content, and audio narration were identical with only the video resolution and camera angle changed between groups, see Figure 1.



1. High-resolution, Eye-level camera



2. Low-resolution, Eye-level camera



3. High-resolution, High-angle camera



4. Low-resolution, High-angle camera



*Figure 1.* Each treatment group viewed one of four variations of the same multimedia presentation, though the presented video resolution and angle of recording camera varied.

All four independent trials viewed the video in their specific treatment group on the same classroom displays and in the same classroom to remove extraneous variables related to display type and size. Once students viewed the presentation in their group they next completed two identical surveys. The McCroskey Source Credibility Measure, an 18-item, seven-option Likert-scale instrument with a Cronbach's alpha reliability of .94, was used to measure instructor credibility (McCroskey & Teven, 1999). The Anderson Perceived General Immediacy Scale, a nine-item, seven-option Likert scale instrument with a Cronbach's alpha reliability of .96, was used to measure participants' perception of the instructor's immediacy (Anderson, 1979).

## Results

A series of Analysis of Variances (ANOVAs) were used to evaluate the impact of video resolution and camera angle on instructor credibility and immediacy. McCroskey's Source Credibility Measure resulted in a statistically significant difference between the treatment groups. A 4x1 analysis of variance (ANOVA) comparing the four groups indicated significant differences,  $F(3,104) = 3.34, p = .022$ , between viewers of the high-resolution and eye-level camera angle, low-resolution and eye-level camera angle, high-resolution and high-camera angle, and low-resolution and high-camera angle versions. A follow-up Tukey post hoc analysis indicated that participants who viewed the high-resolution, eye-level recording rated the presenter as more credible, especially in terms of the goodwill component of the construct ( $M = 4.93, SD = 1.12$ ), as compared to participants viewing the low-resolution, high-angle recording ( $M = 4.2, SD = .89$ ), see Figure 2.

### Instructor Credibility

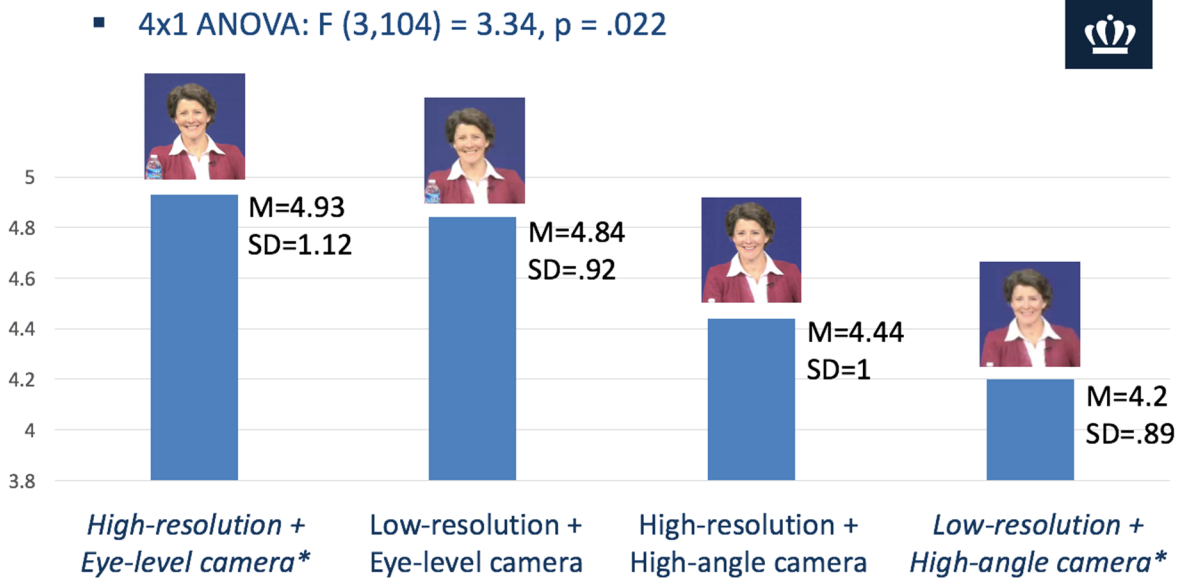


Figure 2. Instructor credibility: An ANOVA and Tukey post-hoc analysis indicated significant differences between the high-resolution and eye-level recording as compared to the low-resolution and high-camera angle recording.

Also, Anderson's Perceived General Immediacy Scale revealed a statistically significant difference between the treatment groups. A 4x1 ANOVA comparing the four groups indicated significant differences,  $F(3,104) = 3.56, p = .017$ , between viewers of high-resolution and eye-level camera angle, low-resolution and eye-level camera angle, high-resolution and high-camera angle, and low-resolution and high-camera angle versions. A follow-up Tukey post hoc analysis indicated that participants who viewed the high-resolution, eye-level recording and the low-resolution, eye-level camera recording rated the presenter higher in communication immediacy ( $M = 5.28, SD = 1.35$  and  $M = 5.25, SD = 1.27$  respectively) as compared to participants viewing the low-resolution, high-angle recording ( $M = 4.27, SD = 1.56$ ), see Figure 3.

# Instructor Immediacy

■ 4x1 ANOVA:  $F(3,104) = 3.56, p = .017$

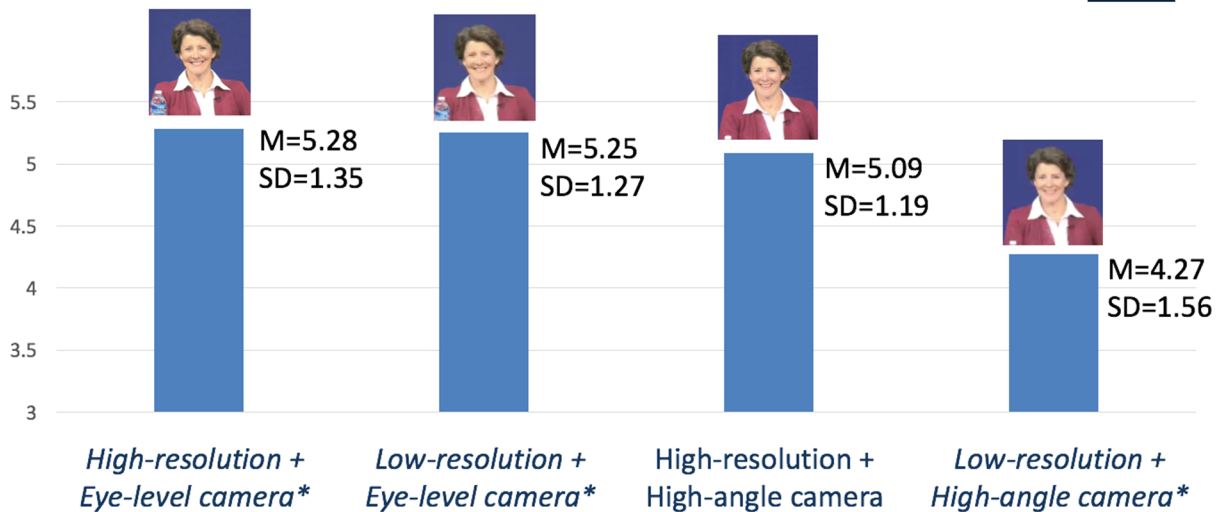


Figure 3. Instructor immediacy: An ANOVA and Tukey post-hoc analysis indicated significant differences between the high-resolution and eye-level and the low-resolution and eye-level recordings as compared to the low-resolution and high-camera angle recording.

## Conclusions

The findings of this study suggest that camera angle and video resolution play a role in enhancing student perceptions in audiovisual modules created for e-learning programs. The high-resolution versions appeared to communicate subtler nonverbal cues than the low-resolution versions. Similarly, the eye-level versions appeared to enhance the communication effectiveness of the instructor and reduced participants' sense of distance. Designers can use these findings to define best practices and advocate that online instructor credibility and immediacy are enhanced when audiovisual presentations are recorded from eye-level cameras and presented in high resolutions.

Investments in video production and content distribution are often expensive and time intensive. However, using effective recording resolution and camera angles can have a positive and influential impact on student satisfaction and improve the effectiveness of message design in multimedia-based e-learning programs. This present study also creates a baseline for future projects. Follow-up research will include presentation slides, additional video content, real-time telepresence, and more diverse subject content to further explore the impact and application of these variables on multimedia learning theory.

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# **The Effects of Visible-Annotation Tool on the Learning Process and Learning Outcome in CSCL**

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## **Abstract**

This study was designed to investigate how representation tool types, designated “visible annotation”, facilitate the learning process and enhance learning outcomes in CSCL environments. Twenty-eight students participated in this study, and they were divided into two groups: the TLL-type focusing on defining the concept of learning contents and the CTLL-type focusing on discussing the concept of learning contents. The result indicated that TLL-type was more effective in both the learning process and learning outcome.

## **Introduction**

Computer-supported collaborative learning (CSCL) is a learning method that facilitates collaborative learning using computers and networked devices (Schwarz, Groot, Mavrikis, & Dragon, 2015; Stahl, 2015). Some CSCL researchers have reported that CSCL is more effective than face-to-face learning because it can help learners overcome the limits of physical space using computational devices (Fischer, Bruhn, Grasel, & Mandl, 2002; Pena-Schaff & Nicholls, 2004; Schellens & Valcke, 2006). Learners carry out complex task through sharing each other’s knowledge, negotiating various opinions, and integrating different perspectives in CSCL (Eryilmaz, van der Pol, Ryan, Clark, & Mary, 2013). It is effective for enhancing individuals’ knowledge construction and achieving a higher-level of collaborative knowledge construction (Garrison & Arbaugh, 2007; Morgan, Whorton, & Gunsalus, 2000). However, in the process of achieving higher-quality solutions, many restrictions can be imposed due to the learners’ diverse perspectives in such areas as sharing problem awareness, negotiating a variety of opinions, and building collaborative knowledge based on communicative activities (Fuks, Pimantel, & Lucena, 2006). In addition, collaboration load can occur in CSCL environments, and this can lead to ineffective learning processes and unsuccessful learning performance. Most previous research showed that representation tool can support learners’ construction of accurate shared knowledge and a higher level of constructed knowledge focusing on learning outcomes (Fuks et al., 2006). However, few efforts explored the impact of learning performance on the sequential process of knowledge construction requiring various interaction types according to the nature of the complex task.

This study was designed to investigate how representation tool types, designated “visible annotation,” facilitate the learning process and enhance learning outcomes in CSCL environments. Based on the principle of collaborative knowledge construction, we developed the following two types of visible annotations with a linked annotation function: the TLL-type, representing the one meaning-sharing learning phase focusing on defining concept of learning contents and one opinion-sharing learning phase used to build shared knowledge (TLL); and the CTLL-type, representing the one meaning-sharing learning phase focusing on discussing concept of learning contents and one opinion-sharing learning phase used to build shared knowledge (CTLL). The two visible-annotation types include the same problem-solving learning phases used to build constructed knowledge.

Specifically, the following research questions were addressed in this study. First, what are the effects of the visible-annotation tool on the learning process in the CSCL environment? Second, what are the effects of the visible-annotation tool on the learning outcome in the CSCL environment?

### **Theoretical Background**

Collaborative learning is effectively carried out if there are active interactions between team members in CSCL environment (Kolhoffel, Eysing, & de Jong, 2011). However, if the number of unshared messages among the learners grows, collaborative interaction is replaced by simple interaction, and this does not positively influence shared knowledge building and collaborative learning outcomes (Suthers, Vatrappu, Medina, Joseph, & Dwyer, 2008). To facilitate meaningful interaction in CSCL, researchers have designed and developed a variety of tools (Kolhoffel et al., 2011). Especially, many strategies using representation tools have been verified that specific functions (e.g., concept map, graph, matrix, and annotation) can induce active interaction within learners and acquire high-quality of learning outcomes by visualizing learners' cognitive process (Bell, 1997; Bruggen, Kirschner, & Jochems, 2002; Schwarz et al., 2015). Recently, Eryilmaz et al. (2013) showed that linked-annotation function based on asynchronous discussion can facilitate interactions of conflict and assertion, which is related to the effects of supporting the "negotiation of position" phase (Beers, Kirschner, Boshuizen, & Gijsselaers, 2005, p. 10). However, they fail to verify to effects of supporting the "negotiation of meaning" phase such as interactions of clarification, interpretation (Beers et al., 2005, p. 10).

As Beers et al. (2005) and Rummel and Spada (2005) indicated, meaningful interaction in CSCL requires a series of phase from unshared knowledge to collaborative knowledge through several sharing activities. In particular, the optimal learning methods for each learning phase should be applied when carrying out the sequential sharing activities of learning content from the key concept to more complex learning content (Cannon-Bowers & Salas, 2001). The exact meaning sharing of learning content in an ill-structured task can help learners reduce the possibilities for misunderstanding and lead them to in-depth discussions (Slof, Erkens, & Kirschner, 2011). Considering the importance of exact meaning sharing in a knowledge construction process for the complex task (Beers et al., 2005; Jorczak, 2011; Rummel & Spada, 2005), Shin, Kim & Jung (in press) suggested the representation tool adapting different types of representation function. Specifically, learning process consisted of three phases based on nature of part-tasks and the process of collaborative knowledge construction; meaning sharing, opinion sharing, and problem-solving. The result revealed the meaningful effectiveness on the accuracy of sharing activities and level of collaborative performance (Shin et al., in press). However, the finding has still a limitation because it could not deeply catch interaction patterns occurring each sharing phase (Fu, Aslst & Chan, 2016; Yücel & Usluel, 2016).

Although recent researches have been conducted to analyze qualitative dialogue, they rarely analyzed results systematically by considering theoretical principle (Fuerstenau, Ryssel, & Kunath, 2010; Schellens & Valcke, 2005; Yücel & Usluel, 2016). The recent research of the analyzing discussion patterns has reported that much research has shown a noticeable problem that fails to consider interaction pattern both theoretically and practically to promote various collaborative interaction activities (Fu et al., 2016). To overcome this limitation, the present study aims to deeply explore the sequential knowledge construction process by using representation tool reflecting knowledge construction principle.

### **Method**

To test the hypotheses, this study analyzed the online messages posted on an asynchronous discussion tool (Visible-annotation) that was used as a learning environment. As a reflecting limitation of previous researches, this paper focused on the analysis of the knowledge construction process more deeply. Moreover, this study tries to explore the process of interaction in relation to the collaborative learning outcome.

### **Procedure**

The experiment was conducted as a three sub-tasks for four weeks in an online learning environment without a face-to-face meeting. The participants first performed pre-test which consisted to prior knowledge, computer literacy, collaborative tendency, and was provided with the manual included to learning tasks and method of using the tool. The students participated in pairs in the experiment. All of the groups performed sub-tasks through same material related to educational methodology. However, there was a difference of annotation type. Specifically, sub-tasks consisted of core-concept understanding and sharing of learning material, specific-content sharing of

learning material, and lesson planning task. Students were asked to submit a lesson planning in pairs at the end of collaborative learning (see *Figure 1*).



*Figure 1. Learning processes*

### The Compared Tools for Analyzing Other Treatment

To compare the effectiveness of treatment, the different two types of visible annotations were used. The tool of CTLL type was considered managing strategy for the type of tool, which has two times sharing activities through sentence-based annotation only (see *Table 1*).

*Table 1. Learning phases and learning methods based on visible annotation types*

Visible annotation type	Sharing phase <i>Comprehension of learning content task</i>		Problem-solving phase <i>Lesson planning task</i>
	1 <sup>st</sup> week	2 <sup>nd</sup> week	3 <sup>rd</sup> & 4 <sup>th</sup> week
	CTLL	Meaning sharing learning phase 1) Sub-task - To define the meaning and explain of core-concept of material 2) Function of tool - Sentence-based annotation - Linked annotation	Opinion sharing learning phase 1) Sub-task - To ask, submit of opinion and comment on specific content of material 2) Function of tool - Sentence-based annotation - Linked annotation
TLL	Meaning sharing learning phase 1) Sub-task - To define the meaning and explain the pros & cons of core-concept of material 2) Function of tool - Word-based annotation - Linked annotation	Opinion sharing learning phase 1) Sub-task - To ask, submit of opinion and comment of specific content of material 2) Function of tool - Sentence-based annotation - Linked annotation	

### Interaction Analysis of Knowledge Construction Activities

We investigated the frequency and proportion of discussion activities in each group. The messages were analyzed by Pena-Shaff and Nicholls (2004) sentence analysis tool. Three educational experts reviewed and used content validity. The level of inter-rater reliability was .78.

### Analysis of Collaborative Learning Outcome

The learning outcome was measured by the lesson-planning task. A three-point Likert scale was developed to measure the level of the constructed knowledge, based on the research of Dick, Carey, and Carey(2003), and Gagné, Wager, Golas, and Keller (2005).The level of inter-rater reliability of three evaluators is .89.

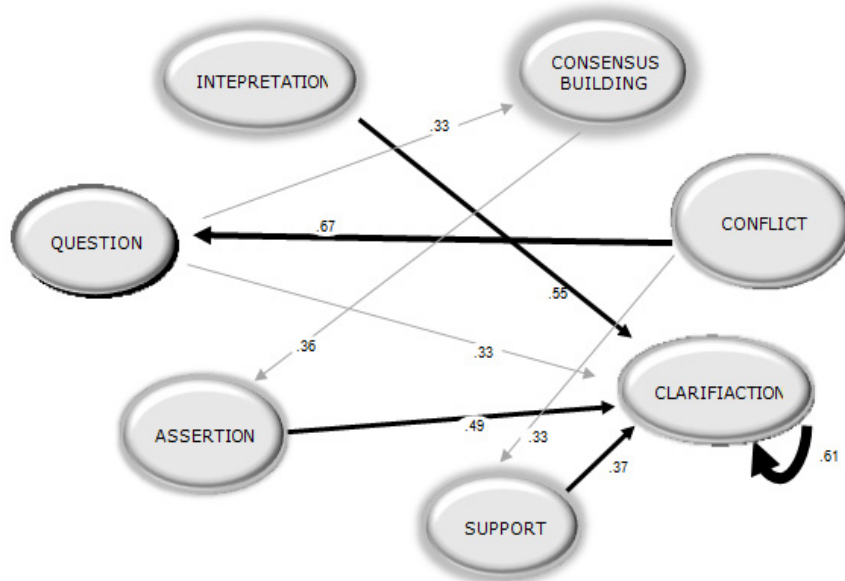
## Results

This study carried out the sequential analysis based on the quantitative content analysis results. Annotations coded by the scheme were organized chronologically. The circles in following figures represent knowledge construction activities. The arrows between circles depict directed transitions. The thickness of an arrow is

proportional to the probability of a transition. The values specified in the figures illustrate transitional probabilities. To ease readability, transitional probabilities less than 0.30 were omitted in the figure. Also, we investigate the z-score which take into account not only the observed total number of responses to a particular messages category but also the marginal totals of each response type observed across all message types (Jeong & Frazier, 2008).

### Meaning Sharing Phase

First, in the CTLL type, sequential analysis results of interactions in meaning sharing phase showed a pattern that almost activities such as interpretation, question, assertion, and support were converged to clarification. However, the result of z-score was only statistically significant in patterns from clarification to clarification ( $z = 2.78, p < .01$ ). On the other hand, despite the small cell frequencies, there was significantly higher than expected from conflict to question ( $z = 7.84, p < .01$ ) (see *Figure 2*). Next, in the TLL type, all seven activities in meaning sharing phase were converged to clarification activities. And there were statistical significant results of z-score from clarification to clarification ( $z = 2.78, p < .01$ ), from Interpretation to interpretation ( $z = 9.19, p < .01$ ), from question to clarification ( $z = 1.81, p < .05$ ), and from assertion to clarification ( $z = 2.19, p < .05$ ) (see *Figure 3*). The interaction patterns of two groups were similar to those of clarification, but TLL type was differed in that they have significant z-score with various activities. In the case of CTLL type, a pattern from conflict to question, which is expected to be derived from the opinion sharing phase, was derived at the meaning sharing stage.



*Figure 2.* Transitional state diagram for meaning sharing phase of the CTLL type



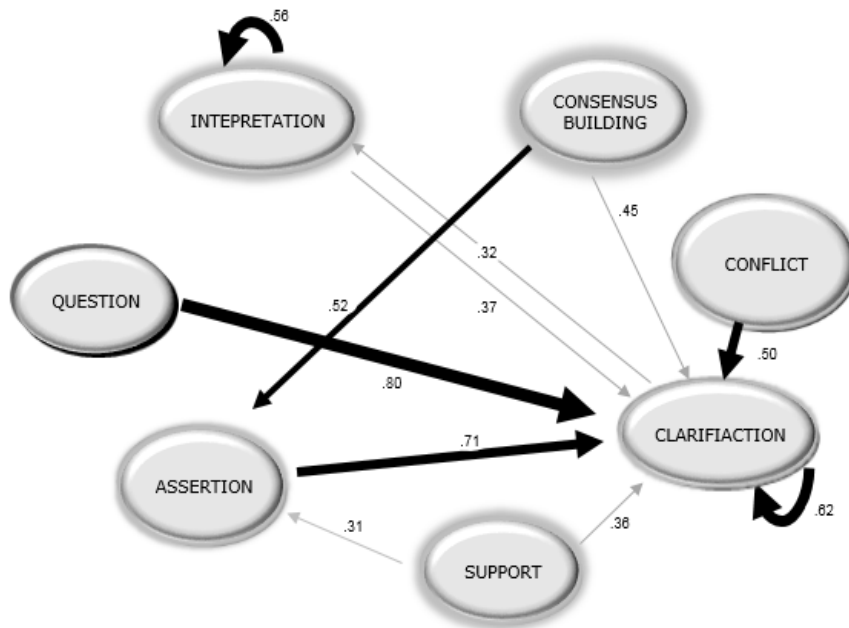


Figure 3. Transitional state diagram for meaning sharing phase of the TLL type

### Opinion Sharing Phase

First, in the CTLL type, the sequential results of interaction showed a pattern that converged to the assertion. Moreover, z-score of sequential analysis was only statistically significant in patterns from assertion to assertion ( $z = 5.38, p < .01$ ). On the other hand, there was significant result from clarification to clarification ( $z = 7.55, p < .01$ ), and from interpretation to interpretation ( $z = 5.90, p < .01$ ) (see Figure 4). Similar to results of the CTLL type, the sequential pattern in TLL type was also converged to assertion activities. Specifically, there were statistical significant result of z-score from assertion to assertion ( $z = 3.14, p < .01$ ), from clarification to interpretation ( $z = 4.43, p < .01$ ), and from interpretation to interpretation ( $z = 4.66, p < .01$ ) (see Figure 5). In conclusion, in the opinion sharing phase, two groups had similar patterns to the interaction, unlike the meaning sharing.

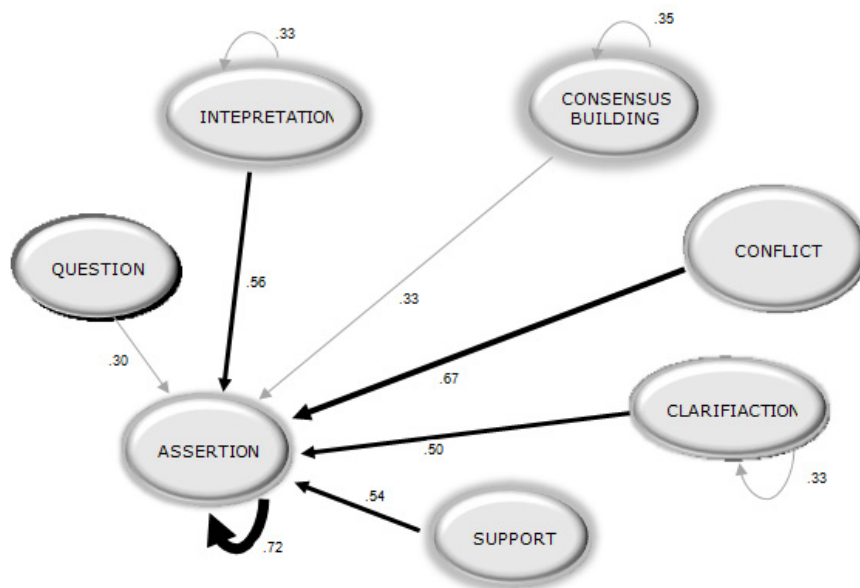


Figure 4. Transitional state diagram for opinion sharing phase of the CTLL type

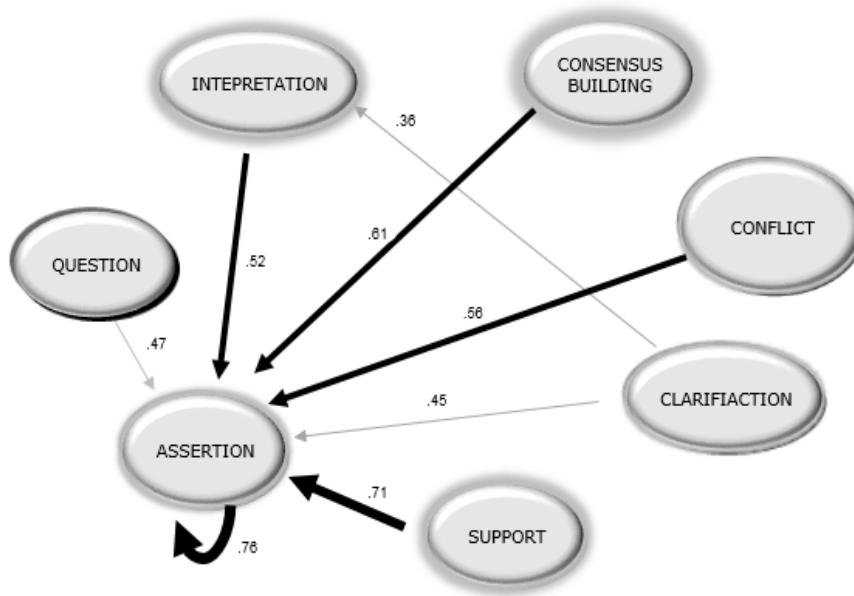


Figure 5. Transitional state diagram for opinion sharing phase of the TLL type

### Effects of Types of Tool in Learning on Collaborative Learning Outcomes

The results of ANCOVA of the constructed knowledge found significant differences between conditions [ $F(1, 23) = 8.59, p = .008$ ]. The level of collaborative learning outcome in the TLL type condition ( $M=10.86, SD=1.49$ ) was higher than the level in the CTLL type condition ( $M=8.04, SD=2.72$ ) (see Table 2). The results implied that the concept sharing phase of the learning content could affect the level of the collaborative learning outcome.

Table 2. Effects of types of tool on collaborative learning outcomes measures

Types of tool	M	SD	AM
CTLL	8.04	2.72	8.07
TLL	10.86	1.49	10.83

$N=28$ .  $M$ =Mean.  $SD$ =Standard deviation.  $AM$ =Adjusted mean.

### Conclusions

The results were consistent with the empirical evidence for the knowledge construction principle previously obtained in CSCL research (Beers et al., 2005; Rummel & Spada, 2005). The TLL focusing on concept learning was found to be more effective in learning process and learning outcome. Specifically, TLL-type facilitates clarification and interpretation activities for help understanding about learning content, and these activities lead to assertion activities that enhance the quality of ill-structured problem-solving. However, lower activities occurred in TLL than CTLL, such as consensus and conflict activities, should be explored with re-analysis.

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# Pre-Service ICT Teachers' Recommendations for School Internet Safety

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### **Abstract**

Students should use the internet responsibly. Teachers, and school IT specialists have roles in keeping students safe. This study aims to determine the readiness levels of preservice ICT teachers about online treats. A unique realistic problem was provided to pre-service ICT teachers; and asked for solution strategies. Preservice ICT teachers' solution strategies and suggested activities were analyzed using content analysis method. Eight categories, which were education, technical solutions, guidance, parents, problem definitions, obstacles, activities, and cooperation emerged from the analysis. Results showed that most of the pre-service teachers were not as ready as desired. Although they knew the importance of education and training for internet safety and security they couldn't emphasize the importance of integrating internet safety education into the curriculum. Also they did not seem to be eager to take responsibility about students' internet safety.

*Keywords: internet safety, pre-service ICT teachers, readiness levels of preservice ICT teachers*

### **Introduction**

The appropriate and safe use of internet requires safe keeping of personal information and not sharing them in public media. However, most people are not aware of this problem. A study conducted as a part of the EU Kids Online project revealed that 42% of the children and teenagers in Turkey have public profiles on social media open to everyone and only third of the children and teenagers share their profile with their friends (Karakus, Çagiltay, Kasikci, Kursun, & Ogan, 2014). According to researchers people who share private information on internet risk of privacy violations or coercive or hostile interactions more than people who do not (Elisabeth, S., & Livingstone, S. 2016; Staksrud, Ólafsson, & Livingstone, 2013). Experts suggested that students should not share their passwords, photos, personal information and identification information on social media and control their privacy settings often. According to Staksrud et al. (2013) children who use social networking sites (SNS) are more likely to have received sexual messages, seen sexual images on websites, encountered negative user generated content, been bullied on the

internet and met people offline that they had only met online before. And these are not the only dangers children can experience online.

Some of the dangers of sharing personal information on the internet are: internet fraud, threat, harassment, financial loss, physical, social, and psychological injuries. The report by the International Telecommunication Union (2013), listed the major dangers experienced by the children online as, pornography, violence, online gaming addiction, cyber fraud, cyberbullying, and racism. Children can be exposed to illegal content, or legal but age inappropriate content. They can be contacted by sexual predators, or participate to harmful online communities such as sites which encourage anorexia, self-harm or suicide. They can engage in risky sexual interactions such as sexting or place information about themselves in the public domain, or post pictures or videos or text which might compromise their personal safety or jeopardize a number of career options for them in the future. Children can be exposed to bullying and to find themselves in an environment that allow or promote bullying others. Children can access or acquire age inappropriate goods and services. Children and young people can be target to scams, identity theft, fraud and similar threats which are economic in nature or are rooted in inadequate data protection or privacy laws. With some children and young people, forms of obsessive behavior or excessive use can be a big problem. Internet addiction, game addiction and similar problems can occur.

Children's exposure to these dangers can turn into personal and social problems. Fear, sadness, hate, disappointment, shame, worry, turning to violence, self-mutilation, sleep and eating disorders, failing at school and social relations, problematic behavior towards family members and friends are some of these problems.

Students should use the internet responsibly, they should only share safe content, and request help from an adult they trust when they experience any issue. Also, parents, teachers, school administrators have roles such as, informing student safe use of internet, taking precautions towards ill-treatment students can experience online, and intervening with proper methods when students experience a problem. However students engage in dangerous online activities such as trusting strangers and chatting with them online, and disseminating personal information online from early age (Kavuk, Keser, & Teker, 2011).

Also, children and teenagers are using internet more and more. According Turkish Adolescent Profile Report (2014), computers, tablets and smart phones are being used by children and teenagers between the ages of 12 and 15 at an overwhelming rate. 65 % of Turkish adolescents have computers at their homes and 48 % have mobile phones and half of these are smart phones. 82 % of the homes with computers have also internet access. Socioeconomic (SES) status and computer and smart phone ownership correlate positively. At high SES computer ownership rate increases to 96 %. 47 % of these adolescents with access to internet do it without any restrictions. Half (48 %) of the adolescents with internet access have online friends that they communicate regularly. 29 % of the adolescents moved their friendships to face to face settings after meeting them online. Adolescents use the social networking sites at an awe-inspiring rate of 76.5 %. Access to internet and smartphones without any oversight and guidance can put children at risk. Similarly access to and use of internet via mobile devices by children and teenagers are increasing and will likely be an issue in the future all over the world (Stald, Green, Barbovski, Haddon, Mascheroni, Ságvári, Tsaliki, 2014).

Previous studies show that, both teachers and students see teachers capable of recognizing, taking precautions and intervening to internet related safety dangers (Kavuk, 2016). Teachers see themselves and students see their teachers capable of recognizing, preventing and intervening cyberbullying related cases. Although teachers see themselves capable they rarely intervene to online problems their students face. Experts suggested that teachers were afraid of overstepping the legal boundaries (Kavuk, 2016).

Teachers, administrators, parents, school IT specialists and students together create an action plan to prevent and intervene online threats students can experience. Information and Computer Technology (ICT) Teachers are the specialist in Turkish schools. ICT teachers would be expected to fulfill this role in addition to regular teachers' role. There were not any studies about ICT teachers' readiness towards fulfilling this role as a whole. There were studies on identifying preservice teachers' perceived awareness of and preparedness for cyberbullying cases (Li, 2008; Ryan & Kariuki, 2011; Yilmaz, 2010). In Canada, Li found that preservice educators did not feel qualified (prepared) in the identification or management of cyberbullying. Similarly Ryan and Kariuki (2011) found that half of the preservice teachers see themselves as not ready to handle cyberbullying cases. Yilmaz (2010) conducted the same study in Turkey and found slightly higher perception levels however still half of the students were not confident about their perceived abilities to handle cyberbullying cases. Since cyberbullying is not the only problem preservice teachers should be able to handle diverse sets of online threats and cyberbullying research clearly shows there needs to be more direct approach to measure preservice teachers readiness levels. This study aims to determine the readiness levels of preservice ICT teachers towards determining, preventing, and intervening online treats towards students.

## Methodology

This case study was conducted with 38 preservice ICT teachers who were senior students at a public University in Turkey. Students' age ranged between 21 and 28. Qualitative data was collected to assess their readiness levels. A unique realistic problem was provided to ICT preservice teachers:

Students at the local public middle school registered to a fishy Illuminati-themed web site using their personal information. The students started to think that they were being followed by this so-called Illuminati organization and were in danger because of the rumors they started themselves and these turned into urban legends at the school. The situation became widespread among the students who registered to the website and started to cause behavioral and psychological problems. How would you solve this problem if you were the ICT teachers at this school?

Participants were asked for solution strategies and activities to assess whether they have necessary skills to cope with these kinds of problems in real life. The problem was a mass hysteria-like problem in a middle school setting about a real web site masquerading as an official historical organization named Illuminati; and they wrote down their solutions for this problem. Content analysis method was used to analyze this qualitative data.

## Findings

Eight categories were proposed based on the solutions participants offered. These categories were education, technical solutions, guidance, parents, problem definitions, obstacles, activities, and cooperation. Strategies including training and information for students were categorized into education category. Strategies such as technical access control and blocking were categorized into technical solutions category. Strategies including use of guidance services and psychological support systems were categorized as guidance. Training and education of parents were categorized as parents. Suggestions about the nature of the problem were categorized under the definition of the problem label. Suggestions regarding unavoidable nature of the problem and real life challenges were categorized under obstacles. Strategies trying to take advantage of indirect social, sportive and cultural activities categorized under activities label. Strategies that suggested cooperation between stakeholder such as parents, teachers, and administrators were categorized under cooperation label.

For education category some of the participants' suggestions were:

"Educate students about the faultiness of disseminating the wrong information and conduct awareness activities about information online".

"Digital literacy training should be given."

"Seminars related to the subject can be given."

"Courses by experts should be provided."

"Banners and posters can be used."

"Conference for the parents."

These suggestions and activities were all educational or informative activities. For technical solutions category some of the participants' suggestions were:

"Access restriction."

"Ban the sites."

"ICT ban."

"Internet filter (restriction) in school."

"Internet access should be restricted both at school and at home."

All of these suggestions were basically same and involved blocking access to the problem site. For guidance category some of the participants' suggestions were:

"Individuals directed to the guidance center"

"Student monitoring"

"Guidance services should be used."

"Developmental needs to be addressed."

"Using group guidance services."

Guidance category suggestions mainly about utilizing the school guidance counselor services. For parents category some of the participants' suggestions were:

"Parents must supervise their children"

"Parents should be informed about the problem."

Parent category suggestions were about involvement. For problem definitions category some of the participants' suggestions were:

"Illuminati site is a fraud site"

"First the situation should be analyzed."

"Students internet activities should be observed."

"A scientific study should be conducted about the problem."

"To understand the problem data should be collected."

Problem definitions category comments were about determining and describing the problem to initiate further activities. For obstacles category some of the participants' suggestions were:

"Simple ban or blocking would not solve the problem."

"The students are in a critical age and the consequence can be severe."

"Students tend to trust the information on the internet."

"The teacher should be informed about the problem."

"There is not a simple solution"

Obstacles category comments were about complexities and difficulties of the problem. For activities category some of the participants' suggestions were:

"Students should be directed to extracurricular activities."

"Extracurricular activities should be conducted."

Activities category comments were about students partaking in extracurricular activities. For cooperation category some of the participants' suggestions were:

"Parents should be informed."

"Teachers should work with school administrators and parents."

"Students should be monitored not only at schools but also at home."

Cooperation category suggestions were about stakeholders working together to solve the problem.

## Results and Recommendations

Results showed that most of the pre-service teachers were not as ready as desired. Although they knew the importance of education and training for internet safety and security they couldn't emphasize the importance of integrating internet safety education into the curriculum. Their suggestions were mostly superficial suggesting about referring subjects to counselor or providing educational activities. Since the unique problem was mass hysteria type of problem, students could come up with more complex solutions. Although some of them were aware that simply banning the website wouldn't solve the problem, their concern was more about students would still be able to access to the web site by other means. This problem might require teachers actually talking to students and understanding their concerns and provide support to them with all the stakeholders. Although few students suggested cooperation the debt of the answers were not at the level we need at our schools. Also, as information technology teachers, they should have felt responsible more; and not refer everything to counselors and administrators. There is definitely a room for academic improvement.

There is a need for addition of internet safety related courses to teacher education curriculum and students should be provided real life cases to prepare them for school practice.

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# **Turkish Schools' Readiness for Preventing Cyberbullying**

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## **Abstract**

Cyberbullying is a serious problem among adolescents. Widespread use of digital communication tools is increasing the number of cyberbullying cases. Schools staff should be ready to overcome cyberbullying. This study aimed to determine the awareness levels of Turkish school about prevention of cyberbullying. Turkish educators' awareness of creating anti-cyberbullying school climate, and instituting anti-cyberbullying technological measures was acceptable; but instituting anti-cyberbullying rules and regulations, and anti-cyberbullying educational actives were not acceptable.

Keywords: cyberbullying, cyberbullying awareness, cyberbullying prevention

## **Introduction**

Cyberbullying is defined as a willful and repeated harm inflicting acts, such as taunting, name calling, insulting, gossiping, knowingly spreading computer viruses, sharing someone's photo without their knowledge, sending SMS messages from hidden numbers, threatening, harassing, and intimidating using information technologies. Considering the prevalence of cyberbullying (Wang, Iannotti and Nansel, 2009; Mishna, Kassabri, Gadalla and Daciuk, 2012; Erdur-Baker and Tanrikulu, 2010), its effects on individuals (Belsey, 2006; Beran and Li, 2005; Hinduja and Patchin, 2005), the factors that trigger cyberbullying (Aftab, 2011; Bauman, 2013; Campbell, 2005; Erdur-Baker and Tanrikulu, 2010;) and the legal sanctions, it is evident that cyberbullying is a serious threat that targets adolescents. This problem grows day by day and it causes concern among parents, educators, and school administrators.

Researchers suggested that, most of the schools' staff did not want to involve themselves in cyberbullying cases because they did not wanted to overstep legal boundaries (Willard, 2007). Moreover, most of the schools do not have preventive measures that educate and inform students about dangers and consequences of cyberbullying. The appropriate, ethical and healthy usage of Information Technologies (IT) should be supported, but at the same

time students, school staff and parents must be able to overcome cyberbullying issues that arise because of inappropriate use of IT.

Jager, Amado, Matos, and Pessoa (2010) stated that cyberbullying is a unique type of bullying. For this reason, it is necessary that the studies of fighting with cyberbullying in schools are unique. Brewer (2011) defines cyberbullying as a challenge unlike any other that school leaders and other educators face. According to Huang and Chou (2013), teachers are in a critical position to cope with bullying. Bhat (2008) stated that the prevention and intervention measures for cyberbullying should be established together with school technology experts, managers, teachers, parents and students.

Researchers make some suggestions about how to combat with cyberbullying. For example, Hinduja and Patchin (2009c) emphasized that the work to be done at school in order to prevent cyberbullying should include the dimensions of recognition, prevention and intervention. To recognize cyberbullying is to know what it is, how it occurs, its features like causes, effects or legal consequences, and to analyze the incidents that take place. To intervene effectively in cyberbullying, and clear school principals and rules of cyberbullying must be identified (Slonje and Smith, 2008) and the evidence and details the incidents must be examined.

To prevent cyberbullying it is necessary to provide school-parent collaboration, to design an effective cyberbullying curriculum and to educate school stakeholders about cyberbullying (Cassidy, Brown and Jackson, 2012). Farrington and Ttofi (2010) stated that effective sanctions and disciplinary methods would be useful in reducing cyberbullying. However, some researchers certainly do not suggest discipline and ignorance behavior (Bauman, Rigby and Hoppa, 2008; Yoon and Barton, 2008). DeSmet et al. (2015) suggests activities such as talking to students, working with parents and guidance specialists to cope with cyberbullying. Besides, some researchers emphasize the importance of creating positive school culture, educating school stakeholders, creating school specific principals and taking technological precautions within the scope of cyberbullying prevention studies (Cassidy et al. 2012; Hinduja and Patchin, 2009a; Kowalski, Limber and Agatson, 2012).

Since it is a serious problem targeting students, it is necessary to raise awareness about preventing cyberbullying to all school stakeholders, and this task falls primarily on school staff. In line with this, it is important to establish educators' perception of cyberbullying, their reaction and current bullying experiences, and then, based on these factors, to devise prevention strategies (Huang and Chou, 2013).

There were some resources and studies on evaluating the perceptions, opinions or awareness of educators regarding cyberbullying prevention, and creating specific cyberbullying strategies for the schools, in the literature (Hinduja and Patchin, 2009a; Kowalski et al., 2012; Mishna et al., 2006). However, studies have not been conducted to determine the opinions of educators in Turkey regarding cyberbullying prevention. For this reason, the main goal of this study was to determine the educators' (e.g., school administrator, ICT teacher or school counselor) awareness regarding cyberbullying prevention. Following research questions was used to achieve this goal.

1. What are the opinions of educators on creation of anti-cyberbullying school climate?
2. What are the opinions of educators on construction of anti-cyberbullying principles?
3. What are the opinions of educators on creation of anti-cyberbullying curriculum and education?
4. What are the opinions of educators on taking anti-cyberbullying technological precautions?

## Methodology

The study was conducted using survey method, and quantitative data was collected. The sample was selected among middle schools and high schools in Turkey. The population was 22249 schools. Stratified sampling technique was used to choose the sample schools. Using Cochran's (1977) stratified sampling formula, the sample size of 378 was determined. Turkish Statistics Institutes' (TSI) statistical region determination classification and provinces' information technology crime rates was used. According to TSI's classification, there are 12 regions in Turkey, and Istanbul province represented a region by itself. The province with the highest information technology crime rate and the province with the lowest information technology crime rate was selected from the remaining 11 regions; 23 provinces in total included in the study. The study was conducted on 1431 schools; and 2586 educators who were employed in these schools at these provinces participated. If there was an ICT teachers and/or school counselors at these schools and at least one school administrator participated from each school. 57.1 % of the participants were school administrators, (f=1477), 20.1% were school counselors (f=521), 19.1% were ICT teachers (f=495), and 3.6% were other teachers (f=93).

Data were collected using "Questionnaire for Cyberbullying Awareness at School" developed by (Keser and Kavuk, 2015). The questionnaire has 51 items in three dimensions, which are recognition, prevention, and intervention of cyberbullying. Prevention dimension had four sub dimensions: the creation of an anti-cyberbullying school culture, the creation of an anti-cyberbullying curriculum and education, the construction of specific anti-

cyberbullying principles, and taking technological precautions. In this study, the four sub dimensions and the 29 items of prevention dimension were used for data collection. Each dimension and each item was analyzed separately.

The data were collected in electronic form. Permissions and approvals for human subject research were granted by Ministry of Education and University Ethics Board. Schools were contacted via e-mail, phone and if possible with meetings and informed about the study and their participation to the online survey was requested. Survey submissions that met the ethical standards were analyzed. Data were analyzed using mainly frequency (f) and percentage. The answers given by the educators were accepted as clues to the readiness of the schools for preventing cyberbullying and the findings were discussed in this way.

## Findings

Regarding the first research question, educators' opinions on *the creation of anti-cyberbullying school culture* sub dimension were analyzed. Accordingly, 72.3 % of the educators reported that they believe students would report cyberbullying incidents to school staff; 82 % of the educators said that students were reminded regularly about reporting cyberbullying incidents; 68.3 % of the educators claimed that there were activates at their schools to show students that cyberbullying was not cool. The majority of educators (93.3%) stated students know that the inappropriate use of technology will not be ignored by the school management.

For the second research question, educators' opinions on *the creation of anti-cyberbullying policies* sub dimension were examined. Only 47.5% of the educators stated that their schools have a clear anti-cyberbullying policy; 57.8 % of the educators reported that they had anti-cyberbullying rules and regulations; just 22.6% of the educators claimed that these rules and regulations were known by the parents; almost half of the educators gave negative response or stated that they had no information regarding these items.

About the third research question, *the creation of an anti-cyberbullying curriculum and education* sub dimension were investigated. According to this, approximately 40% of educators stated that combating cyberbullying is not a part of the curriculum in the schools, or that they do not have knowledge on this subject. 65.5% of the educators thought teachers at their schools were adequate to handle cyberbullying, 50.7% of the educators thought the students at their schools were adequate to handle cyberbullying, and only 22.8% of the educators thought the parents of the students at their schools were adequate to handle cyberbullying. On the other hand; 43.3% of the educators reported that there were educational activities towards the students at their schools; 37.1 % of the educators reported that there were educational activities towards teachers at their schools; and 35% of the educators reported that there were educational activities towards the parents at their schools. However, 13.7% of the educators stated that the school staff does not organize any educational activities for students; 31.2% said there are no educational materials for teachers; and 40.4% believe there are no study materials for families. 78% of the educators claimed that school staff are aware of their responsibility for measures to be taken around the school to cope with cyberbullying. Most of the educators (73.8%) stated that they did not use peer mentoring in their schools to educate student about cyberbullying, or they have no idea on this issue. 60.9% of the educators think that students learn about cyberbullying from ICT teachers, 58.7% from school administrators, 57.1% from school guidance teachers, 23.4% from family and 21.6% from friends.

Regarding the fourth research question, educators' opinions on *the taking anti-cyberbullying technological precautions* sub dimension were viewed. The majority of the educators reported that schools' networks had internet monitoring (73.3%) and content monitoring (55.2%) software/hardware. 87.4% of the educators reported that they had antivirus software; and 87% of the educators reported that they were using government sanctioned safe internet service. 95.1% of the educators declared that they avoid publishing the students' personal information on the school website.

## Discussion

Educators' opinions on the first sub dimensions show that the schools' level of readiness concerning *creating anti-cyberbullying school culture* is found to be generally high. Creating a school atmosphere where cyberbullying behaviors would never be ignored (Hinduja and Patchin, 2013) and creating a positive school culture in which cyberbullying is not popular among the student (Hinduja and Patchin, 2009b) is crucial in preventing cyberbullying. In our research, educators claimed they work to create such a school culture and environment. The vast majority of educators think that cyber victim students would report the incident to a teacher and they stated students are regularly reminded that they should seek help from teachers in such cases. Although similar results can be found in research conducted among educators, the situation is quite different from the students' perspective. In Choucalas's study (2013), the majority of the school administrators and teachers thought that students would report cyberbullying incidents, while nearly half of the students said they would report a cyberbullying incident.

The readiness level of the schools concerning *the creation of anti-cyberbullying policies* sub dimension is found to be generally low. Creating clear and strong anti-cyberbullying policies, principles and rules in schools is important to combat cyberbullying (Hinduja and Patchin, 2009a; Kennedy, Russom and Kevorkian, 2012; Kowalski et al., 2012; O'Moore and Minton, 2005). However, in our study, it can be concluded that the majority of the schools does not have a clear cyberbullying policy, principal or rule, or any policy or set of rules specific to cyberbullying. Although researchers emphasized that the rules and principals of traditional bullying do not work in cyberbullying (Shariff, 2005); in a similar study to ours, it is found that schools have no principles specific to cyberbullying; and educators have determined that the school bullying principles can also be used in cyberbullying incidents (Ryan, Kariuki and Yilmaz, 2011).

The readiness level of the schools concerning *the creation of an anti-cyberbullying curriculum and education* sub dimension is also found to be generally low. Educators' answers showed that cyberbullying is not included in almost half of the schools' curriculum or educational programs. Nevertheless, educators think that they are qualified to cope with cyberbullying. In the literature, there are studies that obtained similar results and obtained different results. For example, Choucalas's study (2013), more than half of the teachers (52%) and more than two-thirds of the school administrators (70%) stated that the teachers knew how to recognize cyberbullying incidents. On the other hand, in another study, only 22.8% of the educators found themselves suited to cope with bullying (DeSmet et al., 2015). Schools have an important role in helping students, teachers, and families prepare for cyberbullying (Bauman et al., 2008; Belsey, 2006; Kennedy et al., 2012). Although educators find themselves capable, while they evaluate the families and children as incompetent, all school stakeholders must be educated about cyberbullying. Nonetheless, the results obtained from our research show that there are very few cyberbullying educational activities, especially for families and students, or that such activities are not organized at all. Prevention studies related to cyberbullying should be conducted not only at school but also outside school, and geared toward the community (Hinduja and Patchin, 2009b). Researchers, on the other hand, mention the importance of peer aid in informing students about cyberbullying (Hinduja and Patchin, 2009b; Kowalski et al., 2012). The results of our research show that school environment is involved in cyberbullying prevention studies in most schools, while the peer-mentoring method is not used.

Educators' opinions on the fourth sub dimensions show that the schools' level of readiness concerning *taking anti-cyberbullying technological precautions* is found to be generally high. To prevent students' access to specific websites or software as part of the cyberbullying prevention efforts, additional software could be installed on computers at schools (Hinduja and Patchin, 2009b). Our results show that most of the schools had taken hardware/ software precautions on the internet, network and on their computers.

### **Conclusion and Recommendations**

It can be concluded that most of the schools in Turkey are ready to address cyberbullying, to the extent of creating an anti-cyberbullying school culture and taking technological precautions; however, especially from the creating anti-cyberbullying curriculum and education and creating anti-cyberbullying policies standpoint, there is a lack of information and study.

Researchers should concentrate on conducting comparative studies that gathered students, parents, and educators. There is also need for studies on awareness of recognition and intervention of cyberbullying cases, together with improving this awareness with educational interventions. School themselves could also engage in self-evaluation studies on overcoming cyberbullying and institute policies to improve their anti-cyberbullying standing. Schools can start custom programs for their schools working together with universities and experts in the field.

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# **Examining Technology Integration Decision-making Processes and Identifying Professional Development Needs of International Teachers**

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Descriptors: Technology professional development, international education, TPACK, technology integration

## **Abstract**

This mixed-methods study examines the impacts of a semester-long technology professional development for international teachers from developing nations and is a follow up to our previous work in this area. Using the TPACK framework and a survey approach, first we investigated the international teachers' perceptions regarding their technology integration abilities. Then, a lesson planning design task was used to qualitatively analyze their rationale behind the technology integration decisions and to triangulate. Overall, the results confirmed our earlier findings that despite reporting highest growth in the technological content knowledge on the post-survey, participants intended to use technology with general pedagogical strategies rather than content specific ones. However, the technology access issues were less evident compared to our earlier study, possibly suggesting that availability of technology and its adoption in education may be improving in the developing nations.

## **Introduction**

Globalization trends, first visible in commerce and industry, have also impacted the field of education. As a result, teacher education has begun to embrace more international collaborations and exchange programs in recent years (Charney, 2009; Townsend, 2011). One such exchange effort is the International Leaders in Education Program (ILEP), conducted by the International Research & Exchanges Board, a non-profit organization established with the help of U.S. Department of State's Bureau of Educational and Cultural Affairs (U.S. Department of State, 2017). Since 2007, the ILEP initiative has brought exemplary secondary school teachers from developing nations to the United States for a semester long program at four host universities. The program encompasses: a) coursework on teaching methodologies, curriculum development, and educational technologies, b) field experiences in local high schools, c) exposure to civic and cultural activities, and d) participants designing a professional development module to enhance teaching and learning in their home-schools.

A key component of ILEP is the technology professional development course, which aims to develop teachers' ability to integrate technology meaningfully in their teaching. The course is designed to equip the international teacher participants with education technology resources, skills, and experiences that they can adapt for use in their home classrooms. While there is a plethora of research on technology-related professional development of in-service teachers in developed countries such as Australia, United States, Singapore, and Taiwan (Harris & Hofer, 2011; Koh & Chai, 2014; Liu, Tsai, & Huang, 2015), limited research has examined technology integration expertise of teachers from developing nations (Kozma, McGhee, Quellmalz, & Zalles, 2004; Voogt & Plomp, 2010). This research points to two primary barriers that hinder use of technology in education in developing nations. The first barrier is the poor technology infrastructure and access issues, and the second barrier is the shortage of skilled teachers and trainers who can integrate technology meaningfully in education (Kozma et al., 2004; Makgato, 2012; Olakulehin, 2007). Our earlier study (Dalal, Archambault & Shelton, 2017) conducted with the 2016 ILEP cohort suggested that though the international teachers learned to consider the affordances of technology in their instructional planning after the coursework, technology access issues were pivotal in their choice and use of

technology. The current study is a direct follow-up and extension of our previous work to see if we find similar results.

Thus, using a mixed-methods approach, we address the following research questions:

1. What is the perceived ability of integrating technology in instruction for the international teachers before and after a semester long technology professional development course?
2. How do international teachers approach technology integration in their instruction planning following the technology professional development?

### **Theoretical Framework**

Lee Shulman (1986) introduced the concept of pedagogical content knowledge (PCK), recognizing the need for a more coherent theoretical framework with regard to what teachers should know and be able to do. Within PCK, he included “the most powerful analogies, illustrations, examples, explanations, and demonstrations” in a way that facilitate powerful teaching and student learning of complex subject matter (p. 9). Koehler and Mishra (2005) extended PCK, developing a framework combining the relationships between content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK) calling it technological pedagogical content knowledge (TPACK). TPACK represents the intersection of all three knowledge domains (content, pedagogy, and technology) and involves an understanding of the complexity of relationships among students, teachers, content, technologies, and practices. As Niess (2005) wrote, “TPCK, however, is the integration of the development of knowledge of integration of the different domains that supports teachers in teaching their subject matter with technology” (p. 510).

Since its formal inception and establishment as a theoretical concept, TPACK has been used by researchers to assess technology-related professional development efforts of teachers (Graham, Borup, & Smith, 2012; Altun & Akyildiz, 2017; Liu et al., 2015). In examining the effective outcome of a technology-related teacher professional development program, TPACK addresses each of the three major components (CK, PK, and TK) and their combinations (PCK, TCK, TPK, and TPACK) needed to ensure high quality instruction. Using this framework, the current study looks for the evidence of TPACK growth among international teachers following the ILEP technology course and also examines the instructional planning approaches of international teachers in relation to TPACK constructs.

### **Methodology**

#### **Context**

The study took place over a semester long, technology course at a large university in the United States, one of the designated host centers of the ILEP program since 2013. The course was divided into 10 sessions consisting of three hours each, held from mid-January to April, 2017. The technology professional development was designed based on the International Society for Technology in Education (ISTE) Standards for Teachers (ISTE, 2014) and focused on methods of effectively integrating computer-based technology in teaching and learning. As part of the program, all participants were provided with laptops. The classroom was equipped with access to the internet and one projector.

The technology course was divided into two phases: a) a learning phase with formative assessments and b) a transfer phase with a culminating design task. At the start of the course, all participants were given a brief overview of the TPACK framework emphasizing that knowing how to use technology hardware and software alone does not guarantee effective integration of technology in classroom teaching. Meaningful technology integration requires systematic understanding of technology, subject matter or content, pedagogy, and how these domains work together (Koehler & Mishra, 2005).

The learning phase involved face to face class instruction with hands-on tutorials on topics such as learning theory and technology, digital citizenship, internet safety, web-based communication tools, student and teacher productivity tools, video recording and editing, screencasting, web-based assessment applications, and mobile/online learning. The hands-on tasks varied in complexity from simple synthesis of information such as understanding online safety issues to complex implementation of ideas like creating digital stories or Google forms. At the end of each session, participants were asked to create an artifact either individually or in a small group to demonstrate their understanding and comfort level with the technology (e.g., create a slideshow, participate in online discussion group, or produce a digital story). These artifacts and their presentations served as formative performance assessments for the course.

The transfer phase involved a culminating design task. In the last two weeks of the course, all participants were asked to develop one lesson that integrated at least one educational technology tool they had learned. The design task not only demonstrated the ability of the teacher participants to conceptualize, design, and deliver a unit plan infused with technology, but it also provided an opportunity for the teachers to engage in decision making, while practicing technology integration in their own curricula.

## Participants

The study involved 16 international, secondary school teachers, divided equally between males and females, who participated in the Spring, 2017 ILEP cohort. Their countries of origin were Bangladesh, Brazil, Ghana, India, Indonesia, Malaysia, Morocco, and Tanzania. The average age of participants was 38 years, ranging from 24 to 49 years. Their teaching experience ranged from six to 21 years, with an average of 12 years. Participants reported a wide range (four to 23 years) of exposure and experience with computer technology (Table 1).

*Table 1. Profile of Participants*

Professional and technology experience	Response count	Response %
Content area		
Language Arts	10	62
Science	3	19
Social Studies	3	19
Started using technology		
Prior to Age 10	0	0.0
Age 10 to 15	2	12
Age 16 to 20	4	25
Age after 20	10	63
Exposure to computers		
1 to 5 years	3	19
6 to 10 years	5	31
11 to 15 years	4	25
16 to 20 years	3	19
21 to 25 years	1	6
Time spent on computer in a typical work-day		
No time	0	0
Less than one hour	5	31
About 1 - 2 hours	4	25
About 3 - 4 hours	5	31
5 or more hours	2	13
Comfort level using computer		
Not at all comfortable	0	0
Somewhat comfortable	5	31
Comfortable	7	44
Very comfortable	4	25

## Data Sources

**Survey.** To answer the first research question regarding the perceived ability of international teachers to integrate technology in instruction, we used a survey instrument created previously (Dalal et al., 2017). The



instrument was based on the validated TPACK measure (Archambault & Crippen, 2009), but modified for an international teacher population. The goal was to measure teachers' confidence related to all TPACK constructs using closed items on Likert scale. The online survey was administered both before and after the course.

**Design task.** Over a two-week period at the culmination of the course, all participants were asked to design one lesson plan using at least one educational technology tool in the instruction. The participants were able to choose the technology based on its affordance and the subject matter they wanted to address. Along with the lesson plan, participants submitted a written rationale for their design decisions. This rationale described why they chose a particular technology as well as how the technology would be used by the teacher and/or students. All participants submitted lesson plans and rationale statements online using the course management system.

### Limitations

It is important to acknowledge the limitations of this study. A survey instrument is inherently limited by its items and scales (Fowler, 2002), and self-report measures are susceptible to bias (Spector, 1994). Additionally, the study's sample size was small and represents a limited population of international teachers, thus restricting the generalizability of the findings. Moreover, a different design task could yield different results for understanding the technology integration approaches of international teachers.

## Analysis and Results

### Survey: Perceived Ability of Technology Integration

The Likert-scale TPACK items were assigned values as follows: not at all able (1), rarely able (2), sometimes able (3), often able (4), and most of the time able (5). For each individual item, we calculated descriptive statistics both pre and post coursework (Table 2). Then, descriptive statistics were calculated for the seven TPACK constructs and internal reliability was established by verifying Cronbach's alpha (Table 3).

Table 2. Descriptive statistics for all individual items

Construct	Individual items	Pre		Post	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
TK	I can solve technical problems associated with my computer or network connection.	2.94	0.93	3.69	0.95
	I can address various computer issues related to software (e.g., downloading appropriate plug-ins, installing programs).	2.62	0.81	4.00	0.97
	I can assist students with solving technical problems with their personal computers.	2.25	0.86	3.56	0.89
PK	I can use a variety of teaching strategies to share different concepts with students.	3.25	0.86	4.75	0.58
	I can modify instruction based on my assessment of students' knowledge and skills.	3.69	1.19	4.56	0.73
	I can determine a particular teaching or learning strategy best suited for a particular concept.	3.37	1.15	4.60	0.63
	I can adjust my teaching methodology based on student performance or feedback.	3.19	1.33	4.56	0.73
CK	I can create materials that align with the concepts students need to learn in a course.	3.62	0.96	4.44	0.73
	I can decide on the concepts in my content area that should be taught in a class.	3.62	1.15	4.56	0.73
	I can plan the sequence of concepts taught within my class.	3.5	1.04	4.53	0.64
	I can produce written lesson plans for the classes I teach.	4.19	0.91	4.60	0.63
TPK	I can create a technology-rich learning environment where students can build new knowledge and skills.	2.56	1.15	4.38	0.88

	I can implement different methods of teaching with technology.	2.56	0.89	4.33	0.72
	I can use technology to facilitate communication and interactions among students.	3.00	1.32	4.63	0.50
	I can motivate students to want to use technology for communication and interactions with each other.	3.56	1.09	4.80	0.41
PCK	I can distinguish between correct and incorrect problem solving attempts by students.	3.50	1.09	4.47	0.74
	I can anticipate likely student misconceptions regarding a particular concept.	3.31	1.14	4.31	0.79
	I can assist students in noticing connections between various concepts in a curriculum.	2.56	1.26	4.38	0.72
TCK	I can use technological representations (like an online video, an interactive map, or an online science experiment simulation) to demonstrate particular concepts in my content area.	3.06	1.06	4.47	0.74
	I can implement curriculum using technology.	2.00	1.15	4.47	0.64
	I can use various online courseware programs to deliver instruction (e.g., Edmodo).	2.50	1.17	4.31	0.79
TPACK	I can use technology to predict students' skill/understanding of a concept.	2.19	1.11	4.19	0.83
	I can use technology to create effective representations of content that expand on the content presented in my textbook.	2.94	1.00	4.50	0.73
	I am able to meet the overall demands of teaching a class, using technology.	2.81	1.17	4.40	0.83

Table 3. Descriptive Statistics for TPACK Constructs and Reliability Scores

Construct	Pre-survey Results		Post-survey Results		Post-Pre <i>M</i>	Cronbach's Alpha
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
TK	2.60	0.87	3.75	0.94	1.15	.691
PK	3.37	1.13	4.62	0.67	1.25	.751
CK	3.73	1.01	4.53	0.68	0.80	.627
TPK	2.92	1.11	4.53	0.63	1.61	.788
PCK	3.12	1.16	4.39	0.75	1.27	.763
TCK	2.52	1.13	4.42	0.72	1.90	.817
TPACK	2.65	1.09	4.36	0.80	1.71	.821

Note. Means and standard deviations computed from responses ( $N = 16$ ) on the following scale: not at all able (1), rarely able (2), sometimes able (3), often able (4), and most of the time able (5).

### Design Task: Technology Integration in Instructional Planning

To address the second research question regarding international teachers' approach to technology integration in their instructional planning, the lesson plans ( $N=16$ ) and accompanied rationale statements were analyzed qualitatively. We used a-priori TPACK codes in combination with open coding to understand the technology-related decision making of the international teachers (Corbin & Strauss, 2015; Tracy, 2013). We decided to use both inductive and deductive coding due to limitations of TPACK framework. While the framework is theoretically robust and helpful for organization, the fuzziness of the domains make it difficult to separate out each of the domains, limiting its practical use (Archambault & Barnett, 2010; Kimmons, 2015). In addition, given the new themes beyond the TPACK codes identified in our previous work, including affordance of technology, student-centered learning, discovering new technology, access issues, and teacher-centered learning (Dalal et al., 2017), we wanted to look for similar evidence, if present.

From the submitted design task materials, we identified 94 statements as data or meaning units for further content analysis (Merriam, 1998). Statements were identified as meaning units for analysis if they pertained to either a specific educational technology, a justification for choosing that technology, or its intended use. These statements were extracted and saved in a spreadsheet for further analysis. Together, two members of the research team read and re-read the data units, first coding for one of the presence of the four technology-related TPACK domains (i.e., TK, TPK, TCK, or TPACK). In a second round, open coding (Corbin & Strauss, 2015) was used on the same meaning unit to identify potential additional themes. The data units were repeatedly read and codes were consolidated or expanded as necessary, until coding saturation was reached. Table 4 outlines the 11 codes thus identified with their description and a sample example. Then one researcher coded the remaining data units (78%) which were reviewed by the other members of the team. Any discrepancy was resolved by discussion to reach 100% agreement.

*Table 4. Codebook with examples*

Code	Description	% Evidence	Example
TK.af (affordance)	Teacher describing what the technology adds to their lesson plan considering the benefits or advantages of technology in education.	11	“Google Forms allows you to ask both open-ended and closed-ended questions.”
TK.rc (resource constraints)	Teacher thinking about available technology resources and school policy constraints.	5	“I chose Powerpoint and Youtube because these are the only resources that can be used in my school.”
TPK.is (instructional strategy)	Use of technology for a specific instructional strategy or a particular pedagogical goal such as assessment.	21	“After viewing a YouTube video, encourage online discussion by asking learners to add their personal insights: What did they like about the video? Was there anything they didn’t understand? How did the video relate to their personal experiences/feelings?”
TPK.af (affordance)	An instructional strategy that involves use of technology specifically considering the affordance of the particular technology tool.	7.5	“Using YouTube videos in lesson encourages your audience to develop their note-taking skills by viewing, rewinding, and replaying the video until they have fully grasped its essence and key points.”
TPK.lu (learner understanding)	An instructional strategy that involves use of technology but keeping in mind the background, abilities and motivations of the learner.	7.5	<p>“As a teacher of classes with inclusion students and at risk students, I have found that measurable differences occur in learning and retention . . . Algebra tiles website can assist their learning process from concrete to symbolic.” (learner background)</p> <p>“Skills such as taking notes, writing summary, or reading comprehension are being taught through interesting approaches such as taking note from videos and online articles instead of reading textbook and listening to the teacher.” (engagement and motivation)</p> <p>“Students with hearing loss learn by watching and observing, so with technology, they will see the presentation, my delivery using signing language, and observe the graphic organizer</p>

			representing the processes of debate.” (learner ability)
TCK.af (affordance)	Teacher talking about a particular technology tool considering its affordance and relevance for specific content.	3	“Chemistry experiments are hazardous, one cannot see what’s happening at molecular level. PhET allows to see and conduct experiments again and again if something goes wrong.”
TCK.rc (resource constraints)	Considering a technology tool for its relevance to specific content while weighing the technology access issues and resource constraints.	2.5	“Show google earth as it is useful for geography lesson. No internet in school but has personal connection through mobile. The plan to show google earth may fail.”
TCK.tp (teacher planning)	Teacher planning the lesson thinking about content and technology.	2.5	“Power point will be used in early stage, (New knowledge presentation) to explain the content of the lesson.”
TPACK.is (instructional strategy)	Teacher combining pedagogy, content and technology in instructional strategy however, one domain may be prevalent.	9	“The teacher introduces VoiceThread, an online platform where students can leave their comments on a question/subject given by the teacher. This kind of activity can help students improve their listening and speaking skills.” (Pedagogy)  “Students will watch the video about exploring the coral reef. Students will discuss and pose questions about the video they have watched.” (Content)  “They will learn how to produce their learning products by making Prezi presentation, power point show, movie maker and PhotoPeach.” (Technology)
TPACK.af (affordance)	An instructional strategy for a particular content that involves meaningful use of technology considering the affordance of the particular technology.”	2	“Stop the video at 4:59 minutes and solve the following sums from your textbook based on arithmetic mean. You may watch the video again for clarity and understanding.”
TPACK.lu (learner understanding)	Teacher talking about an instructional strategy for a particular content that involves use of technology but keeping in mind the background and abilities of the learner.	2	“Students often have difficulty learning Mathematics especially algebra. It is deemed too abstract and students cannot represent the numbers and variables physically. But students can understand algebraic thinking and its concepts with Algebra tiles website that takes geometric approach to algebraic concepts.”

*Note.* Percentages calculated based on  $N = 94$  rationale statements.

Overall, the largest portion (40%) of the data units were related to TPK followed by TK (18%), TPACK (15%), and TCK (8%). Of the statements, 4% could not be coded using a second level as they did not reflect a particular or consistent theme. Thus, total 81% of the data units were coded for one of the technology related TPACK constructs (TK, TPK, TCK or TPACK). The remaining 19% data units simply mentioned specific technologies that international teachers were planning to use in instruction upon return.

These included statements such as, “Students will need mobile phones with internet connection and preinstalled PhEt lab application.” or “This Khan Academy video is perfect to teach basic statistics.” Specific

technologies mentioned by teachers included Kahoot, Voice Thread, YouTube, Prezi, PowerPoint, Moviemaker, PhotoPeach, Screencast-O-Matic, Google Forms, Audiobook, Poll Everywhere, and the Illuminations website from National Council of Teachers of Mathematics.

Examining the secondary level codes, 30% of the statements were related to instructional strategy, 27% suggested thinking related to various affordances of technology, 10% reflected teachers' understanding of their students' backgrounds and abilities, 8% conveyed technology access and resource issues, and 2% of the statements indicated teacher planning. Remaining statements were related to either specific technology names, websites or the 4% of statements that could not be coded for a secondary level.

## Discussion and Implications

ILEP participants form a highly heterogeneous group coming from a variety of nations, teaching different subjects and grade levels, and possessing varying levels of technological experience. As was the case with our earlier study (Dalal et al., 2017), the participants began the ILEP professional development program with greater levels of confidence in their CK (3.73), PK (3.37), and PCK (3.12) but lower knowledge levels in all technology-related constructs. This was expected with the average teaching experience of 12 years among the participants, resulting in higher confidence for content knowledge and teaching strategies. However, after completing the ILEP program, participant confidence levels for technology-related constructs advanced significantly to match with other non-technology related construct values; and the biggest gains were reported in technology-related constructs of TCK (1.90), TPK (1.61) and TPACK (1.71). This evidence suggests that the ILEP program's emphasis on educational technology was an effective way to empower the international teachers as confident, more assured integrators of technology.

The qualitative analysis of the lesson plans and rationale statements, however, suggests greater development of TPK compared to TK, TCK, or TPACK. The international teachers included in the study were highly experienced. In addition, the presence of categories of learner understanding such as TPK.lu and TPACK.lu suggest that these teachers were confident that they knew their students well, which again speaks to their experience. Our approach, which leveraged teachers' existing pedagogical skills to impart new technological knowledge may not be as effective for international teachers with less teaching experience. This is consistent with Graham et al. (2012) assertion that building a strong foundation of PCK is key for developing TPACK.

While participants reported the highest confidence gain in TCK (1.90), the design task analysis showed very little evidence (8%) of TCK. It seems that while teachers felt confident in integrating technology across their content areas, their ability to do so in the lesson planning process was still limited. This finding matches the results of our earlier study (Dalal et al., 2017). One consideration is that technology access issues in the developing nations (Buabeng-Andoh, 2012; Voogt & Plomp, 2010) could impact how these teachers designed their lessons. Six out of 16 teachers clearly indicated lack of internet or computers in their school. They were also aware that not all students have access to computers and internet at home. These technology resource constraints would act as gatekeepers, preventing them from designing lessons suggestive of TPACK where technology is used constructively with full involvement of students (Koehler & Mishra, 2005). However, the technology access issues and resource constraints were less noticeable in only 8% of the meaning units as compared to the previous ILEP study (Dalal et al., 2017) where we reported 14% meaning units reflecting technology resource issues with the same number of participants (n=16). This could be an indication of increasingly improving technology infrastructure and penetration of mobile technology in the education scene of many developing nations (Chaudhuri, 2012; UNESCO, 2015).

Other considerations for lower evidence of TCK in lesson plans could be that while there is an explosion of educational technologies for assessments and content-sharing, the technologies themselves are rarely designed with teaching and learning specific content in mind (Laurillard, 2009; Forssell, 2016). Acknowledging this limitation, Forssell (2016) implored designers to leverage teacher knowledge and create digital tools guided by the TPACK framework. Moreover, researchers (Graham et al., 2009; McCrory, 2008) have indicated that during technology professional development it is easier to integrate technologies for general teaching strategies than the technologies intended for specific content. This was a particular challenge in the ILEP technology course because the teacher participants had varied backgrounds in terms of content area, grades, and also curriculum owing to different nationalities. The higher concentration of data units coded for instructional strategy (30%) suggest that while designing lessons teachers were thinking about pedagogy – how were they going to teach a particular topic, what difficulties their students might face, and how were they going to assess the learning. As Archambault and Barnett (2010) specify, the teachers are inherently not thinking about technology skills alone or separating out domains of content, pedagogy, and technology when planning. They are likely considering these elements together, all at once.

An indication of the success of the ILEP technology course was evident when the theme of affordance was noticed in the second level coding of all technology-related constructs including TK.af, TPK.af, TCK.af, and TPACK.af. The knowledge of affordance is suggestive of advanced thinking about how technology can enhance content and pedagogy (Koehler, Mishra, Kereluik, Shin, & Graham, 2014; McCrory, 2008). The teachers learned to consider the benefits and advantages of technology at every stage of instruction planning to see if the teaching-learning process could be enhanced by the use of specific technology tools, rather than simply using the technology for the sake of doing so.

In summary, the international teachers entered the ILEP program with limited confidence in their ability to integrate technology in the classroom. During the semester-long technology course, they explored new educational technologies, built upon their integration skills, and learned to think about the affordances of these technologies in connection with their instructional strategies. Through other activities in the ILEP program, such as observing in local high schools and taking other university level courses, they also had varied experiences with educational technology in action. As was the case with our earlier study (Dalal et al., 2017), the results suggest that while teachers learned to consider the affordances of technology in instruction planning, there remains a distinct need to impart general technology skills and awareness of content specific educational technology tools.

Future work along this line would benefit from similar studies with higher number of participants or with a different design task to explore the decision-making approaches of international teachers. A longitudinal study examining the actual classroom practices would illuminate not only the ability of international teachers to integrate technology in the natural settings of their home countries, but would also shed light on the new approaches needed in the design of technology-related professional development programs for international teachers.

The findings have implications for the future design and motivation of international teacher education programs. International collaborations and teacher exchange programs such as ILEP are the vehicles to provide space and opportunity for teachers to make connections between and among diverse educational issues and engage in meaningful learning that enables them to use technology constructively. Lawless and Pellegrino (2007) have emphasized that the digital divide between urban and rural schools in the United States is not because of a lack of access to technology, but due to the lack of access to teachers who are able to integrate classroom technology effectively. This discovery has even larger implications in the context of developing nations where there is a critical and continuing shortage of teachers and trainers equipped to integrate technology in education (Kozma et al., 2004; Makgato, 2012; Olakulchin, 2007). We anticipate that the current study will provide added focus on the technology-related professional development needs of developing nations and contribute toward longitudinal research in understanding the sustainability of technology professional development efforts in the international context.

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# Integrating Learning Analytics into Workforce Education to Develop Self-Assessment Competency

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## Introduction

Self-assessment, which is a cyclic process of self-monitoring, self-evaluation, and identification and implementation of instructional correctives as needed, is fundamental and critical skill for lifelong learners (Yan & Brown, 2016). Lifelong learner needs to frequently assess individual performance, validity of learning resources, and the learning environment. Self-assessment affects learner's cognition, affection, and conation and assists learners to learn how to learn. Effective self-assessment can encourage deep as opposed to surface approaches to learning, with positive implications for the quality and sustainability of learning (McDonald & Boud, 2003).

Formative analytics has been identified as a good method to support students' self-assessment competency development (Singh & Terry, 2008; Zhong, 2016). As a new approach of learning analytics, formative analytics focus on supporting the learner to reflect on what has been learned, what can be improved, which goals can be achieve, and how to move forward. By providing analytics for learning rather than analytics of learning, formative analytics can empower each individual learner to reach his or her potential through personalized feedback and self-reflection

Though many theoretical discussions related to self-assessment and learning analytics have been conducted, empirical studies exploring how self-assessment competency can be supported through formative analytics appear to be scarce. Aimed at filling this research gap and get deeper understanding of how formative analytics can support self-assessment competency development, this study examined the effects of formative analytics on developing self-assessment competency in workforce education. The research question, *How formative analytics impacts students' self-assessment competency development?*, were examined in this study.

## Literature Review

Self-assessment is defined as a cyclic process of self-monitoring, self-evaluation, and identification and implementation of instructional correctives as needed (McMillan & Hearn, 2008). In this study, self-assessment is considered as a learning strategy rather than a personal skill or a type of assessment method (Yan & Brown, 2016). Self-assessment has been recognized as fundamental and critical skill to lifelong learners (McDonald & Boud, 2003). Self-assessment affects learner's cognition, affection, and conation and assists learners to learn how to learn, which is an important lifelong learning competency in digital age. Effective self-assessment should neither overestimate nor underestimate learners' performance. Boud and McDonald (2003) believed that effective self-assessment can encourage deep as opposed to surface approaches to learning, with positive implications for the quality and sustainability of learning.

Self-assessment practices cover two major actions, self-directed feedback seeking and self-reflection (Yan & Brown, 2016). Self-directed feedback seeking refers to the process by which students initiate and take responsibility for seeking feedback from various sources for the purpose of self-assessment. 'Self-directed' is used to emphasize that the characteristics (the content, source, direction, etc.) of feedback are determined by the student him/herself rather than following external instructions. Feedback could be obtained from both external and internal sources (Butler & Winne, 1995). External feedback can be obtained from two sources including people and processes (Sargeant, Mann, van der Vleuten, & Metsemakers, 2008), or inquiry and monitoring (Ashford & Cummings, 1983). Internal feedback comes from within the self, such as emotions, motives, physical sensation and internal states (Epstein, Siegel, & Silberman, 2008). Self-reflection is the action by which students reflect on and evaluate the quality of their learning process and outcomes with the support of available/gathered feedback, and



identify their own strengths and weaknesses. By critical reflection, students may have a better understanding in terms of their strengths and weaknesses as well as how to facilitate achieving their goals.

Adaptive digital learning environment with low pressure is suggested to help learner's development of self-assessment competency ( Yan & Brown, 2016; Zhong, 2015). Students need opportunities to expose their reflection without fear of shame or embarrassment. Adaptive learning environment can provide space and time for students' deep thinking. Instructors are suggested to create such learning environment where students are allowed not to disclose their self-assessments to the teacher or classmates, but are encouraged to share these with trusted people (Andrade & Brown, 2016).

Formative analytics has been identified as a good method to create adaptive learning environment that supports students' self-assessment competency development (Zhong, 2016). Formative analytics refers to using analytics to encourage students to reflect on how they are learning, or to initiate a conversation between a tutor and a student, instead of using the system to assess the student's performance or ability. As a new approach of learning analytics, formative analytics focus on supporting the learner to reflect on what has been learned, what can be improved, which goals can be achieve, and how to move forward. By providing analytics for learning rather than analytics of learning, formative analytics aim to empower each individual learner to reach his or her potential through personalized feedback and self-reflection.

### **Method**

Case study was chosen to answer the research question. Participants were 8 students in workforce education at a large research university in Illinois. All participants are adult learners and have full-time jobs. Average age of participants is 34 years old. Data was collected from individual interviews and group interview with a semi-structured questions guide. In addition, students' academic outcomes, in this study ePortfolios (Zhong & Hartsell, 2015) and presentations, were included in data analysis. In this course, students were required to complete four group projects and three professional presentations and post a weekly reflection on the learning experience of the past week on their individual e-portfolios. Interviews and students' academic outcomes were transcribed and coded after students' grades were submitted.

### **Findings**

Preliminary findings showed that formative analytics is effective in supporting self-directed feedback seeking. More student-initiated feedback seeking behaviors were reported. It indicates that formative analytics has positive impact on self-directed feedback seeking. Students was triggered by formative analytics results to independently assess their performance by using the same criterions as the instructor. In addition, internal self-directed feedback seeking behaviors were also found from students' interviews. Students tend to regularly reflect on performance not only in this particular course but also in other courses and even personal activities out of school. It shows that formative analytics not only affects students' academic performance but also performance out of schools. This finding shows the potential of formative analytics in developing students as lifelong learners, who are independent and self-regulated learners.

Unfortunately, self-reflection behaviors were not found in this study. All reflections behaviors performed in the class were required by the instructor. For example, students are required to post a weekly reflection to their ePortfolios. All students did what the instructor asked but no additional posts. Although some internal self-reflection activities (e.g., thinking in head) were mentioned in students' interviews, few students went back and checked their thoughts again after the class. Instructors still lead self-reflection processes and activities as found from previous research (Costa & Kallick, 2004; Zhong, 2017). One possible explanation may be students' age. Because all students are adult learners and have full-time jobs, students are not able to spend extra time on school work. Most students tend to meet the minimum requirements of the class in order to get the course completed. Thus, even though students had some self-reflections in head, no behaviors were observed. Another possible reason is the technical limitation in this study. Although there are some learning data related to self-reflection generated such as website tracking data, few of the data can be used to analyze students' self-reflection activities. In addition, as mentioned above, most self-reflection activities were occurred in students' heads. It is difficult to observe and capture. Therefore, researchers are not able to conclude whether formative analytics impacts self-reflection activities.

## Conclusion

This qualitative study examined students' self-assessment competency development supported by formative analytics. Preliminary findings showed that formative analytics is effective in supporting self-directed feedback seeking but self-reflection was not found although students showed positive attitudes during interviews. This study demonstrated that formative analytics has the potential to achieve the goal of developing students as lifelong learners. Although few self-reflection behaviors were found in this study, I believe it is possible to promote self-reflection behaviors if formative analytics are properly designed and integrated into instruction. Thus, following step of this study is to improve formative analytics design in this course to ensure more data related to self-reflection can be captured and analyzed.

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# **Ensuring Academic Integrity in Online Courses: A Case Analysis in Three Testing Environments**

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## **Introduction**

The issue of student identification and authentication is now an essential area of compliance within federal policy and law. Providers of online education must develop policies and procedures for verifying that the same student who signed up for the course does the work and receives the academic credit. Protecting the integrity of online courses and programs, and satisfying the accrediting agencies responsible for enforcing the law, requires investment of time and resources into the prevention and detection of academic dishonesty.

## **Federal Compliance**

In August 2008, Congress passed the Higher Education Opportunity Act, reauthorizing the 1965 Higher Education Act, as amended. In a section addressing accreditation and program integrity, 34 C.F.R. § 602.17(g), the law states in pertinent part:

[The agency] Requires institutions that offer distance education...to have processes in place through which the institution establishes that the student who registers in a distance education ...course or program is the same student who participates in and completes the course or program and receives the academic credit....

The statute specifically requires institutions to verify the identity of a student who participates in a class or coursework by using methods such as: secure login and passcode; proctored examinations; and, new or other technologies and practices that are effective in verifying student identity.... 34 C.F.R. § 602.17 (g)(1)(i –iii).

## **Ways to Ensure Academic Integrity**

Educators in higher education use a variety of methods and tools to ensure academic integrity in online courses. Creating a clear academic dishonesty policy and making them availability to students is the first step (Simonson, Smaldio, Albright, & Zvacek, 2003). Utilizing authentic assessment strategies, such as collaborative projects, and e-portfolios is effective (Bobak, Cassarino, & Finley, 2005). Requiring an outline and a draft for

individual written projects prevents students from submitting others' work in the end of a semester. Wikis are a great tool in the implementation of this process. Many software applications like Turnitin and SafeAssign can also detect plagiarism by comparing students' essays to electronic databases.

Proctored examinations are another way to verify student identification. Whether it is prepackaged, using lockdown browser and recorded video features in the Learning Management System (LMS), or proctored with a human proctor at a distance via video streaming, consideration must be given to convenience, affordability, minimal hardware requirements, and most importantly, security.

Prince, Fulton, and Garsombke (2009) found significant differences in average test scores between tests taken electronically without a proctor and those administered using a live or a remote proctor. Students scored significantly lower on proctored exams versus non-proctored exams. Cochran, Troboy, and Cole (2010) found that the grades for the remote proctor group trended lower than the non-participants. They also found that remote proctor participants felt that the remote proctoring system had no impact on their exam taking abilities.

To meet the need of online education in online testing, many vendors have developed technological tools to provide proctoring services. This study involved Respondus Monitor, Respondus LockDown Browser, and Blackboard Test Tools available to faculty and students in the university that the study was conducted.

### **Non-proctored Recorded Online Testing Environment**

Respondus Monitor is a companion product for LockDown Browser that enables students to take online exams in non-proctored environments ("Respondus Monitor, 2015"). There is no additional software to install, and students use their own computers with a standard webcam to record assessment sessions. Instructors can review the entire session from Blackboard course sites. If used, students enrolled in the course need to pay a flat fee per course per semester. Institutions can also purchase seats and allow students to use it for free.

### **Non-proctored Lockdown Online Testing Environment**

Respondus LockDown browser is a custom browser that locks down the testing environment and can be integrated with the LMS. When students are required to use the LockDown Browser when taking a test, they are unable to print, copy, go to another website, or access other applications using the same computer. When a test is started, students are locked into it until they submit it for grading ("LockDown Browser", 2015).

### **Non-proctored Online Testing Environment**

The Blackboard quiz/survey tool allows faculty to create timed tests with random selections pulled from a pool of questions. On the test day students will be able to take the test in the time frame that was set by the faculty. The questions in the test can be different from student to student since they can be randomly selected from the question pool. When time expires, the system will shut down the test.

The Blackboard quiz tool allows faculty to control when the results of the test are released to students, as well as the type of results and feedback that are released. Instructors are encouraged to consult with an instructional designer to discuss options and settings that will meet the goals of individual assessments, and the course as a whole.

## **The Study**

The purpose of this study was to determine which remote testing systems, all designed to ensure academic integrity, offer a realistic and secure approach to online examinations and best fulfill the needs for faculty and students. This study explored the use of three testing tools to determine whether there are differences in test scores and student grades in the distinct testing environments. They are: Non-proctored Recorded Online Testing Environment (Respondus Monitor), Non-proctored Lockdown Online Testing Environment (Respondus LockDown Browser) and, Non-proctored Online Testing Environment (Blackboard Test and Survey Tool). The data was collected from a Midwest public university.

### **About the Course in the study**

This course on auditing was a cross-listed, offered to both undergraduate and graduate students, and open to all students at the university. The same faculty member has offered this course online for several semesters. The

overall goal of the course was to help prepare students for a professional career either working as an auditor or working with auditors. The course introduced numerous professional topics such as the importance of auditing, management assertions, risk, evidence, and reporting and professional liability. The material covered is tested in a standalone section on the certified public accounting (CPA) professional exam.

The course included two midterm exams and one comprehensive final exam. The exams contained true or false and multiple-choice questions, several cases, and a four-part company analysis project. The final exam was weighted. Approximately one half of the points were based on material already tested. The other half was based on two chapters that were not previously tested.

To assure the integrity of the testing process different testing tools were used in the previous semesters. In summer and fall 2014 and spring 2015 semesters, Respondus Monitor was used. In spring 2014 Respondus Lockdown was used. In summer and fall 2013 Blackboard Test tool was used. The settings for all exams were set up the same with randomized questions, displayed one at a time, and backtracking prohibited. The exams opened from Sunday through Wednesday with 80 minutes to complete the final exams and 55 minutes to complete each of the two midterm exams.

### Data Collection and Analysis

The instructor collected the exam scores and final grades of the same course offered over four semesters with different testing tools used. The instructor also removed identifiable student information before data analysis. Eighty-seven students used Respondus Monitor, 32 students used Respondus LockDown Browser, and 38 students used Blackboard Test Tools. One-way ANOVA was used to determine the grade difference between the three groups. Among the 87 students whose tests were administered in Monitor, 1 student did not take any of the tests; therefore, that data set was dropped from analysis.

### Results

Descriptive statistics were calculated on the mean scores of exams administered in three testing environments: Non-proctored Recorded Online Testing Environment, Non-proctored Lockdown Online Testing Environment and, Non-proctored Online Testing Environment. As shown in Tables 1-3, there is not much difference in the mean score between three different testing environments. However, the standard deviation scores of the final exam and the total points between the three testing environments are different and it is very large as there are two students who did not take some of exams when the tests were given in Respondus Monitor.

*Table 1. Mean and Standard Deviation of Exams Administered in Monitor*

	N	Minimum	Maximum	Mean	Std. Deviation
Exam 1	86	50	100	83.49	12.009
Exam 2	86	0	100	84.28	15.459
Final Exam	86	0	150	127.37	25.421
Total Points	86	70.0	481.0	389.907	71.1879
Valid N (listwise)	86				

*Table 2. Mean and Standard Deviation of Exams Administered in Lock Down*

	N	Minimum	Maximum	Mean	Std. Deviation
Exam 1	33	42	98	81.94	14.313
Exam 2	33	58	100	83.82	10.409
Final Exam	33	86	148	132.18	15.559
Total Points	33	336.5	479.5	418.424	41.6126
Valid N (listwise)	33				

*Table 3. Mean and Standard Deviation of Exams Administered in Blackboard*

	N	Minimum	Maximum	Mean	Std. Deviation
Exam 1	39	58	96	80.56	10.789
Exam 2	39	52	100	84.00	11.211
Final Exam	39	84	150	125.18	17.881
Total Points	39	269.0	512.0	423.013	56.3328
Valid N (listwise)	39				

One-way analysis of variance (ANOVA) was used to determine whether differences existed in the mean score of tests administered in three testing environments. As shown in Tables 4-7, no statistical differences were detected across three testing environments in mean scores of the exams.

*Table 4. ANOVA results for Exam 1 by method of testing environments*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	21.194	23	.921	1.375	.135
Within Groups	89.825	134	.670		
Total	111.019	157			

*Table 5. ANOVA results for Exam 2 by method of testing environments*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	23.242	23	1.011	1.543	.067
Within Groups	87.777	134	.655		
Total	111.019	157			

*Table 6. ANOVA results for Final Exam by method of testing environments*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	28.449	29	.981	1.521	.059
Within Groups	82.570	128	.645		
Total	111.019	157			

*Table 7. ANOVA results for Total points by method of testing environments*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	84.019	116	.724	1.100	.372
Within Groups	27.000	41	.659		
Total	111.019	157			

*Table 8. Percentages of Letter Grades*

Environments/Grades	A	B	C	D & F
Monitor	34.88	36.04	24.42	4.62
Lockdown	33.33	36.36	21.21	9.09
Blackboard	25.64	33.33	35.90	5.12

## Discussion and Implication

Although there were less students with Ds and Fs when exams were administered in Respondus Monitor (4.62%) than in Lockdown Browser (9.12%) and Blackboard Test Tool (5.09%), there was a big difference between the three testing environments on the standard deviation of the final exam (Monitor, 25.42; Lockdown, 15.56; Blackboard, 17.88) and the total scores of the exams (Monitor, 71.19; Lockdown, 41.61; Blackboard, 56.33). The difference might indicate that the technology-based non-proctored testing tool via streaming audio and video, such as Monitor, could be the environment that discriminated the student population in this study.

The result was not statistically significant, but the standard deviations of exams administered in Monitor were bigger than exams administered in the other two environments. It is recommended that technology-based non-proctored testing tool via streaming audio and video, such as Monitor, be used for high-stake exams if human proctored testing is not feasible to students due to a variety of constraints such as cost, time to travel, and schedule. However, other types of assessments and online testing can be used but need to be carefully designed and implemented in online courses.

The possibility of academic dishonesty can be better handled by proactively assisting our students develop legitimate strategies and providing resources and support throughout their academic journey. When designing student assessments, faculty can consider different types of assessments to evaluate student performance against the stated learning objectives. The assessments can include but are not limited to: online testing; online proctored testing; on campus testing; remote proctored testing; and, authentic assessment.

No matter what type of assessments faculty use, it is imperative to have an open, ongoing dialogue with students about academic dishonesty and the consequences of breaching the policy. Embedded activities regarding academic dishonesty scheduled for the first week of class, such as a pop-quiz or an online discussion, may be an effective way to communicate the policy to your students.

This study was based on a course offered in different semesters with limited number of students and was not statistically significant. However, if human proctoring is not a feasible option for students, the findings indicated that technology-based proctored testing tool via streaming audio and video, such as Monitor, may be an effective tool to use to tackle the issues of academic integrity, especially for high-stake tests such as midterm and final exams. Further studies are necessary utilizing larger data sets.

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# **Changing Student Performance and Perceptions through Productive Failure: Active Learning for Applied Chemistry in Pharmaceutics**

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## **Abstract**

This paper will analyze the implementation of an active learning strategy built on productive failure in a foundational course in a pharmacy doctorate program. This strategy followed several non-graded tasks, aligned with effective strategies for failure-based activities. A quasi-experimental research design using one control and two treatment groups showed students in the treatment cohorts scored significantly higher than the control group. Students also perceived the productive failure activities as more valuable than lectures.

## **Motivation and Objective of the Study**

Foundational courses in pharmacy doctorate programs help students build strong competencies to allow them to “integrate knowledge foundational sciences to explain how specific drug and drug classes work” and to apply these knowledge “to solve therapeutic problems and advance patient care”.(Medina et al., 2013). The most common instructional strategy used in fundamental and applied sciences builds on a scaffolding approach that includes in class instructor-driven worked examples of well-structured problems followed by transfer problems set up as homework. While worked examples are useful for well-structured problems (Jonassen, 2011), this strategy has major shortcomings (Darabi, Nelson, & Palanki, 2007; van Gog et al., 2015).

First, the expert’s logical and systematic presentation of the problem-solving process tends to prompt learners to focus on the procedural aspects of the problem-solving mechanics. Consequently, learners often miss those problem-solving steps and insights that address the conceptual integration of foundational knowledge in the context of target topic exemplified through the worked example. Second, because the instructor assigns transfer problems outside the classroom learners often miss critical on-time feedback they might need when engaging in the problem-solving process. Since homework is intended to be a form of the learning-by-doing problem-solving task (e.g.Schank, Berman, & Macpherson, 2009), the lack of on-time feedback significantly hinders the effectiveness of this instructional task. The consequences of these two shortcomings become even more critical for topics that build on each other, as the gaps in knowledge and skills grow exponentially in time.

The major objective of the intervention presented in this study was to mitigate the above weaknesses of worked examples by including in the instructional process a strategy that merges worked examples, homework-like tasks, and active learning classroom environment (Pelley, 2014; Wolfe, 2006). Next section will provide details about this instructional intervention.

## **Instructional Context and Gap**

Pharmaceutics I is a foundation course focused on helping first year students (P1) enrolled in the in the pharmacy doctorate (Pharm. D.) program to create integrative bridges between the foundational chemistry course in pre-pharm curriculum and clinical courses in the Pharm. D. curriculum. The main expectation of this course is that students will build strong analytical and problem-solving skills. The instructional process in Pharmaceutics I builds on lectures augmented with story problems (Jonassen, 2004, p. 10) presented as worked examples. These worked examples build on each other, exposing P1 students to topic-specific problem-solving strategies that evolve from simple to complex. During the lecture, students have the opportunity to engage in the problem-solving process as they solve in-class transfer problems with a complexity matching that of the worked examples presented by the instructor. To sustain students’ engagement with the transfer problems the instructor uses virtual clickers, ResponseWare from Turning Technologies® (Turning Technologies, 2017) to collect students’ answers and provide



on-time feedback during the lecture and for student-solved in-class worked examples. For the worked examples with a complexity similar to the problems included in the summative assessments, the instructor assigns transfer homework problems to help students prepare for the exams.

As proven by the student performance in the course, this instructional strategy proved to be effective except for two major topics in the course: *buffered and isotonic solutions* and *dispersed systems*. These topics are the base for about 80% of the problems administered in one of the major exams during the semester as well as part of the problems included in the comprehensive final examination. Therefore, the impact of these two topics on students' performance could be significant, especially since the Pharm. D. is a mastery program that requires at least a final course grade of C to pass. Therefore, the instructor decided to contact college's instructional designer to identify potential solutions to address this issue.

As part of the needs analysis phase, the instructor identified three main potential constraints that can justify the identified gap in students' performance. First, students learned the basic chemistry knowledge and skills needed for solving the problems associated with the focal topics above discussed two to three years before this course. Second, the level of complexity of the problems used in Pharmaceutics I course is higher than what students used to solve in basic chemistry courses, the time they started to build these knowledge and skills. Finally, students often failed to make the required connection between the conceptual aspects of chemical reactions and the algebraic equations used to model them.

These identified constraints indicated that an effective solution to the target issues should simultaneously address several factors. First, it needs to make students aware of their level of prior knowledge in basic chemistry, especially when students are behind the expected level of prior knowledge. Next, the identified solution should help students build a valid idea of the complexity of the problems in the course. Third, the instructor needs to provide on-time feedback to help student gradually master the required complexity of those problems. Finally, an effective solution should make students aware that they need to focus on the conceptual understanding rather than surface elements of the problem-solving process associated with buffered and isotonic solutions, respectively dispersed systems. The instructional strategies and tools used at the time of the analysis, mainly the lectures augmented with worked examples and virtual clickers, provided support for on-time feedback and awareness of one's lagging prior knowledge. However, the most critical issues, a clear picture of problem complexity and the need to focus on conceptual understanding of the problem-solving process, lacked support in the existent instructional strategy. To address this issue, the redesign team decided to implement *productive failure*, a failure-based instructional strategy that proved to be effective in increasing students' problem-solving skill in mathematics (Kapur, 2008, 2010, 2013).

### **Instructional Intervention**

Productive failure focuses on the role errors and error acknowledgment by the learner play during problem-solving. The core elements of the implementation of this strategy are the intentional delay of scaffolding, that is, the support provided to the learners prior and during the problem-solving process (Kapur & Bielaczyc, 2012). We propose that the main consequence of the productive failure strategy is the exposure of learners to tasks for which we deny them the opportunity to work within their zone of proximal development. Vygotsky defined the zone of proximal development as "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem under [expert] guidance or in collaboration with more capable peers" (Vygotsky, 1978). One of the outcomes of offering the learner all the needed conditions to create a zone of proximal development is a relatively low level of anxiety that is engaging rather than paralyzing.

By forcing students to solve problems that are above their actual level of problem-solving knowledge and skills without any instructional support, the instructor denies them the opportunity to move into their zone of proximal development and forcing them to fail. However if students in the course will have a wide range of problem-solving knowledge and skills and the instructor allows students to collaborate, then the problems to solve need to be above the expected zone of proximal development of the peer group to force students to fail. If this failure would occur in a high-stake assessment context, more likely the level of anxiety will paralyze learners, preventing them from learning. However, since productive failure happens in low or no-stake situations, the level of anxiety during the failure phase will typically be at the engaging stage. This decreased level of anxiety create an instructional dynamics that brings the problem difficulty level closer to learners' potential zone of proximal development making this strategy productive for the learning process. The main assumption behind the effectiveness of productive failure strategies is that when a learner is confronted with a task that is similar to a previously failed one, the previous failure will be referenced and act as a strong activation of prior knowledge and skills (Kapur, 2008).

The implementation of productive failure in Pharmaceutics I had, therefore, the potential to create awareness among students about the complexity of the problems in this course. The expectation was that once students became aware of the complexity of the problems they need to solve they will focus on the underlying conceptual aspects of the problem-solving process rather than searching for easy-out strategies to get the correct answer. The integration of productive failure strategy for the *buffered and isotonic solutions* section of Pharmaceutics I, the focus of this study, followed several steps, aligned with effective strategies for failure-based activities (Tawfik, Rong, & Choi, 2015).

Step 1. A short revision of fundamental chemistry knowledge that served as a base for these topics followed by an worked example for a simple, one concept buffer problem to determine the level of understanding of the students. The instructor started the productive failure session with a simple problem on the calculation of acetic acid and sodium acetate required to prepare a buffer solution of desired pH value (see Figure 1a). The problem directly targeted the topics discussed in class.

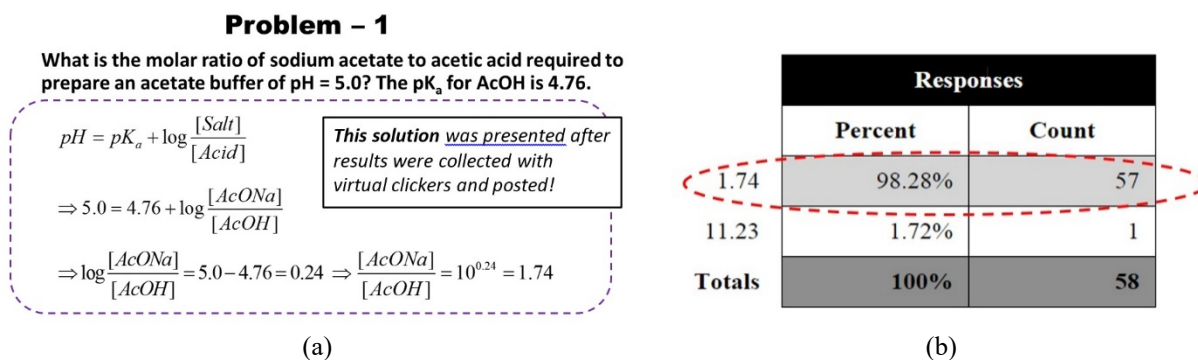


Figure 1. Preparing productive failure: (a) Simple revision problem; (b) Answers collected with virtual clickers;

Students performed the calculation for this first problem and submitted the ratio (a number) using virtual clickers. The class response (98% correct) indicated that the students followed the application of the Henderson-Hasselbalch equation in performing the buffer calculations (Figure 1b).

Step 2. Failure problem. A more complex, two-concept buffer problem was then posted for students to solve without any prior worked example. Students were encouraged to collaborate while solving this problem and the results were collected with a clicker question. As part of this problem, the instructor included a two-part question with this problem (Figure 2a). In the first part, students needed to calculate the concentrations of the chemicals provided as aqueous solutions. In the second part, they needed to use the concentrations to calculate the pH of the buffer.

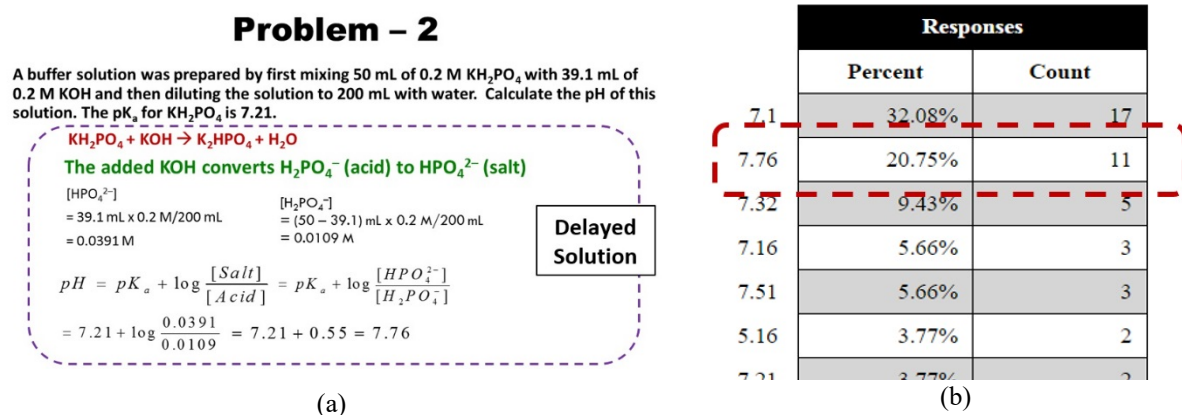


Figure 2. Failure problem: (a) Two-concept buffer problem; (b) Answers collected with virtual clickers;

The instructor encouraged students to discuss the problem with their neighbors. The clicker responses indicated 21% correct answers (Figure 2b). The responses indicated that the students found the problem to be challenging. Discussions amongst themselves clearly did not produce a positive impact on the outcome. The

problem therefore achieved the proposed goal, to create a failure context for the buffer problem solving. Subsequently, the instructor discussed the steps required to analyze the information provided critically and to answer the question successfully.

Step 3. Once the instructor discussed the failure problem and the expected solving process he rechecked the comprehension with a similar, near-transfer problem. However, instead of providing the solution concentration of the chemicals, as it was in the failure problem, the instructor gave students the amounts of the chemicals and the volume of buffer required. This tweak in the problem statement intended to test students' deep understanding of the conceptual aspects of the problem solving process. Again, the students discussed the solving strategies among themselves and responded through the clickers.

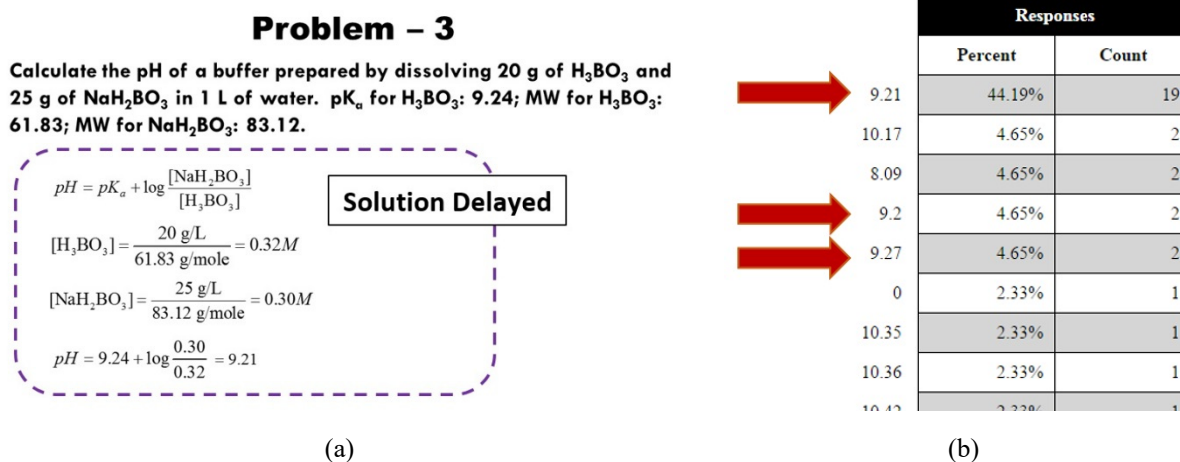


Figure 3. Near-transfer problem: (a) Modified buffer problem; (b) Answers collected with virtual clickers;

Once the clicker answers were collected and posted the instructor had some discussions with students and concluded that the pH values between 9.2 and 9.27 were acceptable as they emerged from significant digit rounding errors. Therefore, about 54% of the class responded correctly (Figure 3b). The instructor again explained the steps and the critical thinking needed to address the problem and emphasized the impossibility of a few calculated pH values (e.g., 0 and 4).

Step 4. The last buffer problem, a three-concept far-transfer problem, closed this productive failure cycle (Figure 4a). As shown in Figure 4a, in this final step the instructor challenged students with a buffer problem that used all the concepts discussed in the previous three steps.

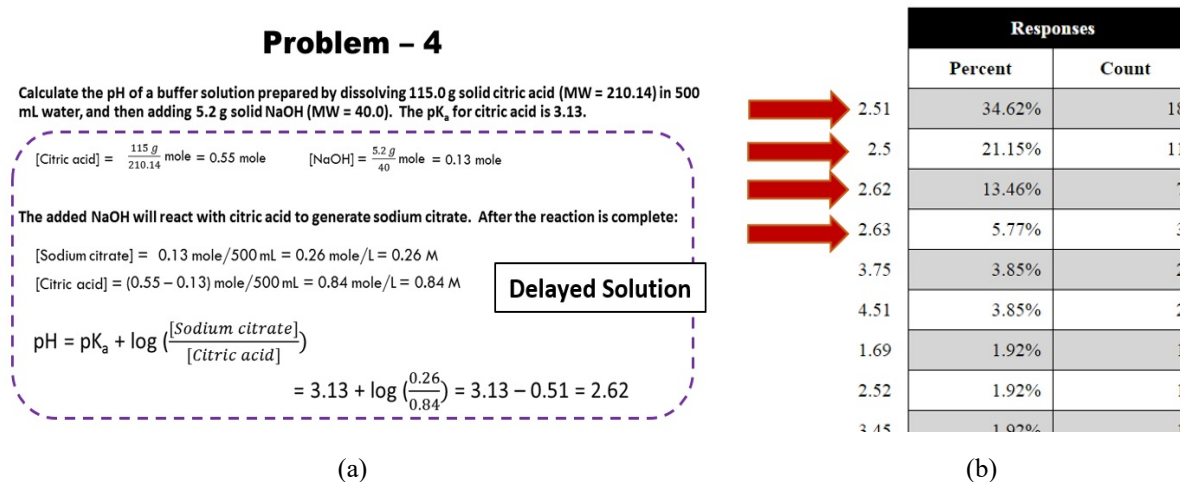


Figure 4. Far-transfer problem: (a) Three-concept buffer problem; (b) Answers collected with virtual clickers;

The results were again collected with a clicker question. Following the posting of the results and after some discussions with the students, the instructor concluded that the pH values between 2.50 and 2.63 were acceptable as they emerged from significant digit rounding errors.

Since the goal of administering this problem was to validate the effectiveness of the productive failure cycle, the instructor was pleased to note that 74% students now responded with the correct answer (Figure 4b). This result confirmed that the expected impact of the innovative integration of productive failure in the design of the active learning instructional process addressed the major goal for this intervention. That is the integration of productive failure reduced the potential gap in student performance in solving buffered and isotonic solutions problems. We will discuss in more details the actual student exam performance on this category of problems in the results section.

### Research Questions & Methodology

The exploratory questions in this study were: (1) Will the use of productive failure as an active learning instructional strategy increase students' exam performance?; (2) Do students perceive productive failure as more valuable for their learning than the more traditional lecture part in the course?

Two cohorts of P1 PharmD students, 2015 and 2016, served as treatment groups for the productive failure intervention, while 2014 cohort served as the control group in a quasi-experimental research design. Cohorts had between 81 and 85 students and while instructional tasks were mandatory, the participation in this study was voluntary. We used the results of an entry knowledge test administered by the instructor during the first week of the semester to analyze the homogeneity of the groups at the entry point in the instructional process across semesters. The second exam that mainly covered the target type of problems, buffered and isotonic solutions, served as the main measure of student performance used to test the impact of the productive failure strategy. Finally, only for the last treatment cohort, fall 2016, we administered a perceptual construct, adapted from the published literature (Grasman & Cernusca, 2015), which measured students' perceived value of productive failure on their learning (Table 1).

Table 1. Perceived Learning Value of Productive Failure

During the <i>Buffered and Isotonic Solutions</i> lectures, your instructor asked you to solve a couple of difficult problems before discussing similar ones in the lecture. Then, once you provided your answer with ResponseWare (virtual clicker), the instructor explained the solution to the problem. This strategy, called Productive Failure, pushed you to fail in a secure instructional environment and learn from you failure. Please think about those lectures and indicate how strongly you disagree or agree with the following statements.			
<b>The use of Productive Failure with ResponseWare (virtual clickers) in PSCI 368 helped me to:</b>	Strongly Disagree		Strongly Agree
... <i>better retain</i> the material taught in Buffered Solutions lectures	1	.	9
... <i>better prepare</i> for Exam 2	1	.	9
... <i>develop a better understanding</i> of the concepts introduced in Buffered Solutions lectures	1	.	9
... <i>feel more confident</i> in my ability to learn the material for Buffered Solutions	1	.	9

The perceptual survey was administered online during the last week of the semester using Qualtrics®. The perceptual construct showed a strong internal reliability with Cronbach's Alpha = .97, being above .70, the accepted value for a strong internal reliability.

### Results

While the mean values of pretest scores decreased each year (see Figure 5), a one-way ANOVA showed no statistically significant differences between the three groups' mean value of prior knowledge,  $F(2,235) = 2.56, p = 0.08$ . Tukey's HSD test did not indicate any statistically significant differences between paired groups. Consequently, the three groups were homogenous at the entry point in the instructional process.

When students' performance on Exam 2, buffered solutions, was analyzed, a one-way ANOVA revealed a significant effect for the semester,  $F(2,247) = 25.5, p < .001$ . Mean values for the three groups are presented in Figure 5. Tukey's HSD test showed that students in the 2016 cohort scored significantly higher on the Exam 2,

buffering solutions, than both 2015 treatment cohort ( $p < .001$ ) and the 2014 control cohort ( $p < .001$ ). The 2016 treatment cohort also scored significantly higher than 2015 treatment cohort ( $p < .01$ ) did.

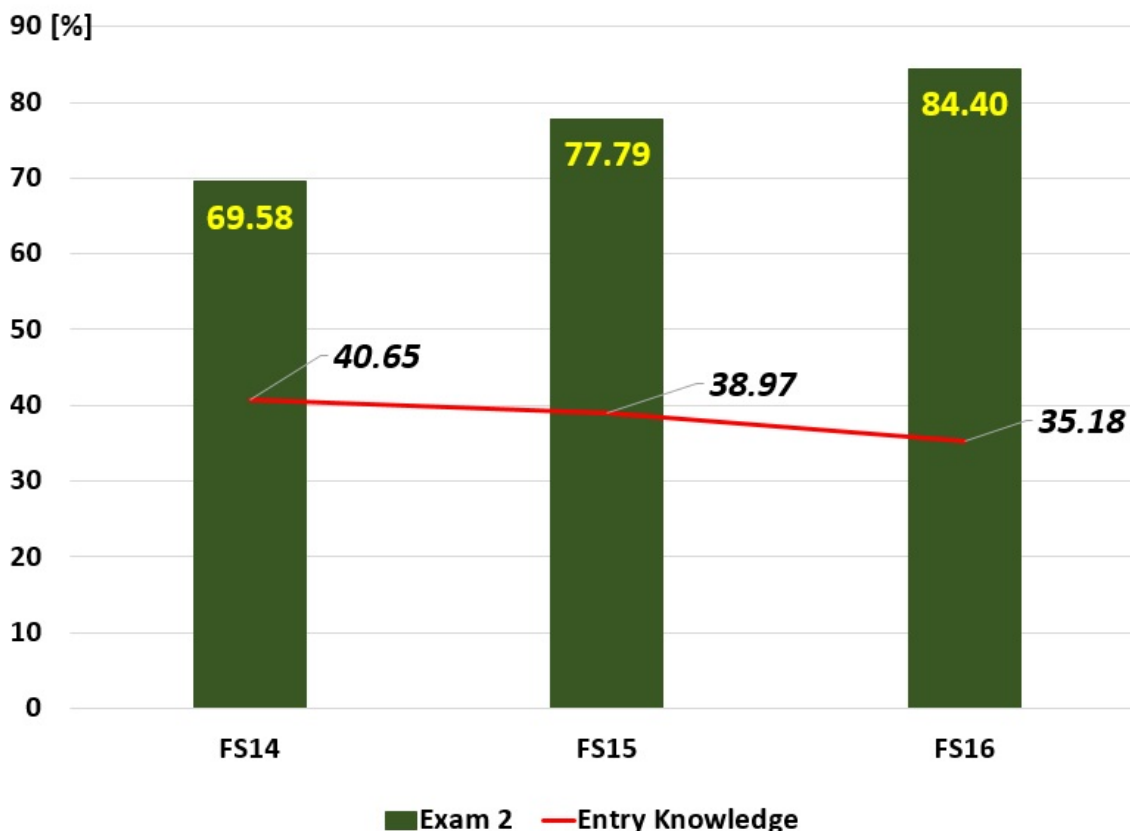


Figure 5. Mean score values for the control cohort (Fall 2014) and respectively productive failure treatment cohorts (fall 2015 and fall 2016) for both the entry knowledge and Exam 2, buffered solutions.

When we analyzed the exit survey results, regarding the perceived value of productive failure for the Fall 2016 group, the mean value of the five items was 7.3, on an evaluation scale of 1 (strongly disagree) to 9 (strongly agree). Considering a value of “5”, the middle of the scale, a neutral opinion that will equate the value of the productive failure with the other instructional tasks during the lecture, we used a one-sample t-Test to test the significance of the mean value for the fall 2016 group. The one-sample t-Test indicated that students perceived the productive failure activities as statistically significant more valuable than other instructional tasks during the lectures,  $t(71) = 11.2, p < 0.001$ .

### Discussions

Instructors often face rather asymmetrical results within the same course, even if they carefully designed and implemented what they assumed to be an effective instructional strategy. In Pharmaceutics I, the course that was the context for this innovation, the instructor found that the active learning strategy worked for about two-thirds of the course failed to produce same results for one section, the buffered and isotonic solutions and dispersed systems. More important, this issue proved to persist across semesters despite instructor’s continuous efforts to improve the instructional process by adding extra worked examples and trying to maximize the use of virtual clicker during the lectures. This outcome convinced the instructor to work with an instructional designer to bring an external perspective in the efforts to bring students’ performance for the somewhat troublesome section of the course. The success of the solution totally depended on the instructor’s willingness to implement it in the course and implement strategies to monitor the impact of that implementation. This aspect is critical since in for students heavily focused on high achievement, as is the case with Pharm. D. students, the implementation of the proposed failure-based strategy could easily fire back by stimulating students’ resistance to potential academic failure.

From students' perspective, the benefits of the proposed strategy, integration of productive failure into active learning classroom environment, is trifold. First, the productive failure cycles bring to the classroom problems with a level of difficulty that is typical for homework or exam preparation while adding a level of engagement in the problem-solving process that is hard to stimulate and control outside the classroom. As a result, after a cycle of productive failure, students leave the classroom with a level of problem-solving skills that allows them to be successful in solving additional transfer problems when assigned as homework or as preparation materials for an examination. Second, during the productive failure cycle students get multiple feedback opportunities at the time they need it the more, that is, as they are working on building and improving their problem-solving skills. Finally, the use of technology-driven instructional tools such as virtual clickers encourages students' participation in the problem-solving process, as their input of the solution for the problems used in the classroom is anonymous. The simultaneity of these three benefits resulted from the implementation of the proposed strategy provide a strong support for its innovative character.

Both by the increases in students' performance as well as their perception of the value of productive failure in their learning process support the effectiveness of this strategy. As shown in the results section, students' performance on the exam that previously lagged in terms of students' performance continuously increased while despite the fact that students' entry-level knowledge had a decreasing tendency. The fact that the second semester of productive failure implementation produced a mean performance that was statistically significantly higher than the first semester of its implementation also showed that this strategy requires time for the instructor to master the novelty of this strategy to the point to ensure its full integration into the instructional process.

The main adjustment in the application of productive failure from one semester to the next one was the complexity of the problems used in the classroom. That is, in the first semester the instructor tested the strategy to, first, get a sense of its potential negative impact due to its "failure" part and, second, to make sure this strategy has a measurable impact on students' performance on the second exam that covered the target topics, the major objective of this effort. The expectation is that, as the instructor will implement the strategy in the future semesters students' performance for this section of the course will level out, mapping students' performance in the other assessments in the course.

## Conclusions

While productive failure is a proven effective strategy for mathematics, this is, based on our knowledge, a first for Pharmaceutical Sciences in pharmacy education. What makes this implementation even more special is the integration of productive failure in an existing active learning environment without any major disruption to the instructional process but with significant improvement on students' performance. The implementation of the productive failure strategy in the Pharmacology course confirmed its effectiveness when correctly transferred to this domain in pharmacy education. Further research will focus on the potential impact of this failure-based strategy for other topics in the course. More important, failure-based strategies have the potential to produce positive outcomes in other pharmaceuticals and in the pharmacy practice courses that are driven by case-based instructional tasks.

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# The Construction of Sentiment Lexicon in Educational Field Based on Word2vec

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Descriptors: sentiment lexicon, sentiment analysis, Learning analysis, word2vec

## Abstract

Recognizing students' sentiment in learning state plays an important part in improving teaching and supporting educational decision. The construction of sentiment lexicon will help to analyze the emotional state in the opinion text. In this study, we focus on constructing of multidimensional sentiment lexicon automatically in the domain of education. We proposed a Word2vec based approach to extract sentiment words, and automatic categorization of these sentiment words. Experiments conducted on the review message, from online learning system, show that our approach leads to a better performance.

## Introduce

Sentiment analysis refers to the task of obtaining a point of view, evaluation, attitude, emotion, etc from the opinion text (Liu & Zhang, 2012; Zhang & Liu, 2016). It is important to understand the sentiment orientation of students to predict the thoughts and behaviors of individual and groups of students, and to make educational decision support accordingly. Such as by analyzing the emotional expression of the students during the online learning process, we can more accurately predict the student's online learning course completion and more convenient for teachers to provide effective academic achievement prediction. Sentiment analysis has been widely used in a range of applications since 2001(Pang & Lee, 2008). It has been widely used in business, public opinion analysis, online stores and other fields (Feldman, 2013). In the domain of education, the sentiment analysis is also getting more and more attention from researchers. With the development of online learning, the learner's opinion expressed on the content of learning is an important way of communication, which often contains a lot of information, such as learners ' sentiment orientation towards learning content, learners ' cognitive level, the learner's suggestion of learning content, etc.

Sentiment lexicon is the most fundamental unit of sentiment analysis, and most affective analysis tasks are based on sentiment lexicon (Pang & Lee, 2008). Sentiment analysis based on sentiment lexicon is according to sentiment orientation of the words provided by the sentiment lexicon, so as to analyze the text emotion under different granularity. The method based on sentiment lexicon mainly includes the extraction of sentiment words, the polarity distribution of affective words and the construction of affective lexicon. Because sentiment lexicon has domain uniqueness, the quality of sentiment lexicon in different fields has a great influence on the accuracy of sentiment analysis. Therefor researchers have constructed a domain-special sentiment lexicon , such as the sentiment lexicon for the sentiment analysis of Twitter(Tang, Wei, Qin, Zhou, & Liu, 2014), and the sentiment lexicon used for medical sentiment analysis(Goeuriot et al., 2012). However, in the domain of Chinese education did not build the domain related sentiment lexicon. In the Chinese sentiment lexicon, the more commonly used sentiment lexicon has HowNet (Dong, 2015), National Taiwan University Sentiment Dictionary (NTUSD)(Ku, Liang, & Chen, 2010) and Dalian University of Technology sentiment lexicon ontology library (DUTIR)(Xu, Lin, Pan, Ren, & Chen, 2008).



HowNet and NTUSD are not classified according to sentiment classification of emotional vocabulary, DUTIR although the sentiment lexicon for the seven categories, but it contains the vocabulary in the field of education is not commonly used.

### **Purpose of study**

The purpose of this study is to acquire sentiment words with multidimensional classification in the domain of education. According to Ekman's six categories of emotional classification(Ekman & Friesen, 1975), we divide sentiment words into surprise, fear, disgust, anger, happiness, and sadness six categories. Until now, most Chinese general sentiment lexicon have divided the polarity of sentiment words into positive and negative. Such as HowNet and NTUSD, which are classified according to the simple dichotomy of positive and negative emotions. The two lexicons ignore the richness and diversity of human emotions, and the new emotion based on the theory of emotional structure Dictionaries need to break down more emotional types or dimensions. Even the DUTRI lexicon contain Chinese sentiment words are divided into seven categories, but most of sentiment words in it not apply to the domain of education.

The emotional states contained in an educational commentary sentence is not only positive and negative in both states, it contains more emotional information, such as a positive comment that may contain happiness or surprise state. Therefore we mining more emotional information in the review text, based on the constructive multi-dimensional sentiment lexicon. These emotional information can accurately describe the student's learning status, and it can help teachers adjust the teaching plan. In addition, it can be better to assist teachers to carry out personalized teaching. But this is a long-term work, In order to build a more comprehensive classification of emotional information in the domain of education, we need to collect the text of the review in each scene of the teaching process. In this paper, we collected a number of educational information with rich emotional information, based on the data to construct multidimensional sentiment lexicon to verify the feasibility of our method.

### **Method**

#### **Using word vector**

The rise of machine learning brings new ways to natural language processing. Using machine learning to deal with natural language must be natural language symbolization, one-hot representation is the most commonly used method. This method expresses each word as a very long vector whose dimension represents the size of the vocabulary. The vast majority of the dimension in the one-hot representation is 0, and only one dimension is 1. This dimension is the current word. There's a flaw in this representation: The arbitrary words represented by this method are independent of each other, and there is no correlation between the two words on the word vector. Hinton first proposed a distributed word vector representation(Hinton, 1986), which is widely used in Deep Learning. This method of distributed word vector representation uses words as a low-dimensional real vector. The advantage of this method is that semantic similar words are closer in distance and can reflect the correlation between different words, thus indicating the dependency between words. Mikolov et al.(Mikolov, Sutskever, Chen, Corrado, & Dean, 2013)Proposed CBOW model and Skip-gram model on the basis of Word Representation. The common advantage of these two models is that they can get high quality word vectors from scale data and better describe the correlations between different words.(Mikolov, Chen, Corrado, & Dean, 2013). In this paper, we use these two models to get the context-related word vector.

#### **Seed words selection**

American researcher Ekman& Friesen (Ekman & Friesen, 1975) found that humans have six basic emotions that are surprise, fear, disgust, anger, happiness, and sadness. These six basic emotions can be combined with each other into other emotions. Xu et al(Xu et al., 2008). On the basis of Ekman's research, the emotion of happiness is divided into happiness and good. Therefore, Xu et al. construct the sentiment lexicon contained 7 categories of sentiment lexicon. This article will use Ekman emotional classification method, the sentiment words classification six categories. The seed word is selected from DUTRI. Because many of the sentiment words in the DUTRI are not used in the domain of education, we have chosen strong polar sentiment words as the seed words.

Multi-dimensional classification of sentiment words based on word vector corpus and existing six classification general sentiment lexicon

The basic sentiment lexicon generally divides the sentiment words into positive and negative. In the English dictionary WordNet-Affect Word Word-based extended sentiment vocabulary will be divided emotions into

happiness, sadness, anger and fear of four basic emotions(Strapparava & Valitutti, 2004). In this paper, we propose a Multi-dimensional classification of Chinese sentiment words, and extract sentiment words using seed words containing six kinds of emotions such as surprise, fear, disgust, anger, happiness, and sadness. The extraction process of the sentiment words is shown in Figure 1. Word2vec can train the vocabulary of the opinion text into a word vector with context semantics, and by calculating the word vector of the words. If two word vectors with greater cosine, they have higher semantic similarity. In this study, the words with the highest similarity to the seed words are the sentiment words that we have to be emotionally classified.

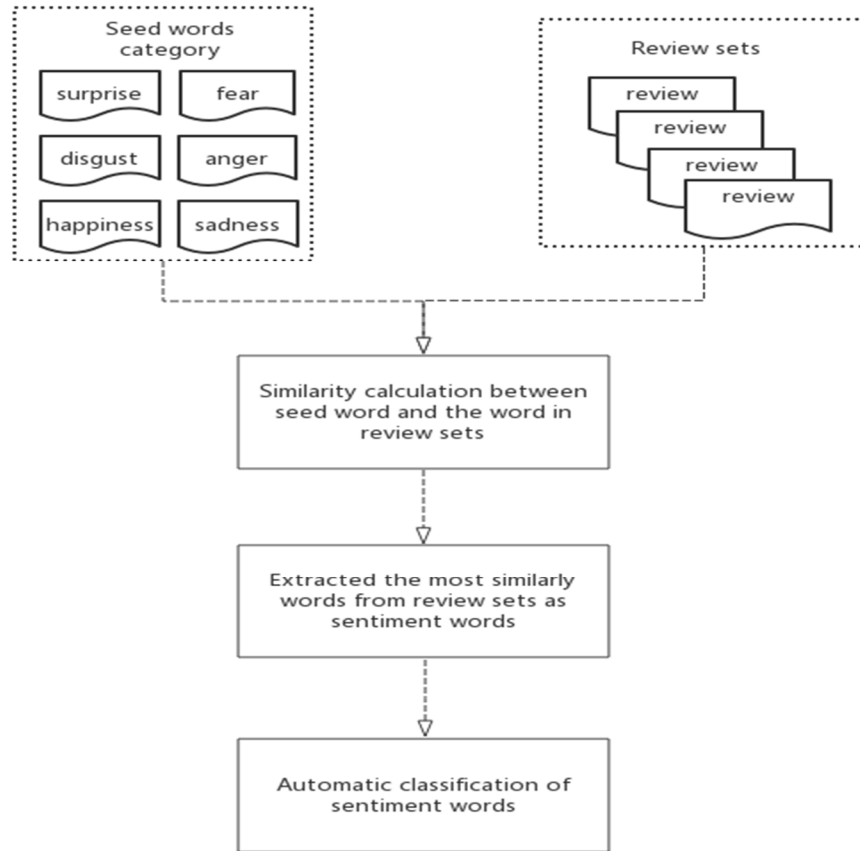


Figure 1. The extraction process of the sentiment words

In the previous step, we use the seed words to extract the sentiment words with similar emotional categories to the seed words. But these sentiment words may be repeated in other emotional categories of vocabulary. For example, "很差" means Very bad, it may exit in 'sadness' and 'disgust' kinds of emotions at the same time. In this paper, we propose an automatic classification algorithm to determine the categories of sentiment words, and these sentiment words are unique in each category. The automatic classification algorithm for sentiment words is shown in algorithm 1:

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**Algorithm 1** Sentiment words classification

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**INPUT:** sentiment words(SW), Similarity between sentiment word and seed word(SIM)

**OUTPUT:** sentiment words classification:  $W_{su}, W_f, W_d, W_a, W_h, W_{sa}$

```
1: function WORDSClassification(SW, SIM)
2:   for each  $W \in SW$  do
3:      $W_1, W_2, W_3, W_4, W_5, W_6 \leftarrow 0$ 
4:     if  $W$  exist in multiple sentiment categories then
5:        $W_1 \leftarrow SIM_w$  or  $W_2 \leftarrow SIM_w$  or  $W_3 \leftarrow SIM_w$  or  $W_4 \leftarrow SIM_w$  or  $W_5 \leftarrow$ 
         $SIM_w$  or  $W_6 \leftarrow SIM_w$ 
6:     end if
7:     while  $MAX(W_1, W_2, W_3, W_4, W_5, W_6)$  do
8:        $W$  add in ( $W_{su}$  or  $W_f$  or  $W_d$  or  $W_a$  or  $W_h$  or  $W_{sa}$ )
9:     end while
10:  end for
11: end function
```

---

In the algorithm, the emotional category of sentiment word  $W$  - fear, disgust, anger, happiness, and sadness are expressed by  $W_{su}, W_f, W_d, W_a, W_h, W_{sa}$  respectively. We use  $w_1 \dots w_6$  to denote the similarity of between the sentiment word  $W$  and the six kinds of seed words. We use the emotional category corresponding to the maximum  $W_i$  ( $i = 1, 2, 3, 4, 5, 6$ ) to represent the emotional category of  $W$ . For example, if  $W_1$  is the maximum, the emotional category of  $W$  is 'surprise'.

#### Data collection

In the domain of Chinese education, there is no general data set for the extraction of sentiment words. In this study, we obtained review message from the online education platforms Mooc college (<http://mooc.guokr.com>) and Tencent class (<https://ke.qq.com>), which is very popular in China. We have crawled 8096 review message on both platforms, which mainly expresses the evaluation of the teaching content of a course. These reviews contain both positive and negative content, so these comments contain many words with sentiment orientation.

In the course of the experiment, we used the general sentiment lexicon DUTIR, NTUSD, and HowNet. Part of sentiment words from DUTIR as seed words in our experiment. In the experiment, we compared the DUTIR in the various types of sentiment words in the frequency of comments. We found that the categories of 'anger' sentiment words in our collection of comments data almost did not appear. So in the experiment we did not produce an sentiment words associated with 'anger'. In our research, we selected a total of 328 seed words.

#### Experiments and results

In this selection, we will introduce the parameters used in the experiment. Then we introduce the extraction process and classification result of sentiment words. We first use the word2vec tool, all the words in the comment represented by the vector. The parameters in the vector training process are set as follows: Vector size = 150, min\_count = 5, Window size=5, alpha = 0.05, Negative Sampling= CBOW.

The experiment is based on our proposed method to automatically extract the sentiment words and realize the multidimensional classification, we achieve a total of 1847 sentiment words. These words are divided into sadness (contain 114 sentiment words), disgust (contain 404 sentiment words), surprise (contain 26 sentiment words), fear (contain 58 sentiment words), and happiness (contain 1245 sentiment words) 5 categories. In order to verify the automatic selection and classification of sentiment words, we use artificial annotation method to verify the accuracy of these emotional words. The results of the manual verification are shown in Table 1 below:

*Table 1. Accuracy of sentiment words multidimensional classification*

category	sadness	disgust	surprise	fear	happiness
The quantity of sentiment words	114	404	26	58	1245
Correct quantity	90	300	22	40	1130
Accuracy rate	0.789	0.743	0.846	0.690	0.907

Table 1 shows that the accuracy rate of the method is very high in the recognition of the 'happiness' of the category of emotion: 0.857. The accuracy of other emotional categories is also well demonstrated. The experimental results show that the method we proposed can be used to automatically extract sentiment words and classify the multidimensional degree in the text.

Compared with the general sentiment lexicon, the sentiment words in the domain of education are only a small number of words exist in the general sentiment lexicon. The proportion of sentiment words in the general emotional dictionary is shown in table 2 .

*Table 2. Compared with the general sentiment lexicon*

General sentiment lexicon	DUTRI	NTUSD	HOWNET
Coexistence quantity	409	367	385
Proportion	0.221	0.200	0.208

It can be seen from Table 2 that there are only a small amount of words in the domain of education and the general sentiment, that is, most of the sentiment words contained in the general sentiment lexicon do not exist in the domain of education. In the domain of education, many sentiment words are not exist in the general sentiment lexicon, such as '听不懂' and '听的懂', their meaning is ' not understand ' and ' understand ', they represent a negative or positive emotional state. The sentiment lexicon in the domain of education will be more effective in expressing the emotional state contained in the opinion text of education.

### **Application case**

Sentiment analysis based on emotional dictionary can effectively measure the sentiment orientation of the text. In this paper, we build a visualization of the opinion text in the sentiment analysis platform. For example, students express their opinions through a comment window or an instant communication window in an online learning course. Teachers can perform affective analysis tasks according to the opinion text in the back end. Then teachers can see the result as picture 2, picture 3 and picture 4: Opinion text Visualization

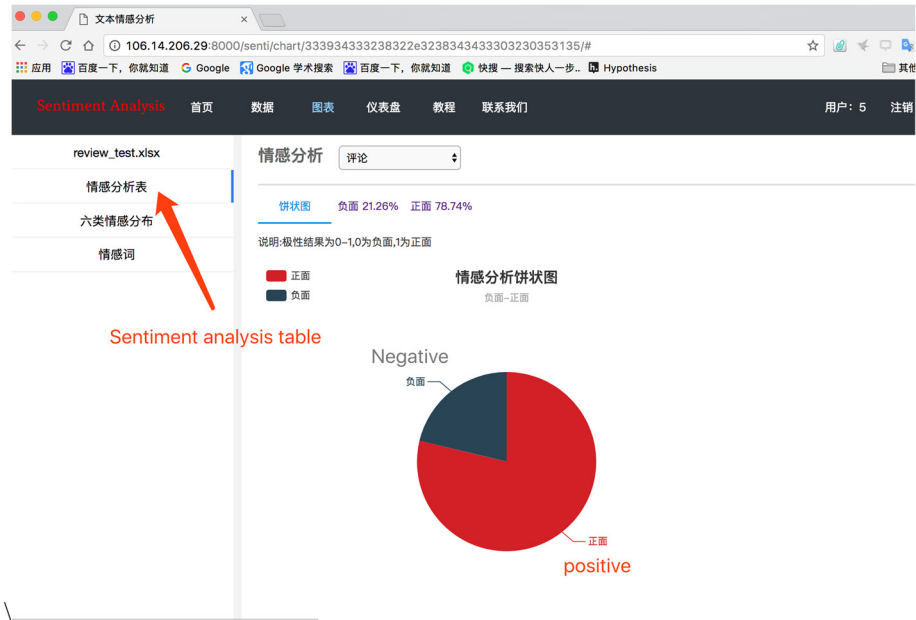


Figure 2. Opinion text Visualization

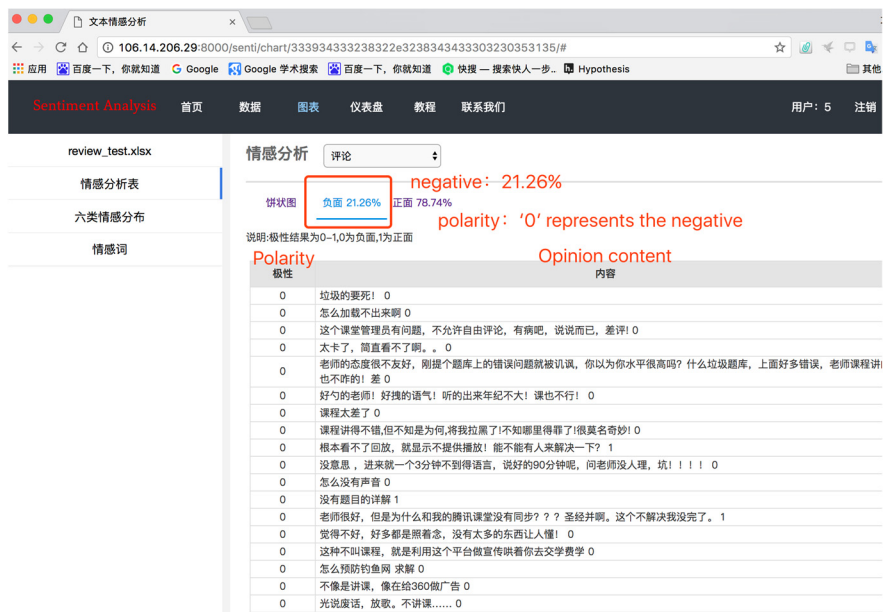


Figure 3. Statistical tables of sentiment analysis

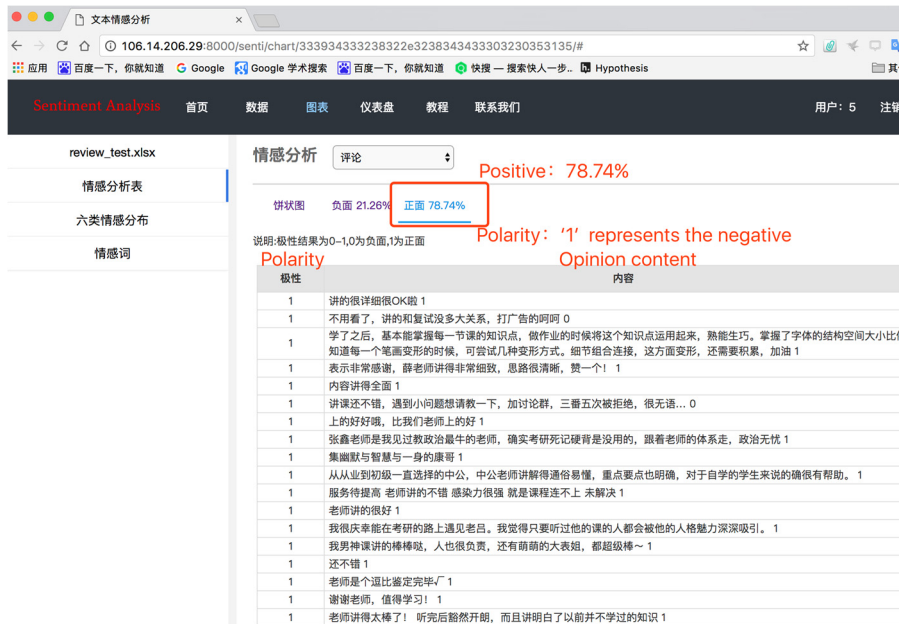


Figure 4. Statistical tables of sentiment analysis

The results of the sentiment analysis visualization can be more intuitive to see the student's learning state. Teachers can adjust the teaching plan according to the statistical results, and stimulate students' interest in learning.

## Conclusion and discussion

In this paper, we focus on constructing of multidimensional sentiment lexicon automatically. The lexicon makes up for the lack of sentiment lexicon in the domain of Chinese education. Experiments show that our proposed method can quickly and effectively extract sentiment words from a large number of educational domain opinion text, and our method effectively achieves multi-dimensional classification of sentiment lexicon. It is significance to construct multi-dimensional sentiment lexicon to analyze the students' online learning opinion text.

The words form multi-dimensional sentiment lexicon can be more detailed description of the performance of the text of the emotions. The emotional analysis of the educational emotion dictionary based on multi-dimensional sentiment lexicon has a more effect on the recognition of learners' opinion text which contained the learning motivation, the learning needs and the learning needs. However, there are still many improvements in the process of automatically building sentiment lexicon. In the experimental process, the opinion text used to construct sentiment lexicon is small and the sample range of corpus is limited. The corpus of the experiment is limited only to the environment of online learning, and the corpus of the traditional classroom is not included. In addition, there are some improvements in the parameters of word vector training in experiments. Word2vec is born in the English world, and English and Chinese have a greater difference, Therefore, there is room for optimization in the training of the parameters of Chinese corpus. In future work, we will continue to optimize the sentiment lexicon in the domain of education and apply it to sentiment analysis.

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# Blended Instruction by Using Simulation Method Teaching to Enhance Digital Literacy for Student Teachers in Thailand

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## Introduction

*Now, at the turn of the new century, Web technologies are replacing TV, telephones and newspapers as the primary means by which we are informed and entertained.* (Gilster, 1997)

The development of technology has impacted the digital interaction of people. The digital environment has placed a great deal of importance on the ability to successfully access and use the hardware and software necessary for online participation (Thompson, Jaeger, Taylor, Subramaniam, & Bertot, 2014). The ability to deal effectively with digital tools is often labeled *digital literacy*.

Twenty years ago, Paul Gilster claimed that digital literacy was the “ability to understand and use information in multiple formats from a wide range of sources when it is presented via computer” (Gilster, 1997, p. 1). However, there are a variety of definitions for digital literacy:

Digital literacy refers to the skill, knowledge and understanding required to use new technology and media to create and share meaning. Digital literacy also refers to the knowledge of how particular communication technologies affect the meaning they convey, and the ability to analyze and evaluate the knowledge available on the web. (Hague & Payton, 2011, p. 1)

Digital literacy involves knowing how to use a range of technology to find information, solve problems or complete tasks. Digital literacy is also about knowing how to act safely and respectfully online. (Australian Government, 2008, p. 1)

Spires and Bartlett (2012) classified digital literacy into three categories: (1) locating and consuming digital content; using strategies effectively to search for information and evaluate its accuracy and relevancy (Leu, Coiro, Castek, Hartman, & Reinking, 2008); (2) creating digital content; and (3) communicating digital content. Moreover, the Department of Broadband Communication and Digital Economy (2009) defines three core skill sets in a digital literate society: 1) the technical ability to engage at a basic level on the computer and internet; 2) the ability to understand and critically evaluate digital media and digital media content; and 3) the ability to create content and communication. It can be concluded for this research study that digital literacy is a set of skills to locate, evaluate, use, create, and communicate content or information via networks in multiple media forms.

Digital literacy has evolved into an essential literacy because the literacy of the future rests on the ability to decode and construct meaning from one’s constantly changing environment. The capacity to evaluate information on the issues of credibility and reliability is essential, as is the ability to decide when and how to apply information to solve problems (Spires, & Bartlett., 2012).

There is a survival approach to developing digital literacy. Knowledge and understanding are important to learning. Building on the knowledge about how to use search engines and having a general knowledge of resources available on the Web is a critical beginning step (Moraveji, Morris, Morris, Czerwinski, & Riche, 2011). The next steps include: practice locating; evaluate using, creating, and communicating information in various ways by spending more time facilitating student learning. Less time lecturing and allowing students to create or consume digital content may assist developing needed skills for a technological society. In addition, using mobile devices such as cellphones and tablets provide convenience and immediacy to the communication process for students (Hiller A. Spires and Bartlett., 2012). Enhancing digital literacy for students should focus on blended technology, especially digital technology in the classroom.

“Blended Learning are classes where a portion of the traditional face-to-face instruction is replaced by web-based online learning about 30%-70% depended on class, discipline and learning objectives” (University of Central



Florida & American Association of State Colleges and Univers, n,d,, p. 1). Blended learning can be implemented in many ways, such as:

- 1) students will attend face-to-face classes, study online, and do group work on a fixed schedule
- 2) students will attend face-to-face classes on a fixed schedule, but they can study online by computer laptop that flexible schedule.
- 3) students can manage their schedule to study in a face-to-face classroom and online class by themselves.
- 4) students will study via an online class at home before coming to a face-to-face classroom at school, and
- 5) students can take an online class with an online teacher in a computer lab, in addition to face-to-face classroom to provide students with more flexibility over their schedules (Clayton Christensen Institute, 2017) .

One of benefits of blended leaning is it allow students and faculty to take advantage of much of the flexibility and convenience of an online course while they can get benefits of the face-to-face classroom experience. (University of Central Florida & American Association of State Colleges and Univers, n.d.) In addition, students who attend a blended course can improve social online skill while they study and practice via the online course because they have to create and communicate information in the online class to realize meaningful learning (Garrison & Vaughan, 2008).

Furthermore, digital literacy is a construct of many skills, such as critical thinking for making informed judgements about retrieved information, verifying the information validity, and checking the completeness of internet sources (Bawden, 2008) and communicating skills to present created content via online. Thus, the development of digital literacy should enhance the new set of these skills at the same time.

Khammani (2010) developed a teaching method that enhanced several skills: interaction skills, communication skills, problem solving skills, and thinking skill supported by a simulation teaching method. While Ruksakaew (2009) found that students being taught by using the online learning interaction activities in simulation had higher scores in interpersonal communication skills than those of students being taught without online learning interaction activities with simulation at a .05 level of significance. This is study it meant the simulation teaching model promoted the use of critical and evaluative thinking because it encouraged students to contemplate the implications of a scenario. In addition. it helped students understand the concepts being taught by doing an activity in a scenario (The University of New South Wales, 2015). This model was determined to enhance the digital literacy of student teachers.

Simulation is a form of experiential learning in the imitation of real-world scenarios. Students are able to develop skills and experience safely (Glover, 2014). There were 4 steps in this model;

- 1) Introducing simulation scenario.
- 2) Defining player and role in simulation
- 3) Playing in simulation and
- 4) Discussion and Conclusion. (Jones, 1982; Mack, 2009; and Khammani, 2010).

These are the reasons the researcher for this study selected blended learning and digital literacy to enhance digital literacy for Thai student teachers.

In 2011, UNESCO redeveloped the ICT competency standards it had first developed for teachers in 2008. As stated in the standards: professional teachers should have digital literacy and be able to:

- a) Use authoring environment or tools to design online materials,
- b) demonstrate the use of an authoring environment or tools,
- c) have participants work in groups to design an online unit,
- d) Use the network to support student coloration within and beyond the classroom, etc. (UNESCO, 2011, cited in NSW Education Standards Authority, 2017, p. 1).

The NSW Government adopted all the recommendations of *Great Teaching, Inspired Learning: A Blueprint for Action* in 2013. In 2015 it was also decided to review the teacher preparation programs as the national priority for the Information and Communication Technology area. Graduated teachers of Australia have to understand: their subject area, curriculum content, and teaching strategies. In addition, they have to know how to integrate contemporary technologies, including digital technologies, into their teaching to enhance the learning of students. They also apply their ICT or digital skills in enhancing digital literacy of students (NSW Education Standards Authority, 2017). This blueprint for preparing teachers of NSW and the required competence levels for Thai teachers are similar. Thai competences were defined by The Teacher' Council of Thailand. It indicated that Thai teachers have the ability to uses technology and to apply technology to student learning.

As mentioned above, digital literacy is very important for Thai student teachers. Especially, elementary teachers because students in the third grade start developing digital literacy skills (Chall, 1996). For this reason, the researcher was interested in enhancing digital literacy of Thai student teachers who study to teach in the elementary education field by developing an instructional model based on blended learning combined with the simulation

teaching method. To design the instructional model, the first step was to set the goal of the instruction followed by analyzing the students to plan activities for them (Dick, Carey, & Carey, 2009). This research was the step to analyze students by using a survey. The result of this research will help the researcher to develop a teaching model to enhancing digital literacy of student teachers as recommended future research.

### **Research Objectives**

The objective of this research was to survey the opinion of student teachers in Thailand on the Blended Instructional Model using simulation to enhance digital literacy for student teachers in Thailand.

### **Research Methods**

This study is an exploratory research study with sampling methods, research tools, and procedures as follows:

#### **Participants**

The research used stratified sampling to randomly select 5 University of Thailand institutions that have Elementary Education Departments. Participants recruited for this study were 241 Thai student teachers who study in the elementary education filed.

Sample size calculation was determined by using Yamane's formula of sample size with an error 5% and with a confidence coefficient of 95%. Multi-stage Sampling was used by classifying the Students into 5 years including Year 1-5 in each year were selected by using Systematic Random Sampling. Therefore, there were 277 questionnaires distributed and 241 were returned which was equaled to 87.72%.

#### **Instruments**

Instruments employed in this research included a questionnaire exploring the opinion of student teachers in Thailand on the Blended Instructional Model using simulation to enhance digital literacy. This particular questionnaire consisted of 3 sections as follows;

- 1) Participants' information,
- 2) Participants' use of digital tools and
- 3) Opinion of participants on the Blended Instructional Model using simulation to enhance digital literacy.

In ensuring the technical adequacy of the research instruments, 3 experts reviewed the instruments. Those experts consisted of 1 expert in digital literacy, 1 expert in blended learning and 1 expert in simulation. They evaluated all the content and construct validity, and scopes and relevancy of the items.

#### **Data Collection**

The Researcher sent letters to the Elementary Department, Faculty of Education by post to ask for permission to collect data, along with an exploratory letter to certify that data obtained from the questionnaire would remain confidential, and the questionnaire. After the Elementary Department granted permission, the Department distributed questionnaires to student teachers who met the criteria identified in the questionnaire. Participants were asked to complete the questionnaire. Then, the Department sent the questionnaire back to the researcher by mail.

### **Research Results**

The participant pool was 241 Thai student teachers all studied in the elementary education filed: students in first year 24.1%, students in second year 25.7%, students in third year 16.2%, students in fourth year 20.3% and students in fifth year 13.7%. The researcher found that all of the Thai student teachers use smart phone while some of the participants did not use computer or tablet (3.7%). Most of them use smart phone and computer 3-4 hours per day (33.1% using smart phone and 38.6% using computer/tablet)

*Table 1. Using Digital Tools by Student Teachers*

Time/day	Smart Phone		Computer/tablet	
	frequency	percent	frequency	percent
None	0	0	9	3.7
Less than 1 hr..	1	0.4	53	22.0
1-2 hr.	23	9.6	93	38.6
3-4 hr.	79	33.1	56	23.2
5-6 hr.	70	29.3	23	9.5
More than 7 hr.	66	27.6	7	2.9
total	241	100.0	241	100.0

The study indicates that Thai student teachers tend to use smart phones for communicating in social media (21.4%) more than other uses while most of them use a computer/tablet to do student papers (23.5%). In addition, online searching was the secondary computer use (19.6%) while communication via applications was the secondary smart phone use (15.6%)

*Table 2. Smart Phone Use by Student Teachers.*

topic	frequency	percent
Talking on phone	122	13.3
Communication via the applications	143	15.6
Communication in social media: Facebook	196	21.4
Online searching	129	14.1
Sending or receiving E-mail	52	5.7
Game playing	85	9.3
Reading/Listening online news	80	8.7
Listening to music	107	11.7
Other	1	0.1
total	915	100.0

*Table 3. Computer/Tablet Use by Student Teachers*

topic	frequency	percent
Communication via the applications	54	7.8
Communication in social media: Facebook	89	12.9
Online searching	135	19.6
Sending or receiving E-mail	68	9.9
Game playing	45	6.5
Reading/Listening online news	38	5.5
Listening to music	95	13.8
Doing student paper	162	23.5
Other	2	3
total	688	100.0

The findings based on the opinions of Thai student teachers regarding blended instructional by using the simulation method teaching were: Thai student teachers prefer simulation scenario being introduced via online but complete the activity in a face-to-face classroom. In addition, the most suggested advice from participants (28.2%) about online tools for introducing stimulation scenarios is a document in PDF form that allows students to download the file to read it.

*Table 4. The Findings of Opinions by Student Teacher On Blended Learning*

	Online learning		Face-to-Face classroom	
	frequency	percent	frequency	percent
<u>Step 1</u> Introducing simulation scenario.	170	70.5	71	28.5
<u>Step 2</u> Defining player and role in the simulation.	111	46.1	130	53.9
<u>Step 3</u> Playing in simulation.	104	43.2	137	56.8
<u>Step 4</u> Discussion and Conclusion	95	39.4	146	60.6

*Table 5. Online Tools in Step 1: Introduce Simulation Situation*

	frequency	percent
A document in PDF form.	68	28.2
Content on website	46	19.1
A thread on Facebook	22	9.1
A Video clip on website	22	9.1
Combine a video clip and a tread on Facebook	38	15.8
Interaction via online real time		
Skype	46	26.6
You Tube live	22	12.7
Hang out video	22	12.7
Facebook live	48	27.7
Line Group call	35	20.0
Other	0	0
Other	0	0

When analyzing responses by a student's year in the program, the research found:

1. All Thai student teachers said that the step 1 introducing a simulation scenario should study via online.
2. Only Thai student teachers in the first year said the step 2 defining player and role in the simulation and step 3 playing in simulation should study via online.
3. All of students said the step 4 discussion and conclusion should study in face-to-face classroom.

*Table 6. Result of Opinions by Student Teacher Year*

Year	Step 1		Step 2		Step 3		Step 4	
	Introducing simulation scenario.		Defining player and role in the simulation.		Playing in simulation		Discussion and conclusion	
	Online learning	Face-to-Face classroom	Online learning	Face-to-Face classroom	Online learning	Face-to-Face classroom	Online learning	Face-to-Face classroom
Year 1	44 (75.9%)	14 (24.1%)	30 (51.7%)	28 (48.3%)	31 (53.4%)	27 (46.6%)	24 (41.4%)	34 (58.6%)
Year 2	44 (72.1%)	17 (27.9%)	27 (43.5%)	35 (56.5%)	27 (43.5%)	35 (56.5%)	20 (33.3%)	40 (66.7%)
Year 3	25 (64.1%)	14 (35.9%)	15 (38.5%)	24 (61.5%)	8 (20.5%)	31 (79.5%)	12 (30.8%)	27 (69.2%)
Year 4	31 (63.3%)	18 (36.7%)	24 (49.0%)	25 (51.0%)	26 (53.1%)	23 (46.9%)	23 (46.9%)	26 (53.1%)
Year 5	25 (75.8%)	8 (24.2%)	15 (45.5%)	18 (54.5%)	12 (36.4%)	21 (63.6%)	14 (42.4%)	19 (57.6%)

### Discussion

Digital literacy is one skill needed in the present and for the future. Developing digital literacy in elementary students is very important. Therefore, improving digital literacy of Thai student teachers is also important. There are several ways to enhance digital skills: blended learning by simulation was selected for this research. Because blended learning allows learner communication via digital tools, it helps learners develop online communication skills. The simulation method can enhance thinking skills, especially critical thinking; an essential digital skill. To achieve the goal, it was necessary to analyze the background and opinion of student teachers about the blended instruction model by using simulation method. This research found:

- 1) All Thai student teachers use smartphones, but some do not use a computer/tablet. Smartphones are very functional: sending messages (SMS), calling, chatting, opening documents, checking-email, internet browsing and socialization (Alson & Msiagal, 2016). Moreover, nowadays smartphones are small and can be carried easier than a tablet. Another advantage is that the average prices of smartphones are cheaper than computers/tablets.
- 2) Most Thai student teachers use smartphones for socialization such as Facebook. This finding is the same as the results of researchers Alson and Msiagal (2016). They found socialization is the most widely used feature on smartphones. Because there are many socialization applications for smartphones, it helps people to easily connect and socialize online. For this reason, smartphones are the most popular digital tools for socialization.
- 3) Blended learning by simulation method includes 4 steps. Thai student teachers prefer the simulation scenario that was introduced via online (step 1) but defining player and role in simulation (step 2), playing in simulation (step 3), and discussion and conclusion (step 4) are activities that should be done in a face-to-face classroom. The results revealed in this study is that Thai student teachers still believe in face-to-face classroom more than online learning.

- 4) When analyzed separately by year, the results indicated that first year students preferred online learning. This may be because first year students are the new generation or Gen Z; born after 1977 (FAIRVIEW CAPITAL, 2017). Technology has permeated Gen Z in their lives in many ways: they use cloud computing for homework assignments or make online friends around the world on social networks. In addition, for Gen Z, the real world and the virtual world naturally overlap (FAIRVIEW CAPITAL, 2017). The Researcher believes this is the reason that Thai student teachers that were first years prefer to study online more than the others.

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# Social Network Use Preferences of Pre-Service ICT Teachers

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Extensive use of technology related to rapid advancements have changed the daily habits and behaviors of people (King et al., 2013). For instance, people have started to check their smartphones as the first thing to do in the morning and last thing to do at night before going to sleep. So, we have several new, technology related phobias such as nomophobia (King et al., 2013; Yildirim & Correia, 2015), cyberphobia (Lucas, 2015), and many more. The main point here is not how many times people check their smartphones or smart devices, why do they check their devices. According to Yildirim and Correia (2015), people afraid of losing communication and connection with other people at most.

According to O’Keeffe, Clarke-Pearson, and Council on Communications and Media (2011) using social networking sites has become the most common activity of teens’ and adolescents’ daily life. They take pictures to share on “Instagram”, tweet about their moods and ideas on “Twitter”, check-in a place to announce where they are on “Swarm”, chats with many groups on “WhatsApp”, or share videos, single photos or albums, tag their friends on “Facebook”. According to PEW Research Center’s (2017) social media update 2016, 79% of online adults, which is 68% of all Americans, use Facebook, whereas 32% of online adults, which is 28% of all adults, use Instagram. Moreover, according to Facebook (2017), there were 1.79 billion monthly active users and 1.18 billion daily active users as of September 2016. While 1.66 billion monthly active users logged in via mobile devices, 1.09 billion monthly active users logged in via mobile devices. When the social media usage statistics were compared it is seen that Facebook is the most commonly used social networking site among all social networking sites.

The extensive use of social networking sites has already gain the attention of educators that many different studies have conducted to examine educational use of social networking sites, especially educational use of Facebook (Arteaga Sánchez, Cortijo, & Javed, 2014; Demirbilek, 2015; Henderson, Finger, & Selwyn, 2016; Manca & Ranieri, 2016; O’Keeffe et al., 2011; Roblyer, McDaniel, Webb, Herman, & Witty, 2010).

Although there are many studies conducted to investigate how educators and students use social media, or would like to use it with or without educational purposes, this study aims to investigate how pre-service ICT Teachers use social media, and what do they expect from professors about social media use. In Turkey, Department of Computer Education and Instructional Technology (CEIT) is responsible for educating ICT teachers. The department has B.S., M.S., and Ph.D. degrees. People with B.S. degree in CEIT could be ICT teachers in private and public schools. These ICT teachers have several roles in schools besides teaching such as being a role model to both other teachers and students about the correct and effective use of technology, maintaining computer labs, solving network, hardware and software problems, and so more. Furthermore, ICT teachers are responsible for preparing web sites, and managing social media accounts of the institution.

Since ICT teachers have a key role for technology integration and effective technology use in schools, they needed to be correctly educated. Moreover, the proper use of social media is required to be taught. At this point, understanding how pre-service ICT teachers use social media and what do they expect from professors might help to establish a road map to social media education.

This study investigate how pre-service ICT teachers use social media, and what do they expect from professors in terms of using social media in education. For this purpose, a descriptive questionnaire consisted of 44 questions, nine questions to understand social network use, and 35 questions to understand their expectations from professors and institutions, was prepared and utilized. At first, the questionnaire was sent to five experts with Ph.D. in order to ensure there was no problem. The final form of the printed questionnaire was distributed to pre-service ICT teachers in a public university located in central Anatolia region, and 88 responses were collected.

According to preliminary analysis, there were 44 (51.2%) women and 42 (48.8%) men, and their ages ranged between 18 to 24. The main device used to connect to the Internet is smartphones (n=60). The most common social network was Facebook (n=83), and least common was LinkedIn (n=22). The other social networks used by students were Twitter (n=45), Instagram (n=72), Google Plus (n=48), Swarm (n=42). They use social networks to communicate with friends (n=83), to find old friends (n=51), to find new friends (n=28), to learn what other people do (n=43), to share (n=60), to follow celebrities (n=44), to follow institutions (n=42), to follow news (n=74), to buy something (n=36). When they are asked to clarify which information they share on social networks, it is seen that they share their names (n=77), phone numbers (n=12), addresses (n=12), e-mail (n=30), marital status (n=21), photo and video (n=60), hometown (n=69), political view (n=20).

When pre-service teachers asked to whom do they send friend request, it was seen that they send friend request to relatives (n=65), friends (n=72), classmates (n=69), schoolmates (n=62), dorm mates (n=57), friends' friends (n=20), professors (n=47), and everybody they know (n=26). Furthermore, they accept friendship request of their relatives (n=68), friends (n=78), classmates (n=78), schoolmates (n=72), dorm mates (n=65), friends' friends (n=41), professors (n=55), and all requests (n=13).

These are just the initial findings. More detailed findings on what do they expect from professors and institutions will be presented and discussed.

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