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A mixed methods study of online course facilitators' perceptions of mobile technology, design, and TPaCK affordances

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A MIXED METHODS STUDY OF ONLINE COURSE FACILITATORS' PERCEPTIONS OF MOBILE TECHNOLOGY, DESIGN, AND TPaCK AFFORDANCES

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This dissertation, written by

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DOCTOR OF EDUCATION

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DEDICATION

"We drink from wells we did not dig"

-Deuteronomy 6:11

Twenty years ago, my Dad first discussed with me, my participation in Pepperdine University's EDLT program, just in its formation, thanks to the innovative foresight of his colleague and weekly tennis opponent, Dr. Jack McManus. It took seventeen years for my vision to match Dad's vision. Both of my parents strongly supported education as a means for vocational ministry and public service. They lived by the concept of Caring, Serving, and Excelling. They encouraged me to begin and continue in the Caring, Serving, and Excelling concept. During the completion of this degree, my mother experienced a stroke and passed to heaven. Her encouragement, passion for excellence, and red pen, always at the ready, were sorely missed. My daughter, Amelia, took the cheerleader baton from my mother and encouraged me to continue this purposeful path.

My Dad has remained stalwart in his support. He encouraged me and never said 'I told you so' when I told him he was right in his original vision, of twenty years ago.

Dad, you and Mom dug the well and prayerfully set the foundation. I am still working on the building.

With gratitude~~Helen

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VITA

EDUCATION

1985	M.Ed. Curriculum & Instruction	Abilene Christian University Abilene, Texas
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ABSTRACT

The increase in mobile technology options for students in post-secondary, continuing education influences how instructors design and implement courses, specifically online courses (Sözcü, İpek, & Kınay, 2016). Much of the current research addresses technological, pedagogical, and content knowledge (TPaCK), course design, and/or mobile technology as separate topics. There is limited research addressing the combination of TPaCK, design, and mobile technology from the course instructors' perspective. The mixed methods study addressed design for online, mobile learning with a new layer of the TPaCK instructional framework in three phases.

Phase 1 involved a pilot study of a survey that measured TPaCK, lesson design practices, and design perceptions. The pilot study responses informed Phase 2. In Phase 2, the survey was given to 33 current online course facilitators from PBS TeacherLine, an online continuing education course provider. Responses were gathered. In Phase 3, a qualitative interview designed to understand online course instructors' perceptions of their use of mobile technology, design decisions, and the TPaCK, instructional framework was conducted with a random sample of twelve people from the survey participant pool. The threefold data collection process allowed for a triangulation of the findings, which heightened construct validity and comprehensive understanding.

In Finding 1, 100% of the online continuing education course facilitators integrated TPaCK in their courses through the use of mobile and digital tools. In Finding 2, 100% of the online continuing education course facilitators made dynamic and innovative mobile and digital design decisions through the creation of supplemental course content. In Finding 3, 92% of online continuing education course facilitators utilized mobile technology in their online courses through an innovative inclusion of both mobile devices and mobile apps. Five conclusions resulted from the study and are discussed. The study contributes to existing literature by

Chapter 1: Study Introduction

Background and History- The Growth of Mobile Technology in Online Learning

The research study proposed to use a mixed methods approach of a quantitative survey instrument to measure online course instructors' use of the TPaCK instructional framework and a qualitative interview to measure online course instructors' specific use of mobile technology in their online courses.

Online education continues to provide a growing and preferred educational option for students of all ages (Allen, Seaman, Poulin, & Straut, 2016; Scoble, Israel, & Benioff, 2014; Sher, Williams, & Northcote, 2015). Online education provides new technology options for content through the expanding availability of open source libraries of information (Flood, Heath, & Lapp, 2015) and also the obliteration of field dependent tethers.

Online education courses, known by the terms *virtual learning, distance education, or e-learning* courses, offer an advantageous option for teachers and students. Specifically, software, apps, and online learning systems influence the pedagogical and instructional practices of teachers. Encompassing virtual learning, distance education, and e-learning, online education courses delivered over an internet connection are offering advantageous learning options for students. Graber's (2014) premise asserts, "No form of technology has changed the face of how education is delivered to students as dramatically as online education" (p. 173).

Nicholas Negroponte (1996) observed, "Computing is not about computers anymore. It is about living" (p. 6). The greatest concern of the top technology companies is "being where people will spend most of the time online" (Scoble et al., 2014, p. 16). People interact with technology and personalize it in social ways (Nass, Steuer, & Tauber, 1994). During the 2017 Super Bowl LI, 27.6 million tweets were posted to the Twitter hashtag #SB5164 (Perez, 2017).

Facebook reported that 64 million people posted 240 million interactions on Facebook with over 90% of the interactions occurring over mobile devices (Perez, 2017).

Field dependence is "the tendency to rely on external referents, while field-independence is the tendency to rely upon internal referents" (Sözcü et al., 2016, p. 189). Graber's premise (2014) is applicable to mobile technology and mobile learning. The global market for mobile learning reached a sales total of $5.3 billion in 2012 (Pande, Thankare, & Wadhai, 2017). The sales forecasts of the explosive growth of global are projected to increase to $12.2 billion by the end of the 2017 (Pande, Thankare, & Wadhai, 2017).

The emergence and dominance of mobile learning is an explosive innovation in educational technology. Mobile technology reimagines and redefines educational opportunity away from field-dependent spaces of learning (Sözcü, İpek, & Kınay, 2016). Mobile technology disrupts field and place dependency to include learning from any WiFi-connected space. With increases in mobile device storage capacity, continuous WiFi is being disrupted as well.

Embodying Negroponte's claim, mobile devices are abundant and ubiquitous. They have enormous potential to facilitate ever-present access to learning materials, and to enable learners "to perform authentic activities in the context of their learning" (Martin & Ertzberger, 2013, p. 76). Contextually authentic learning is necessary because students in secondary and post-secondary education prefer "here and now" learning (Martin & Ertzberger, 2013, p. 26).

A large number of learners prefer mobile technology (Martin & Ertzberger, 2013; Scoble et al., 2014). For instance, of the 400 million Instagram users, 90% are younger than 35 years (Duggan, 2015). Even students as young as elementary school are proficient with mobile technology (Muir, Callingham, & Beswick, 2016). Over 90% of middle school students use technology (Muir et al., 2016). Empirical research studies indicate that use of mobile devices to access learning and curriculum materials is common among graduate level learners (Hamm,

Drysdale, & Moore, 2014, Traxler, 2009). Learning institutions recognize the need to define strategies for e-learning and mobile learning (Tseloudi & Arnedillo-Sánchez, 2016). These strategies outline ways in which students and faculty access course content online using a mobile device on a safe and secure network.

Although mobile devices have tethered options for connectivity, learning with mobile technology is different from desktop-tethered eLearning (Traxler & Lally, 2016). Courses featuring mobile technology are more learner-centered rather than instructor-led. Mobile technology affords learning that is more contextual, (Scobel, Israel, & Benioff, 2014), impromptu, cooperative, and innovative (Looi et al., 2016; Sung, Chang, & Liu, 2016). Learning with mobile technology is also more portable and flexible (Johnson, Becker, Estrada, & Freeman, 2014; Rashid-Doubell, Mohamed, Elmusharaf, & O'Neill, 2016; Sher et al., 2015).

Learning with mobile devices is most often referred to as *mobile-learning*. However, the terms, *mLearning, one-to-one learning,* and *handheld learning* are also used. A comprehensive definition of mobile learning remains elusive (Berking, Haag, Archibald, & Birtwhistle, 2012; Chen, Hsu, & Doong, 2016; El-Hussein & Cronje, 2010). This is because mobile learning involves many situations and conditions (Fulantelli, Taibi & Arrigo, 2015; Tseloudi & Arnedillo-Sánchez, 2016). These situations include learning sites with mobility affordance tools (Kukulska-Hulme, 2010; Manches, Phillips, Crook, Chowcat, & Sharples, 2010) outside of the traditional classroom (Compton, 2016; Torrisi-Steele, 2008). Mobile learning combines various locations, social and content interactions, using personal electronic devices (Crompton, 2013).

Mobile technology devices include wearables, smartphones, tablets, personal digital assistants, eBooks, and notebooks (Scobel et al., 2014). They also include leading-edge business delivery modes such as robots (Eguchi, 2015), unmanned aerial vehicles, i.e. drones (Huggard & McGoldrick, 2016; Morris, 2015) and flybots (Morris, 2015). In educational settings, the

majority of mobile technology devices include Apple iPads, Android tablets, Android smartphones, iPhone smartphones, ebooks, and wearables.

The most used mobile device is the smartphone. In 2012, the number of cell phone units surpassed the world's population (Scobel et al., 2014; Statista, 2016). From home, business, and public networks, 89% of US adults access news and information via their mobile devices (Knightfoundation, 2016). In the 9 years since its market debut, the smartphone epitomizes ubiquitous, "enchanted object" status described by Rose in his book of the same name (Rose, 2014). Forecasts of global cell phone users through 2016 exceed two billion and approach three billion users by 2019 (eMarketer, 2016; Pramis, 2013).

In 1916, Dewey wrote, "the method of teaching is the method of an art, of action intelligently directed by ends" (p. 200). Over 100 years since Dewey's statement, mobile technology is an emerging equivalent of those "ends". The emergence of cloud computing technology has further enhanced the demand for mobile learning applications. Mobile learning supports "multiple entry points and learning pathways" (So, 2009, p. 217). Mobile technology changes the landscape of online instruction. It facilitates sequenced learning beginning with teacher-centered instruction and proceeding to learner-*centered* learning and culminating in learner-*driven* learning (Bevan, Gutwill, Petrich, & Wilkinson, 2015; Duckworth, 1972; Tseloudi & Arnedillo-Sánchez, 2016).

Mobile technology includes a myriad of applications (apps) to carry messages. Mobile apps are the "secret sauce" (Scoble et al., 2014, p. 16) that connects the technology of devices with the pedagogy of learning. Because of customization and flexibility, students prefer mobile technology (Liu, 2007; Scobel et al., 2014). University students prefer online courses accessible with mobile tech via Smartphones (Korucu & Usta, 2016; Liu, 2017; Sher et al., 2015). As they progress to full-time employment, students rely on their facility with mobile technology. A 2016

employment study found fully 89% use technology, especially downloaded apps for continuing education and scaled up productivity (Overton & Dixon, 2016).

The goal of telecommunications remains as a conveyance of technology between people. Previously, telecommunication effectiveness meant improving the technological tool itself. For example, a faster modem meant better communication and therefore a better experience. The means by which "the effectiveness and impact of person-to-person telecommunications" (Short, William, & Christie, 1976, p. vi), is re-imagined in the mobile arena. Embodying Negroponte's assertion, mobile devices are abundant and ubiquitous. They have enormous potential to facilitate ever-present access to learning materials, and to enable authentic, personalized instruction for learners (Martin & Ertzberger, 2013) with an emphasis on contexts and higher-order critical thinking (Scobel et al., 2014). Today, a faster network connection and an expansive data plan are desirable, but learning requires more than geeky tools and "gee-whiz" gadgets. The arrival of mobile technology necessitates new, ubiquitous Web 2.0 platforms, new instructional messaging methods (Kent, Laslo, & Rafaeli, 2016), and expanding repositories of open educational resources (OERs).

Additionally, mobile technology and online education render some instructional methods and educational technology unnecessary or obsolete. This cycle of new entrants and exits in the innovative of mobile technology echoes Schumpeter's (1943) premise of transformative "creative destruction" (p. 81). Transforming the process of learning online with mobile technology demands disruptive solutions (Christensen, 2013). Educational institutions customize and re-engineer their learning management systems and content delivery platforms to reach the app-driven, smartphone student culture. Educational agencies garner funding to develop and maintain mobile infrastructure and applications for learning (Marcus-Quinn & Cleary, 2016; Stuart & Triola, 2015).

Post-secondary faculty are often required to provide the full array of instruction, design, delivery, and administration of online content. Further, they are expected to stay current with the latest mobile technology options and apps. Within online education and mobile education, there is a lack of data on the technological, pedagogical, content knowledge and learning design methods used by online instructors in continuing education. How to collect and codify the skills needed to teach online requires new models and new approaches for educational, professional development. Research to determine to what extent continuing education online instructors use TPaCK and make design decisions in their courses would add to the current body of literature. As technology devices became smaller and faster, the mediating effects in teaching and learning became an important research focus (Gunawardena, 1995; Richardson, Swan, Lowenthal, & Ice, 2016). Instructors with the greatest personal satisfaction and positive student reviews accept technology and are adept at utilizing technology as a medium for instruction (Allen et al., 2016; Gunawardena, 1995; Richardson et al., 2016; Rose, 2012; Song & Yuan, 2015).

Discussions on the future trends and impact of online learning increasingly include the affordance of mobile technology. Mobile Learning has implications for online, as well as classroom, course design and delivery (Marcus-Quinn & Cleary, 2016; Winters & West, 2013). How to define and codify the skills needed to teach online requires new models and new approaches for educational, professional development. Within online and mobile education there is a lack of published research on the technological, pedagogical, content knowledge and learning design methods used by course instructors in higher education (Marcus-Quinn & Cleary, 2016; Salifu, 2014).

Improved educational technology use by professors in post-secondary education continues to be a priority for technology-mediated instruction (Allen et al., 2016; Marcus-Quinn & Cleary, 2016). However, teachers in post-secondary education are reluctant to embrace online

education or include mobile technology (Hamilton, 2016; Lucas, 2015). They see online courses as an increase in their workload (Bainbridge, Melitski, & Zahradnik, 2015); inferior to traditional courses (Lucas, 2015); and associated with for-profit colleges who are not accredited (Lucas, 2015; Natale, Libertella, & Doran, 2015). Some faculty simply resist changing their teaching practices (Lucas, 2015; Sheninger, 2014).

Need for Research

The growth of mobile technology continues to impact online instruction. A research-based, integrative approach to the practice of teaching with mobile technology that is less tool specific and more clearly defined and systematic is needed (Marcus-Quinn & Clearey, 2016; Shuler, Winters & West, 2013). As the number of online courses increases (Brenton, 2015), there is a need to provide professional development models and methods for online course instructors. Online instruction and mobile technology have changed the design needs of online teachers. Online continuing education faculty are often required to provide the full array of instruction, design, delivery, and administration of online content. Further, they are expected to stay current with the latest mobile technology options and applications (apps). The combination of a design-focused technological, pedagogical, and content knowledge skill set is effective for online instructors in higher education and continuing education.

Educational institutions must respond to the growing demand for online courses accessed by mobile technology. Without a strong TPaCK, design, and mobile technology background, online educators will not be able to keep up with the current and future demands for online courses. Professional development that reflects current continuing education instructors' best practices, combined with technological, pedagogical, and content knowledge, instructional design and mobile technology, emerges as a promising approach to prepare all faculty. Because

this study connected online instructors' insights into the ways in which they design lessons for mobile technology integration, it also adds to the relational literature.

Statement of Problem

Expenditures for educational, professional development remain a budgetary necessity. Schools must spend time and money to incorporate mobile learning into their technological infrastructure so the specific return on investment benefits must communicated clearly (Marcus-Quinn & Cleary, 2016). Expenditures are prioritized based on the mutual benefit to instructors and students. However, "there is money available if it can be obtained" (Teague, B. 1965, p. 57). The fourth quarter (Q4) of 2015 reflected $1 billion in investments in technology. This was a 300 percent increase in the Q3 of 2015 investment of $295 million. Although the Q3 spending was the lowest of 2015, Q4 investment still outpaced the $474 million raised in Q2, and $694 million raised in Q1 (Hustad, 2016). The most successful recipients of funding dollars will anticipate and combine innovative trends with research-based methods.

Technology initiatives are often focused on getting mobile devices into the hands of learners absent the training in how to use it to improve learning outcomes is sidelined. It is not an issue of more technology inventory. Indeed, in a 2015 PBS TeacherLine study, (Figure 1), 81% of teachers have access to at least one PC or laptop (PBS TeacherLine, 2015).

Much is expected of the educator who teaches online with digital and mobile technology. As online course options continue to increase, more professors must adopt design features to create and upload their course content. An incentivized, systematic process or standard to present to instructors remains elusive. Curriculum, in the form of content modules or comprehensive online courses, requires new foundations in teaching with technology. Unfortunately, a standardized, theoretical professional development model has not been designed to support online instructors' needs. As a result, the unique needs of online instructors are seldom addressed

in the educational, professional development options offered by their institutions' instructional technology department (Downing & Dement, 2013; Lawless & Pellegrino, 2007; Marcus-Quinn & Cleary, 2016).

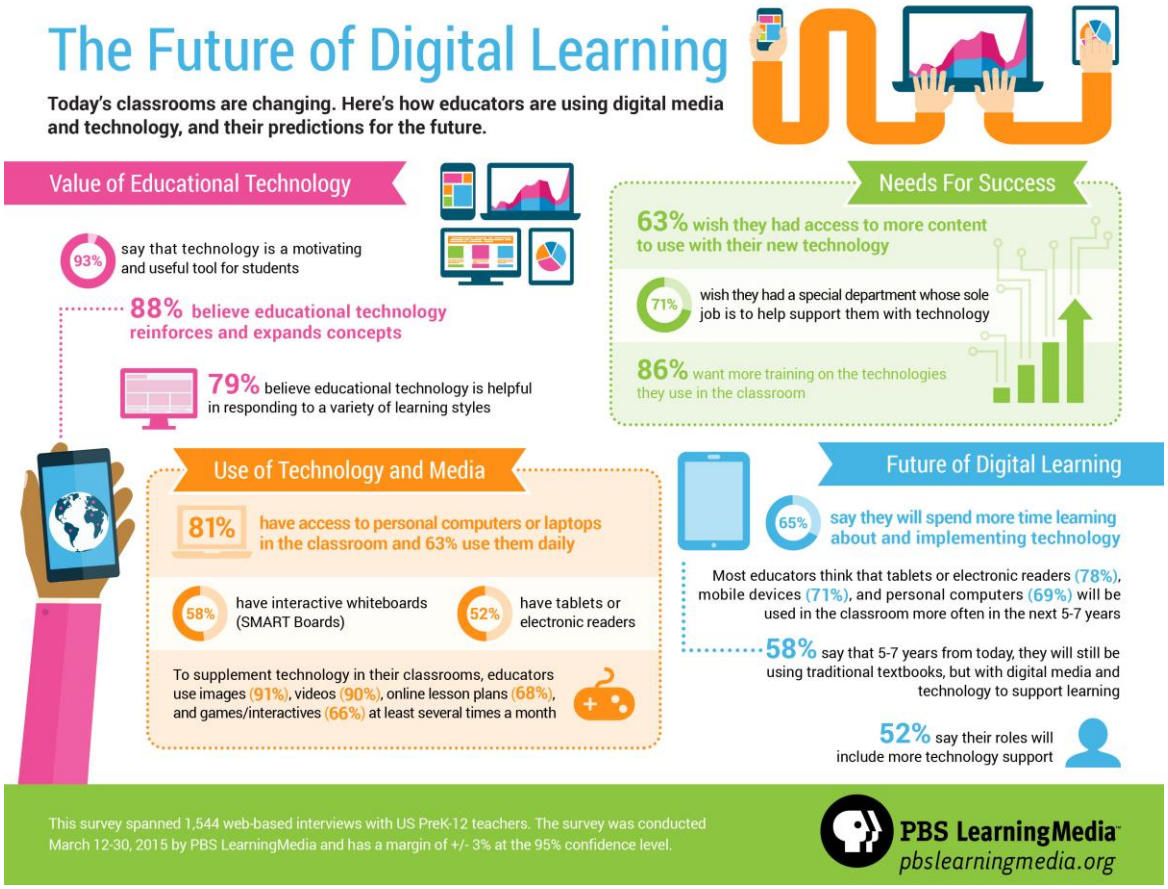

Figure 1: The Future of Digital Learning, Used with permission from PBS Learning Media.

Understanding the instructional practice of continuing education, online teachers will help to create more cost-effective and aligned professional development protocols. It will also offer pertinent clues to incentivize teachers. What remains to be discovered is how teachers in purely online course environments use TPaCK, and mobile technology to maximize their students' learning. Instead of accepting Daniel Willingham's (2016) claim that "It's time to admit we don't know what we're doing when it comes to educational technology," (para. 1), a new combinatory approach of TPaCK, design, and mobile technology offers an answer. To date,

the researcher has been able to find little published research that shows the combined impact of instructors' mobile learning device use, TPaCK, and design in online courses for continuing education.

Statement of Purpose

The increase in mobile technology options in post-secondary, continuing education influences how online instructors design their courses. Much of the current research addresses mobile technology, course design, and technological, pedagogical, and content knowledge (TPaCK; Koehler & Mishra, 2005; Koh, Chai, Hong, & Tsai, 2014; Mishra & Koehler, 2006) as separate topics.

There is limited research addressing the combination of mobile technology, TPaCK, and course design from the course instructors' perspective. The researcher was unable to find any published research that shows any generalized processes that emerge when online teachers reflect on their mobile technology use, TPaCK instructional framework, design decisions in their courses.

The purpose of this mixed methods study addressed online instructors' perceptions of their online course design with new layers of mobile technology and the TPaCK instructional framework. The study proposed three phases. Phase 1 conducted a pilot study and recruited current online course facilitators in adult, continuing education. The online course facilitators were known as facilitators in their instructional role and this term will be used when referring to this group. The Phase 1 pilot study drew on the work of a 2014 research study in Singapore. The study proposed to gather data with the same survey, *A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK)* (Koh et al., 2014). The study proposed a different location and different study participants and gave the survey to current continuing education online course facilitators in the United States. In Phase 2, after minimal modifications from the

pilot study, the 2014 Koh et al. survey was given to current online course facilitators in the United States and responses were gathered. In Phase 3, a qualitative interview designed to understand online instructors' perceptions of their TPaCK integration and course design for mobile technology access was given to randomly selected participants from the survey population.

The dissertation research studied how teachers use mobile technology, the TPaCK framework, and design considerations in their online courses. The research measured the occurrence of these factors among online teachers in a continuing education environment to form a deliverable of methods for dissemination in educational, professional development. The study adds to the current literature in the field of educational technology in three ways. First, this dissertation research provided evidence of the inclusion of mobile technology by online course facilitators. Secondly, the dissertation research provided evidence demonstrating online teachers' perceptions of their TPaCK use in the online courses they facilitate. Third, the dissertation research provided evidence of the instructional design activities of online teachers. The resulting information can be used in future educational professional development initiatives in post-secondary, continuing education, and higher education. This dissertation addressed the combinatory benefits of a new online teaching approach that integrates mobile technology, TPaCK skills, and course design characteristics. It is intended for implementation into online post-secondary, continuing education, and higher education course methodology. One method of implementation will be a cost-effective webinar series delivered in a self-paced format for course instructors. Another method of implementation will be an educational, professional development module deployed at faculty professional development sessions. These are not the only avenues of implementation. There are benefits in the study results for decision makers who are interested in saving time and money in professional development training and who seek ways to increase performance.

Research Questions

The central research question addressed in this study is:

- How do selected online course instructors combine the components of mobile technologies, design, and the TPaCK instructional framework to improve online course content?

The Sub-questions addressed in this study are:

1. How do selected online educators demonstrate technological, pedagogical and content knowledge in their online courses?
2. To what extent do online teachers' design content for mobile technology access?
3. To what extent do online teachers utilize mobile technologies in their online courses?

Significance of the Study

Research offers new insights for teaching and learning. Mishra and Koehler's seminal work on the TPaCK instructional framework attracted more than 2,000 citations on Google scholar in 2014 (Ritzhaupt et al., 2016). Studies since 2014 including the framework number an additional 4,100 citations. Research citations address curricular design decisions of online teachers, and those who utilize mobile technology. However, all these research studies exist in separate silos. Few, if any, studies combine online teaching methods with mobile technology affordances.

Applied research is needed to address the combinatory factors of teachers' use of mobile technology, design practices, and the TPaCK instructional framework. On a macro level, the results of the study provide justification for the allocation of institutional dollars to follow the areas of greatest promise. On a micro level, the results of the study allow the study participants to better prepare for mobile learning which benefits learners enrolled in their online courses. This research offers a new perspective and understanding of the innovative teaching practices that result when online teachers combine TPaCK domains, design, and mobile technology. It is possible that the

results of this study can be operationalized for multiple applications in continuing education, higher education, and K-12 institutions.

The results of the study offer cost-effective options for planning and implementing online learning options mediated by mobile technology. First, the results of the study support the educational institutions' administration with a cost-effective, research-based professional development option of outcome-based TPaCK and design characteristics to prepare faculty to teach online courses with mobile technology. Secondly, the results of the study may improve faculty performance in creating more learner-centered approaches in the online courses they teach. The learner-centered approach is a combination of TPaCK skills and design principles optimized for online learning with mobile technology. The researcher has not found a similar model that combines these characteristics. The results of the study provide a template of targeted skills in mobile technology, TPaCK, and course design for cost-effective professional development of online faculty beyond the initial site selected for the study.

Operational Definitions

For the purpose of clarity in the study, definitions of terms are assigned as follows:

1. *Content Knowledge* (CK) - "Content knowledge is knowledge about the actual subject matter that is to be learned or taught…knowledge of concepts, theories, ideas, organizational framework, knowledge of evidence and proof, as well as established practices and approaches toward developing such knowledge" (Shulman, 1987, p. 9-13).
2. *Distance Education* – Distance Education is "the electronic delivery of programs or courses" (Zhang & Xu, 2015, p. 14).
3. *Mobile Learning* – Helen Crompton's definitions for mobile learning as "learning across multiple contexts, through social and content interactions, using personal electronic devices" (Crompton, 2013, p. 4) was used.

4. *Mobile Applications (apps)* – Ailie Tang's use of '*app*' as an abbreviation for mobile applications with the definition of mobile applications as "software applications designed to run on smartphones, tablet computers and other personal mobile devices" (Tang, 2016, p. 224) was used.

5. *Online Courses* - The Sloan Consortium's definition of an online course is "a course where 80 percent of more of the content is delivered online (with) typically no face-to-face meetings will be used (Allen et al., 2016, p. 7).

6. *Online Education/Distance Education/ELearning* – Scardamalia's 2002 definition of "an intentional process of teaching learning in which physical space separates facilitators and students… Students and online course facilitators communicate through various media and an education organization exists to design, facilitate, and evaluate the educational process" was used (p.145).

7. *Pedagogical Content Knowledge* (PCK) – Shulman's definition of pedagogical content knowledge as "the most regularly taught topics in one's teaching area, the most useful representation of those ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations…the ways of representing and formulating the subject matter that make it comprehensible to others" was used (1987, p. 9).

8. *Scaffold* – Scaffolds are learning supports that a mentor can provide to help learners achieve beyond their original capacity (Wood, Bruner, & Ross, 1976).

9. *Technology Knowledge* (TK) – Koehler and Mishra's definition of technology knowledge as "understanding information technology broadly enough to apply it productively at work and in their everyday lives, to recognize when information technology can assist or impede the achievement of a goal, and to continually adapt to changes in information technology" was used (2009, p. 64).

10. *Technological Content Knowledge* (TCK) - Koehler and Mishra's definition of technological content knowledge as "an understanding of the manner in which technology and content influence

and constrain one another" (2009, p. 65) was used.

11. *Technological Pedagogical Knowledge* (TPK) - Koehler and Mishra's definition of TPK is "an understanding of how teaching and learning can change when particular technologies are used in particular ways" (2009, p. 65) was used.

12. *Technological Pedagogical and Content Knowledge* (TPACK) – Koehler & Mishra's definition of TPACK as an "emergent form of knowledge that goes beyond all three 'core' components (to) the interactions among content, pedagogy, and technological knowledge" (2009, p. 66) was used.

Assumptions

To reiterate, the dissertation research centered on the perception by selected online, continuing education teachers of their use of mobile technology, the TPaCK instructional framework, design activities, and use of online lesson plan practices. The study was limited to a single, continuing education institution headquartered in Arlington, Virginia. This institution has provided online education courses since 1990. This institution was selected as it has an online faculty who reside across the United States and who are representative of educators who have transitioned from onground, face-to-face classroom to online course design and facilitation.

One of the assumptions of the research was that respondents would volunteer their time to complete the survey and subsequent interview. Also, the researcher expected that respondents would be candid as they completed the survey. Finally, the intention of this research relied on respondents' detailed replies to open-ended interview questions for rich data gathering. Although the main objective of the research was reached, it was anticipated that the researcher would make some choices and boundaries, or delimitations that would also be present.

Delimitation

The study collected data from one organization only: a homogeneous group of online course facilitators in the United States. This group of course facilitators currently participate in an

institutional culture that prioritizes regular professional development in online teaching methods. The faculty receive regular professional development in instructional methods and edTech innovations, although not specifically addressing TPaCK. Consistent professional development infuses the faculty within an experiential learning (Dewey, 1938) and socially mediated culture (Lave & Wenger, 1991; Riel & Polin, 2004) that places an importance on the need for online learning. While this was not a limitation for the quality of teaching that the faculty provided to learners, it probably skewed research results toward more positive responses than would be found among a combination of onground and online faculty. The researcher has been a member of the instructional faculty of the proposed target population since 2005.

Chapter Summary

The research study addressed how online, mobile learning can be optimized by combining mobile technology best practices with the TPaCK instructional framework and lesson design considerations in a new eLearning blueprint for learner-centered instruction. This research points to new, cost-effective protocols for professional practice. The researcher has not found any empirical studies that address the combined inclusion of the TPaCK instructional framework, design, and mobile use protocols to online instruction in either global or domestic settings. This study sought to deductively and inductively research the processes by which continuing education faculty manage their online environment and construct student-centered learning experiences with mobile technology. There is a validated survey that quantitatively examines teachers' perceptions of the relationship between design activities and TPaCK usage (Koh et al., 2014). The survey had been administered to teachers in a K-12 face-to-face setting in Singapore. This chapter concludes by proposing a disruptive innovation for improvement: use a combination of methods to measure the usage of the TPaCK instructional framework, design abilities, and mobile technology use among online, continuing education faculty.

Chapter 2: Background and Related Literature

Overview

Presented in this chapter is a summary of empirical research from peer-reviewed scholarly sources in academic literature and a review of the current literature regarding the best mix of socio-cultural theory and instructional frameworks for teachers' professional development and continuing education. Professional development has many definitions depending on the context. Developing or improving competence is central to professional development endeavors (Rudenko et al., 2016). Bernard (2009) described professional development as "opportunities for professional growth as a basis for increasing teacher knowledge and changing current teaching practice in order to increase student achievement" (p. 11). In previous economies, it was possible for people to have a finite ending point to their educational pursuits with professional development that "enhanced job related skills" (Boyarko, 2009, p. 11).

Understanding online learning, mobile technology, the TPaCK instructional framework, and design characteristics are foundational for teachers' in continuing education. Continuing education is a bridge between classroom learning and authentic employment practice (Rasi & Poikeia, 2016; Ross-Gordon, Rose, & Kasworm, 2016). Traditionally, continuing education functioned on the periphery of the educational continuum (Ross-Gordon et al., 2016; Scull, Thorup, & Howell, 2016). In 1991, Paulo Freire advocated for the institution of "Permanent Education" as an agile approach for teachers' professional development (Saul & Saul, 2016). Freire's Permanent Education involves five principles. First, the teacher's own practice is central. Secondly, the teacher's reflection on daily practice is necessary. Third, teaching practice is recursive and requires systems to nurture it. Fourth, teachers continue to build their pedagogical practice through "curriculum reorientation" (p. 64) while in the classroom. In the fifth principle in

Freire's Permanent Education approach, teacher education contributes to and enhances the teacher's campus community.

Freire's Permanent Education started with teaching practice as a starting point. It then uncovered the "fragments of theory…involved in the practice of each teacher" (Saul & Saul, 2016, p. 63). The mediating factor in Freire's Permanent Education are socio-cultural "education groups" and "teacher collectives" (Saul & Saul, 2016, p. 64). The purpose of these groups was to analyze and discuss teaching practices in a recursive cycle of action-reflection-action (Saul & Saul, 2016). According to Freire (Saul & Saul, 2016), while in education groups, teachers experience best practices that they could return to their schools and initiate on their campuses.

This chapter presents current, empirical research on socio-cultural learning theories, design characteristics (Koh et al., 2014), and the TPaCK instructional framework (Koehler & Mishra, 2009; Mishra & Koehler, 2006). In the following sections in this chapter, specific literature about the TPaCK instructional framework within the worldview of socio-cultural learning are reviewed. Additionally, this chapter references research in socio-cultural theory and empirical research on effective lesson design components. Online course instructors need to implement socio-cultural learning theories and instructional design components in their courses. This chapter discusses the implications of the current research for professional development in continuing education.

The researcher made every effort to represent seminal works in the field. Also included are recent, empirical studies in the application of these theories from books and peer-reviewed journals. Research in the area of online learning with mobile technology in higher education and teachers' continuing education is presented in this chapter.

Some of the studies in this chapter represent research combining aspects of both post-secondary and K-12 education. When studies reference learning ecosystems that are completely online or blended, these distinctions are noted. Because of the dynamic nature of online learning and online instruction, both empirical research from peer-reviewed journals and additional literature sources such as websites were used. Distinctions between these sources are noted.

This chapter also references both the seminal works of the PCK instructional framework by Lee Shulman (1987) and the TPaCK instructional framework by Punya Mishra and Matt Koehler. The researchers alternate the listing of their names in their research studies so some source notation will reference Mishra & Koehler and Koehler & Mishra, respectively. This chapter references both quantitative and qualitative research studies of the perception of teachers in post higher education, continuing education and K-12 education as they use the TPaCK instructional framework.

Literature that pertains to a general overview of the principles of instructional design is included in this chapter. A distinction is made between teachers serving as designers of content as a secondary aspect of their vocation versus as full-time work. Scholarly literature sources include books and articles in peer-reviewed journals.

Title Searches, Articles, Research Documents, and Journals Researched

Research databases including EBSCO, EDLIB, ERIC, ILLIAD, and ProQuest were accessed through the Pepperdine University online library, the Abilene Christian University Library, the library at the College of William and Mary, and Google Scholar to provide a range of scholarly sources. Resources included those found through snowball searching to find similar references. Search terms included: (a) TPaCK, alone and in combination with online learning, higher education, continuing education, and K-12, theoretical framework; (b) online learning, alone and in combination with higher education, continuing education, and, K-12, instructional

strategies, United States, and statistics. Titles and sources that were unavailable through inter-library loan were acquired. The researcher accessed materials from respected online learning organizations, reports from the U.S. Department of Education (2010), and internal documents from PBS TeacherLine.

Conceptual Framework / Theoretical Focus

The socio-cultural learning theories used in this study are constructivism and constructionism woven throughout online instructors' design and lesson plan practices. Constructivism facilitates peer-to-peer knowledge sharing network is online teachers' use of scaffolding, reflection, iterative processes in their online course design.

An instructional framework, socio-cultural learning, and design in online courses mediated by mobile technology form the conceptual framework and theoretical focus of this chapter. The proposed study's instructional framework is the technological content and pedagogical knowledge (TPaCK) by Michigan State researchers Punya Mishra and Matthew Koehler as an extension of Lee Shulman's (1987) seminal research on teachers' knowledge of pedagogy and content knowledge (PCK) by adding the affordance of technology. TPaCK originally was constructed for use in post-secondary education and both Shulman's PCK and Mishra & Koehler's TPaCK analyze the interrelated components that promote effective teaching practices.

Technological Pedagogical Content Knowledge

TPaCK is the collective acronym for the combination of technological, pedagogical, and content knowledge that teachers blend to provide student-centered instruction (Koehler & Mishra, 2005a; Koehler & Mishra, 2005b; Koh et al., 2014; Mishra & Koehler, 2006). Mishra and Koehler (2006) extended extend Shulman's (1987) seminal work connecting pedagogy and content knowledge. Shulman's research (1987) integrated both content knowledge and pedagogical knowledge to more fully represent and support the complexity of effective teaching.

Shulman's research established that high-quality teachers use two domains, content knowledge, and pedagogical knowledge to promote meaningful learning. Content Knowledge (CK) is curricular subject matter knowledge and Pedagogical Content Knowledge (PCK) is how to teach content.

Previously these concepts were considered separate, but Shulman emphasized the blending of content knowledge (CK) and pedagogical knowledge (PK). Shulman combined the two constructs in the acronym of PCK. Shulman described PCK as the "understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction" (1987, p. 8). Knowledge of the pedagogy inherent in the teaching process is represented as PK (Shulman, 1987). Perhaps the most straightforward of the framework's components is content knowledge (CK). When combined, pedagogy and content knowledge (PCK) is reflected in teachers' instructional decisions. As teachers group content, standards, and key facts together, they consider the best sequencing for curriculum pacing. They also think about how and when to present curriculum in ways that meet students' learning needs (Shulman, 1987). Finally, they consider best practices for re-teaching content that is not mastered by students.

Examples of pedagogical content knowledge include project-based learning, the pacing of instruction, curriculum compacting, assessment strategies, and the process of differentiating content for the abilities and interests of all learners. For example, in College Prep Math, one component of a teacher's Content Knowledge (CK) would be knowing how to multiply matrices. The PK would include knowing how to explain this knowledge to a student by using conversational language and applying the correct mathematical symbols and phrases in a step-by-step progression. Teachers' pedagogical techniques include an understanding of what makes mathematical concepts easy or difficult to learn for students. Shulman asserted that effective

instructors have a unique and specialized pedagogy and content knowledge (PCK) that sets them apart and is unique and highly qualified (Mishra & Koehler, 2009).

Using Shulman's work as a foundation, a framework was developed to address the addition of teachers' technological skill (Koehler & Mishra, 2005a; Koehler & Mishra, 2005b; Mishra & Koehler, 2006) and fused the additional component of technology to Shulman's pedagogy and content knowledge (PCK). The TPaCK instructional framework extended Shulman's theory of pedagogical content knowledge (PCK) with a specific affordance for effective teaching with technological knowledge (TK) and technological content knowledge (TCK) and technological pedagogical knowledge (TPK) (Koehler & Mishra, 2005a; Koehler & Mishra, 2005b; Mishra & Koehler, 2006). The resulting TPaCK instructional framework connected technological, pedagogical, and content knowledge in seven categories of instructional practices (Koehler & Mishra, 2005a; Koehler & Mishra, 2005b; Koh et al., 2014; Koh, Chai, Wong, & Hong, 2015; Mishra & Koehler, 2006). The seven categories of TPaCK are: Technological Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPaCK).

The TPaCK model highlights interactions between and among the PCK, TCK (technological content knowledge), and TPK (technological pedagogical knowledge) components. Context is the connecting component. TPaCK provides a context for the dynamic and fluid nature caused by frequent updates of technology and content presentation. The attribute categories of Technology, Pedagogy, and Content Knowledge are not "mutually exclusive" (Mishra & Koehler, 2006, p. 1042). Context is the connector. TPaCK is "grounded in the context of practice" (Mishra & Koehler, 2006, p. 100). In the most effective instructional

environments, both online and face-to-face courses, the TPaCK attributes are interconnected (Mishra & Koehler, 2006). The intersecting boundaries of these three domains forms the interplay of TPaCK (Figure 2).

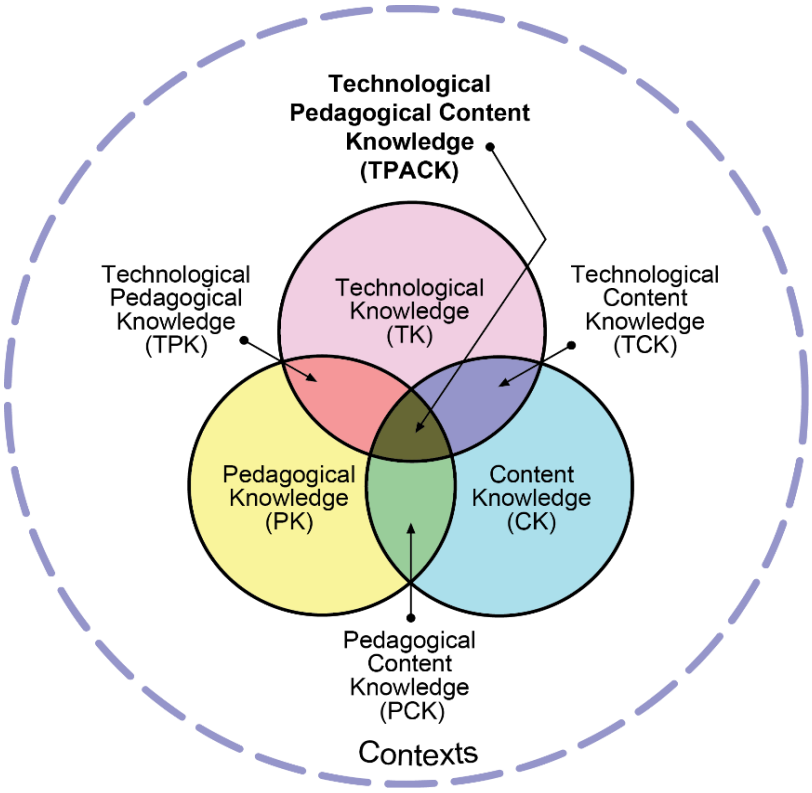

Figure 2: The components of the TPaCK framework. Reproduced by permission of publisher, http:// tpack.org

TPaCK corrals the special kinds of knowledge needed to organize instruction (Koehler & Mishra, 2005; Koehler & Mishra, 2005b; Mishra & Koehler, 2009). TPaCK reflects seven types of knowledge demonstrated by instructors as they adroitly integrate technology into pedagogy and content curriculum (Koehler, Greenhalgh, Rosenberg & Keenan, 2017). Technological Knowledge (TK) is an extensive understanding of technology tools and resources. With technological knowledge, all the hardware gadgets are repurposed as beneficial classroom learning catalysts. Each technology tool has "affordances and constraints, potentials and problems" (Mishra & Koehler, 2009, p. 15).

Online instructor/facilitators with emerging Technological Knowledge (TK) know how to navigate through a catalog of tools or an online inventory of hardware. Yet, that is not the complete picture. Technological Knowledge (TK) is knowing which tools to configure in the best infrastructure. Technological Knowledge (TK) is understanding cross-platform applications and capabilities. Online instructor/facilitators with growing TK skills also know when and how to work with the information technology (IT) specialist and how to describe inevitable technology issues. They use a "systematic approach" (Hilton, 2016, p. 68) to increase and maintain the technical competence needed to stay up-to-date for students. One of the best advantages of TK is its capacity to know which tools to use to create a personal connection with more learners than with traditional face-to-face classrooms communication. This is especially significant in online courses. Online course instructor/facilitators achieve personal connection with learners through voice-to-text apps, short video for check-in, individualized emails, and personalized discussion board posts.

In the technological, content knowledge (TCK) domain is the knowledge about how course content needs to be delivered using technology (Koehler & Mishra, 2009; Mishra & Koehler, 2006). Technological content knowledge (TCK) represents the mutual relationship between emerging technology and teaching subject-matter content. For example, in teaching geometry, a foundational technology was the overhead projector with rolling transparency film to teach theorems. TCK understanding would now include whiteboards, document cameras, and teacher and student created videos, and video capture tools to teach theorem concepts. TCK is "discipline specific" (Spires, Wiebe, Young, Hollebrands & Lee, 2012), matching the most appropriate and cost-effective technology tools to teach curricular concept mastery. Thinking about TCK and its application with various new media and technology tools might shape conversations about future institutional use.

Technological pedagogical knowledge (TPK) refers to the understanding of how teaching and learning can change when technology is used in particular ways (Koehler & Mishra, 2009). Technological pedagogical knowledge (TPK) refers to the teacher's ability to know how to use technology for instructional purposes. TPK primarily entails both a familiarity of hardware, software and how they can be used in teaching and learning. TPK also includes teachers' understanding of how their instruction might change as a result of using a specific technology.

Teachers must consider not only how to teach curricular concepts to students but also how to provide instruction in the technology being used. Examples of TPK include when to use an online or social media resource, how to create a formative or summative online quiz, and how to effectively reply to a learner's email, or when cross-platform facility is needed between the Windows and Mac operating systems and among different web navigational browsers. Yet this knowledge alone is insufficient without deep subject matter knowledge.

TPaCK reflects the pedagogical changes in content delivery from just-in-case learning to just-in-time learning (Duderstadt, 1997; Koh & Divaharan, 2011). The U.S. Department of Education uses the TPaCK skill set as an assessment option in its *Race to the Top* grants program (Department of Education, 2010). The collective cluster of skills in instructor's lesson plans may be identified and assessed in concrete rubrics (Koehler et al., 2017). However, TPaCK is not confined as a rubric assessment tool. It is "an understanding that emerges from interactions among content, pedagogy, and technology knowledge… underlying truly meaningful and deeply skilled teaching with technology" (Koehler, Mishra & Cain, 2013, p. 66). A slightly modified rendering of the TPaCK acronym with a lowercase letter "a" reflected more precisely the connecting and inclusionary focus of the word "and" (Keenwe & Agumba, 2015; Lin, Chai, Si & Lee, 2014) and is often expressed in research published after 2014.

Examples of content knowledge needed for online courses reflect dates, facts, vocabulary, and concepts combined with technology tools and mobile apps. Merely uploading scanned copies of content notes or an instructor's published research robs the learner of the social media conveyance of the current Web 2.0. It negates the pedagogy knowledge of online course content delivery and without considering this aspect, learning online will be stunted.

Knowing how to deliver content using optimal methods for knowledge transfer to course participants is the pedagogical goal of TPaCK. Using TPaCK skills in an online course reflects content knowledge but also knowing where this information resides online, how it is sequenced and how much is delivered at one time. Successful technological content knowledge involves "sequencing and chunking of materials" (Song & Yuan, 2015, p. 732) in ways that invite discussion and limit cognitive overload.

In an example of putting all the TPaCK components together, an online teacher must know the pedagogy (technology/pedagogy knowledge) of combining shorten subject matter content bursts and abbreviated hyperlinks (technology/content) for the best rendering on a mobile device screen. S/he must know how to craft a concise and engaging discussion prompt or reply to a learners' discussion forum post (pedagogy/technology/content/) and when to comment to add depth to an online class discussion board or real-time synchronous discussion (technology/pedagogy/content). TPaCK is a necessary framework to measure online teaching and learning because it captures what teachers currently do to increase student engagement (Koehler & Mishra, 2009; Mishra & Koehler, 2006).

Successful teaching and learning online occurs through the instructor's combinatory use of the TPaCK instructional framework (Koehler & Mishra, 2009; Mishra & Koehler, 2006). The TPaCK instructional framework applies the theoretical concepts of constructivism and constructionism in online course design mediated with mobile technology. One example

combining TPaCK with constructivist and constructionist learning theories would be online discourse between instructor and learners on the design and eventual production of an avatar-infused video. The avatar-video becomes not only a way to connect content components but also a way to think, discussion and create a learning artifact Reflecting about the video presentation, expression, concise language script, and digital storytelling components vaults the video to a "rich artifact" (Koehler et al., 2017, p. 40). Learning online and with mobile technology is enhanced by course content that is multimodal in its constructionist design and promotes constructivist "in-situ improvisation and …sharing and creation of student artefacts [sic] on the move" (So, 2009, p. 217).

The application of TPaCK for online education continues to grow (Archambault, 2016; Archambault & Barnett, 2010). As a conceptual model to measure the interplay between instructional components in learning, TPaCK has been the focus of many empirical research studies. TPaCK studies occur in K-12, face-to-face settings (Gomez, 2015; Jen, Yeh, Hsu, Wu, & Chen, 2016; Koh et al., 2014), higher education (Archambault, 2016; Archambault, & Barnett, 2010; Archambault & Crippen, 2009), and blended learning environments (Watson & Murin, 2014; Watson, Murin, Vashaw, Gemin, & Rapp, 2013). These studies indicate that TPaCK is a valid strategy to measure the knowledge instructors need to facilitate learning with technological components. However, these studies did not give the fullest picture of how instructors used TPaCK in their lesson plan practices and lesson design practices (Dobozy & Campbell, 2015; Koh et al., 2014). The methods used by instructors would create blueprints of practice for others.

Kozma (1994) suggested that educators should stop debating the issue of whether technology and media influence learning. Kozma argued that educators should instead begin to think about "In what ways can we use the capabilities of media to influence learning for particular students, tasks, and situations?" (p. 18). Adding the technology layer to Shulman's

PCK offers one way to answer Kozma's question. TPaCK combines and interconnects all the separate components of technology, pedagogy, and content knowledge (Koehler & Mishra, 2009; Mishra & Koehler, 2006). The convergence of the TPaCK domains mirror the relational and interrelated aspects of Bloom's Revised Cognitive and Affective Taxonomies (Koh, Chai & Tsai, 2010). Context is important within the TPaCK domains. Dissecting each component of the TPaCK reveals its ineffectiveness as a stand-alone instructional delivery means. The domains need their combined synergy. Examples of TPaCK applied to online education require relational interplay between not only content itself, but how contest is presented, discussed and applied in an online environment accessed with mobile technology.

Since its inception in 2006, over 300 TPaCK studies have included assessments for measuring its combined skill sets (Abbitt, 2011; Archambault & Barnett, 2010; Archambault & Crippen, 2009; Koh et al., 2014; Schmidt et al., 2009). The assessments featured in these studies reflect features of self-reporting and performance-based activities to measure teachers' use of the seven domain skills. Research to determine new understandings of the perceptions of instructors in completely online course environments and how they use TPaCK and design for online and mobile technology would add to the current body of literature.

Addressing specific questions referencing TPaCK, design dispositions, and lesson plan practices, a research team led by Dr. Joyce Hwee Ling Koh (2014) compiled, distributed, and statistically validated a Likert-scale survey for 201 Singaporean teachers. The survey addressed perceptions of TPaCK, the teachers' design dispositions, and lesson plan practices with six questions each for TPaCK, Design Dispositions, and Lesson Planning Practices.

Of particular interest was the inclusion of design dispositions in the survey instrument. The research team defined "design dispositions" as "orientations towards design" (Koh et al., 2014, p. 1). The research team included design dispositions because they believed that these two

constructs are necessary partnering agents for teachers' implementation of TPaCK. Design dispositions reveal how teachers utilize and "manoeuver [sic] their TPaCK throughout lesson design as well as the outcomes of their lesson design efforts" (Koh et al., 2014, p. 3). The 2014 Koh et al. research team labeled design dispositions with six criteria: "open to new experiences, exploration of conflicting ideas, comfortable with uncertainty, deviating from established practice, experiencing occasional failures, and seeking to turn constraints into opportunities" (Koh et al., 2014, p. 7).

Socio-cultural Learning: Constructivism in Online Courses

Online course instructors in continuing education build on the premise that learning precedes skill development (Vygotsky, 1978). Constructivist learning is context-based. Constructivist, conceptual learning occurs through active involvement of the student as a "learner, co-instructor, peer evaluator, a producer of knowledge, a consumer of knowledge, an evaluator, and a self-assessor" (Bull & Patterson, 2016, p. 257). The learner maintains personal autonomy and control over learning. Learning is personal growth (Bull & Patterson, 2016).

In constructivist learning mediated by technology, curriculum takes precedence over the infusion of technology (Bull & Patterson, 2016). Technology does not drive the curriculum, in fact, "the ultimate technical goal is to make the technology transparent to the user" (Berge, 2008, p. 410). Learning is "an information processing activity" (Bandura, 1986, p. 51) that involves "reciprocal interactions among behaviors, environmental variables, and personal factors such as cognition." Digital learning must provide a variety of delivery experiences to provide a rich learning experience and resources available to all learning anytime and anywhere.

Online course content design reflects socio-cultural constructivist cycle. A socio-cultural constructivist cycle is present when online instructors recursively design and compose supplemental course content and beta-test that content, share it, tinker with it and refine it, and

share it again. In this recursive cycle, the constructivist educator "must adopt the role of facilitator not content provider" (Vygotsky, 1978, p. 447). Online course instructors take on the role identity of a More Knowledgeable Other navigating a Zone of Proximal Development (Vygotsky, 1978).

With the implementation of specialized instructional practices for an online course environment, online instructors and course participants take on the role of More Knowledgeable Other role (Vygotsky, 1978). The comingling of online course instructor and online learner, each participating as More Knowledgeable Others results in the emergence of a peer-to-peer, knowledge sharing network.

An online course facilitator could create a video, podcast, interactive poll, avatar persona in Minecraft, or another teaching artifact. However, this activity alone does not rise to the constructivist benchmark. It is not creating a product that embodies constructivist learning. Learning occurs as part of an interrelated, iterative process (Dunn & Larson, 1990). This process requires peer-to-peer discussion, instructor feedback, and both the instructor and learners' "knowledge of past experience," according to Freire (as cited in Saul & Saul, 2016, p. 63).

The dynamic nature of mobile technology reflects a need for frequent adaptive thinking. Each upload of course content occurs in a *fail-fast* environment. For example, an online instructor discusses content with peer instructors and then customizes an online discussion post in a content management system (CMS). Beyond the posting mechanics, instructors discuss with other instructors how to convey an engaging tone, how to time the post for learners' best response, and when to supply a nudge to move the discussion forward. Iterative discussion time is essential because, on average, implementation requires 20 separate instances of practice with the number of repetitions increasing along with the complexity of the skill taught (Joyce & Showers, 2002).

Constructivist discussions occur when course instructors discuss their understanding of course content, how they accomplish an assigned task, and discuss forum threads to include learners' posts. In the process of translating content for online courses, teachers think about what they create, tinker, design, and revising their ideas into course content modules. They acquire knowledge and increase their skill level. Reimagining content for online course delivery, observing the effectiveness of the design, reflecting, and peer discussions are manifestations of constructivism in online environments.

Intentional and experiential learning and an atmosphere encouraging trial-and-error are alternatively affirming and confusing. Confusion is part of the iterative cycle, and it is a building block of learning (D'Mello, Lehman, Pekrun & Graesser, 2014). However, too much tension, confusion, and cognitive overload in an online course can be detrimental. This may be a factor in the low-completion rate of MOOCs (Belanger & Thornton, 2013; Daniel, 2012; Jacobsen, 2017).

Socio-cultural Learning: Constructivist Peer-to-Peer Learning in Online Courses

Although *Do-It-Yourself* (DIY) is a culturally popular term, online educators can design course activities that reflect a peer-networking spirit of *Do-With-Each-Other* (Dyer, Gregersen, & Christensen, 2009). Peer-to-peer relationships guide knowledge co-creation and pedagogical concept knowledge (Shulman, 1987). Peer networking activities that foster socio-cultural learning include engaging in collaborative tasks, peer review, offering and receiving assistance, giving feedback, challenging others' contributions, and exchanging information (McLoughlin & Luca, 2000). For example, the online educator and course participants bring a set of content knowledge and problem-solving and solution-finding pedagogy that benefits others. Learners are open to articulating their experience (Dean, Harden-Thew, & Thomas, 2017; Malone, 2014).

Online course instructors/facilitators/designers nurture a supportive peer network and sociocultural learning through course content that reflects the intersection of technological,

pedagogical, and content knowledge (TPaCK). Further, online course instructors/facilitators/ designers can acknowledge and plan for mobile tech access. Students go "in and out" of their interaction with technology (Sølvberg & Rismark, 2012), and design instructional modules to accommodate this type of access. There are many ways to achieve this goal, but some examples of planning for mobile tech access include the use of graphics optimized for mobile viewing, short podcasts of content, QR-coded content pages, and shortened URLs of content.

For example, online facilitators leverage constructivist, peer-network attributes by designing a writing sample assignment with a peer editing forum submission space. Course learners upload their completed writing assignments and download a peer learners' submission. As they receive comments from peers, revise, and rewrite, course learners increase their ability to become Vygotsky's (1978) More Knowledgeable Other for each other. Their growing peer-to-peer relationship structure increases agility, enhances innovation (Ito, 2012), and demolishes silos of isolation. Curriculum content is internalized and enculturated for deep learning (Ritchhart, 2015). Peer-to-peer collegial conversations online produce evocative learning experiences (Day & Leithwood, 2007; Guskey & Passaro, 1994).

Online educators also interchange with the role of student and inhabit a "teachers as learners" role (Shulman & Sherin, 2004, p. 1). PBS TeacherLine uses the term *Learner* to refer to course participants and this term will be used in the remainder of this dissertation.

By immersing themselves in the technological, pedagogical, and content knowledge in the design and construction of online course content, course facilitators return to the role of learners. They re-learn their course content through the lens of how to present it in the most effective way for their students to integrate. Occupying the shared online learning course portal, all are learners connecting with online content and each other. They co-intentionally recreate and direct their learning (Freire, 1996).

Walther (1992) addressed the social aspect of technology in comparison studies of face-to-face and computer conferencing groups. Technology was a means to communicate but the message it carried through it was important. As technology became smaller and faster, its mediating effects in teaching and learning became an important research focus (Allen et al., 2016; Gunawardena, 1995; Richardson et al., 2016; Song & Yuan, 2015). Instructors must become "adept at utilizing technology as a medium for instruction in face-to-face settings" (Gunawardena,1995, p. 165). Doing so will increase their satisfaction with technology and by extension, in online course facilitation (Gunawardena, 1995).

Instructor presence in online environments emerged as an important indicator of student learning (Arbaugh, 2008; Boston et al., 2009; Richardson et al., 2016; Swan et al., 2008; Wang & Antonenko, 2017). Instructor presence, along with Cognitive presence and Social presence, forms the components in Communities of Inquiry (Arbaugh, 2008; Boston et al., 2009; Richardson et al., 2016; Riel & Polin, 2004; Swan et. al., 2008).

The instructor's presence involves more than choosing the type of technology (Chen, Lattuca, & Hamilton, 2008; Wang & Antonenko, 2017). The instructor's online course design and implementation of a variety of activities are predictors of student success in learning (Neumann & Neumann, 2016; Swan et al., 2012). In online courses, talking is typing. Talking things over occurs in synchronous chats and asynchronous discussion forums, threaded discussions (Collison, Elbaum, Haavind, & Tinker, 2000), and text-messaging (DuVall, Powell, Hodge, & Ellis, 2007). Interactions can include games (Chen, 2012) and simulations (Teague, Pruett, & Wee, 2016). Interactions also include digital storytelling (Lowenthal & Dunlap, 2010; Teague & Pruett, 2016) and digital music sharing and composition (Dunlap & Lowenthal, 2014). Further, these activities include student and teacher-created videos (Hamilton et al., 2015), social media (Dunlap & Lowenthal, 2014), and VoiceThread (Borup, West, & Graham, 2012).

Socio-cultural Scaffolding

In this dissertation, the term scaffolding (Pea, 2004; Wood at al., 1976) is used to describe the support affordances provided for autonomous online learners. Online course instructors and learners align with Rogers' Adopter Classification System (2010) which specifies stages of innovation infiltration. These stages are Knowledge, Persuasion, Decision, Implementation, and Confirmation. Participants also can be categorized according to Rogers' roles of Innovators, Early Adopters, Early Majority, Late Majority, and Laggards (2010). Online course participants may also have varying levels of online technology and mobile technology experience. Online course instructors typically have a mix of participants comprised from Rogers' five classifications of adopters (2010). Course participants can simultaneously be at differing levels on Rogers' Adopter Classification System for technology, pedagogy, and content knowledge.

Online course instructors can decrease learners' confusion by providing scaffolds such as Landscape Posts, discussed previously and quick responses by instructors (Teague et al., 2016). Another effective scaffold is to design content for learner mobility and viewing on different mobile devices (Wang et al., 2010). Additional scaffolds used by online course instructors are trouble shooting Help tutorials, Frequently Asked Questions (FAQs) for various technological operations. These operations can be as basic as how to upload a photo through and along a continuum of how to record and embed a video response within the course forums. Help tutorials may reside in a separate course Help Forum or online video channel such as YouTube. Scaffolds may take many forms: Tutorials videos or completion steps in Help Forums, Frequently Asked Questions (FAQs), and online office hours where the online instructor is available for real-time conversation. The scaffolding of tutorial and FAQ support is valuable to ease cognitive overload and possible "rage-quitting" (to borrow a gamer term).

In both onground and online courses, social learning precedes development (Vygotsky, 1978). While interacting with online course content, learners' experience their version of the Zone of Proximal Development, which is the space between what they can do alone and what they can do with coaching, guidance, and/or assistance from a More Knowledgeable Other (Vygotsky, 1978). Attempting to solve complex problems without the provision of support linkages can be an unproductive exercise in failure. In an online course, More Knowledgeable Others provide successful navigation through the Zone of Proximal Development. One way they do this is through the creation of engaging prompts and landscape posts in online discussion forums.

Landscape Posts are a constructivist instructional affordance promoted by Collison et al. (2000). Landscape posts are constructivist summaries that reflect many voices in the online course and "clarify and give a sense of direction and place learners at the center of a dialog" (Collison et al., 2000, p. 186). Landscape posts encourage online course learners to think more deeply about content topics and extend the application of course concepts and continue the online discussion. These landscape posts are clarifying summaries that point learners toward new content application and analysis (Collison et al., 2000). Online course instructors at PBS TeacherLine write weekly Landscape Posts. Landscape posts include course learners' previous discussion forum responses to forward the online dialogue (Collison et al., 2000). Typically, a landscape post will feature three to four course learners' insights. Online course instructors weave direct quotes from learners' insights into the landscape post narrative (Figure 4). Each learner sees how the collective information from course colleagues can be used in their class, and by sharing through the rich discussion, others can sense how implementation of the concepts can also occur in their classes as well as in other subject areas. Often this leads to suggestions on further study.

Online course instructors craft landscape posts in online courses to strengthen social presence and community cohesion (Riel & Polin, 2004) among learners. Online discussions tend to be self-reflective (Means et al., 2010). Landscape posts are a constructivist teaching method that expands online course participants' views beyond themselves and their own posts. Landscape posts are a component of the online instructor training at PBS TeacherLine, the site of the research.

Landscape posts are one instructional method for online course instructors to model reflection-in-action (Schon, 1983). Another way to encourage course dialogue is through instructors' use of engaging discussion forum prompts. Engaging discussion forum topics encourage reflective thinking, interaction and both reflection-on-action and reflection-in-action among course participants. Online course participants include both instructors and learners. Online course participants serve as tools for collaborative learning (Cook, 2010; Kearney, Schuck, Burden & Aubusson, 2012). Learning alone is bereft of "thought and stream of language" (Bruner, 1990, p. 143). Conversely, interacting in the online discussion forum helps to decipher meaning (Dunn & Larson, 1990).

Language is a social tool that is crucial to social interaction (Vygotsky, 1978). The online course discussion forum, whether asynchronous or synchronous, is a place where everyone shares a desire to construct meaningful dialog, a "web of meaning" (Vygotsky, 1986, p. 100) together and alongside each other. As they participate in online discussion forums, online course participant instructors and learners engage in "iterative dialogue" (Laurillard, 2002b, p. 144). Iterative dialogue must occur between participants. It cannot occur in isolation. Iterative dialogue involves a 2-part discourse of theoretical concepts and practical application from experience (Laurillard, 2002b). Iterative dialogue synergistically connects theoretical, practical, (Laurillard, 2002b) and experiential learning (Dewey, 1938).

Iterative dialogue and the development of thorough concept mastery is integrally tied to the communicative interactions with More Knowledgeable Others who navigate the Zone of Proximal Development between what is unknown and what can be learned (Vygotsky, 1978). At the beginning of the online course, course instructors serves the dual roles of More Knowledgeable Other (Vygotsky, 1978) and System Convener (Wenger, Fenton-O'Creevy, Hutchinson, Kubiak, & Wenger-Trayner, 2015).

Systems conveners are passionate communicators with a persisting, entrepreneurial spirit who establish new insertions of input (interventions) among people from different groups (Wenger et al., 2015). Systems conveners respect existing boundaries in organizations but invite participants to extend beyond them and reach for innovations. They survey different locations in the landscape of groups where an intervention could increase the learning capability of the whole system. System conveners "honor the existing accountability of stakeholders to their contexts, including regimes of competence, the agendas and expectations of organizations involved," (Wenger et al., 2015, p. 102).

Designing for Mobile Technology

Dewey (1938) concluded that people do not learn from experience; rather, people learn from stretching back to reflect on past experiences and stretching forward to incorporate their experience. Dewey's conclusion has application to designing instructional content for online, blended, and mobile learning. Design that encourages constructivist online discourse has been shown to increase learning (Vo, Zhu & Diep, 2017). Design that encourages learners to demonstrate their understanding through constructionist product making enhances their learning (Vo et al., 2017). Using mobile technology as a clicker to complete quizzes approaches neither constructivist nor constructionist principles for learning. Learners may use mobile technology to

formulate more detailed and reflective feedback leading to concept integration (Laurillard, 2012; Vo et al., 2017).

Reflection is also intertwined in design thinking either explicitly (Laurillard, 2012; Resnick, 2007) or implicitly through beta-testing and troubleshooting (Papert, 1980). Instructors and learners in online courses mirror the actions of the Reflective Practitioner (Schon, 1983). Reflection has also been cited as essential to the technological and content knowledge instructional practice (Koehler & Mishra, 2009; Mishra & Koehler, 2006). Schon (1983) identified two forms of reflection that are needed for deep learning: reflection-in-action and reflection-on-action. Although Schon's work addressed professional situations, it also applies to educational situations because learners reflect on their learning progress in online forums and make application to their personal practice in the world beyond the virtual course portal.

Reflection-in-action occurs during the online course. Examples of reflection-in-action in online courses are self-assessment checks for factual understanding, course participants' assessment of their growing facility with technology, and reflections of the refinement or change in teaching and learning practices. Reflection-in-action is fundamental, but it must be combined with teachers' attention to identifying learners' growing scholarship, cogent insights, and collaborative action (Blackburn, Robinson, & Kacal, 2015). More research is needed on the effects of reflection-in-action and ways that teachers in online course environment prompt learners to engage in reflection-in-action (Blackburn et al., 2015).

Reflection-on-action refers to culminating or summative evaluation at the end of an online course. Reflection-on-action includes not only an evaluation of course mechanics such as technology connectivity but also on the potential attainment of learning goals and expectations. Metacognitive reflection occurs through many avenues, but especially in online course discussion forums. Educators are "minds-on" and engaged with their ideas (Duckworth, 1972,

2009). Intertwined with each navigated obstacle is an invitation to reflect metacognitively. Reflection is essential to connecting pedagogical theory (Shulman, 1987) and design thinking. Course participants practice the dual tasks of reflection-in-action and reflection-on-action by thinking about what they create, tinker, design, and revising their ideas into course content modules. In the process of translating content for online courses, course participants, both instructor and learner, acquire new knowledge and increase their own skill level. Reflection is essential to mitigating revision (Benkler, 2006), understanding practice (Kreber & Cranton, 2000). When other learners reflect and then comment, ask questions, and offer additional perspectives in discussion forums, learning is transformed into a 'commons-based peer-production' (Benkler, 2006). The reflective peer production cements deep learning.

Specific socio-cultural constructionist competencies transform design thinking from an abstract concept to a design thinking skill set for an online teacher. Keywords in the design process are Collect, Design, Build, and Troubleshoot (Buechley & Qui, 2013). Barr, Harrison, & Conery (2011) quantified design thinking in five parts: prototype product construction, prototype beta-test, beta-test results analysis, debugging of problems, and design refinement. Imagination is an important factor in design thinking. Resnick (2007) gave double emphasis to Imagination in his six-step design process: Imagine, Create, Play, Share, Reflect, and Imagine.

Laurillard (2000a, 2012) asserts that teaching for design thinking is process-oriented and iterative, or able to be applied repeatedly. Laurillard's iterative cycle of design thinking in instruction concentrates on circular cycles of design, redesign, and reflective practice. Constructionism also advocated design thinking as its primary, pedagogical focus (Kafai, 2006). The redesign aspect of design thinking echo's Constructionism's key distinguishing component of tweaking and tinkering (Papert, 1980), which is the adaptive thinking requirement of design.

Design thinking mediates online course construction and course facilitation through iteration, repeated testing, and cyclical processing (Koh et al., 2014; Laurillard, 2000a, 2012; Plattner, Meinel, & Leifer, 2010; Resnick, 2007). It shares features of rapid prototyping (Brown, 2014) through tinkering (Papert, 1980) and fail-fast application.

The technological pedagogical content knowledge (TPaCK) survey *A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK)* (Koh et al., 2014) with design dispositions and lesson plan practices questions emphasizes constructivist principles of discovery learning and solving authentic problems in collaborative constructs. Teachers embody socio-constructivist practices through Freire's action-reflection-action cycle from Freire's Permanent Teacher Education (Saul & Saul, 2016). The Permanent Teacher Education benchmark of action-reflection-action occurs when teachers think about what they create, tinker, design, and revise their ideas into course content modules. In the process of translating content for online courses, teachers acquire knowledge and increase their own skill level. Their professional growth returns with them to their classrooms, both onsite and online and this is a richer experience than just learning where to point and click (Polin & Moe, 2015).

Online course design involves the ways that content is presented to course participants (Wang, Xiao, Callaghan, & Novak, 2010). Online course facilitators often receive course curriculum materials from an institutional Learning and Development department or team. Examples of course management systems include Moodle, Coursera, Blackboard, Canvas, Web-CT (Mitropoulou & Nickmans, 2007; Vovides & Sanchez-Alonso, 2007). The curriculum content materials are bundled as a full course in a Content Management System. A curriculum guide may or may not be included in the course transfer. The Content Management System functions synonymously as the textbook and curriculum guide for face-to-face classroom

teachers, but it does not provide needed curriculum pacing and scaffolding needed for learner-centered instruction (Vovides et al., 2007). This is because 70% of Learning and Design professionals are not proactive in understanding how individuals in their organizations learn (Overton & Dixon, 2016). Moreover, 29% of learners find online content uninspiring (Overton & Dixon, 2016).

To meet the needs of their students, faculty must engage online course participants and use design-thinking principles to craft customized learner-centered and learner-directed instruction and customized instructional message design (Lohr, 2011; Wang & Shen, 2012). Instructional message design involves "the manipulation and planning of signs and symbols that can be produced for the purpose of modifying the cognitive, affective, or psychomotor behavior" of people (Wang & Shen, 2012). Online course instructors know their online course participants. By prompting course participants for reflection, prototyping, and combining and recombining concepts, online teachers embody a spiral design process (Bruner, 1990). Ideally, design thinking intertwines with an online course facilitators' need to utilize technology, pedagogical, and content knowledge to provide Just-in-Time resources and pedagogical support for students (Novak, Patterson, Gavrin & Christian, 1999). Just-in-Time teaching and resource involves taking static content and reimagining it online as an engaging, personalized scaffold. Polin & Moe (2015) refer to this type of teaching as "improvising for instruction" (p. 18). Hyperlinked call-outs, Help Tutorials, and Landscape Posts are examples of online, customized scaffolds.

Shared Elements of the Three Fields

Effective teaching requires complex layering of intentions, instructional approaches skills, techniques, and. As noted in the previous section, designing learning for student engagement is central to the choice and deployment of technology in the best practices of

teachers. Therefore, a deeper examination of activities common to both fields of study will be useful in understanding how to prepare and strengthen faculty to meet students' needs.

Technology mediates student engagement. Pedagogical applications for using technology in student instruction continues into its fourth decade. Technology is an essential consideration that influences both the skills needed by educators and the lesson delivery options to students. "Though not all teachers have embraced these new technologies for a range of reasons-including fear of change and lack of time and support- the fact that these technologies are here to stay cannot be doubted" (Mishra & Koehler, 2006, p. 1023).

Technological pedagogical and content knowledge (TPaCK) addresses the larger, interdisciplinary affordance of technology on instruction and learning. Instructors should know a variety of tools that engaged students. However, they often piggy-back off their own engagement with technology tools when choosing the appropriate technology for students (Muir et al., 2016). Both teachers and students need to have a wide-variety of technology tools and strategies at their disposal. Teachers' knowledge of how to interweave digital, multimedia, and web technologies in their planning can open provide innovative avenues for student engagement and participation. The result of teachers' planning for multimodality can lead to more autonomous experiences for students. It echoes Dewey's (1927) idea of an "associative and continually changing collective experiences, in support of critical and active learning" (Lee, 2008, p. 140).

TPaCK highlights the complex nature of effective teaching with technology. Lesson design that incorporates the multimodality of technology, is one channel through which teachers embody the intertwined components of TPaCK (Koehler, Mishra, & Yahya, 2007). Teachers in face-to-face classrooms and online course arenas draw on design decisions to best position curriculum content for student engagement. However, a "dominant theory" (Kimbell, 2011, p. 18) to categorize design features has not clearly emerged.

Summary of Core Findings from Relevant Studies

Dynamic student engagement emphasizes constructivist principles of sociocultural learning in collaborative constructs and constructionist principles of creating new learning products in an unfolding dialogue with others. Mobile learning has increased student engagement and students' learning autonomy (Sheninger, 2014). Students use mobile technology in meaningful knowledge co-creation. Marc Prensky's (2001) prediction about student learning is certainly true today, "students are no longer the people our educational system was designed to teach" (p. 1). Since they are not the students that instructors were designed to teach, instructors must learn to design their teaching to meet students' needs.

Learners in online courses have a facility in using and familiarity with mobile technology. There is little research however, that records how online course facilitators can design lessons to optimize student engagement with mobile technology. In fact, some educators see online courses and mobile technology as threats to their instruction (Lucas, 2015; Sheninger, 2014). Some of the threats perceived by faculty are fear of change, lack of time, lack of support, silo-based mentality, and lack of collaboration (Korucu & Usta, 2016; Lucas, 2015; Sheninger, 2014; Swist & Kuswara, 2016). Ineffective professional development opportunities are another reason for reason that faculty do not adapt to online courses and mobile technology. Those instructors who are inquisitive and open-minded regarding new approaches with technology often find that faculty training options for integrating digital and mobile technology fall behind their demand (Wyatt, Dopson, Keyzerman, & Daugherty, 2014).

Many surveys that assess teachers' perceptions of TPaCK relate to teachers' knowledge of technology, content subject areas and related pedagogies but the teacher's design processes have been underrepresented (Koh et al., 2014). The Koh, et al., (2014) TPaCK survey, *A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their*

relationships with technological pedagogical content knowledge (TPACK) includes a section to measure what the research team labeled the *design dispositions* of teachers. The 2014 Koh et al. survey addressed the void in the current literature of the TPaCK framework combined with design choices. The 2014 Koh et al. research team found that the Singaporean teachers' perceptions of design dispositions (orientations towards design) and lesson design practices (approaches used for lesson design) enhanced TPaCK in the face-to-face classroom. Koh et al. (2014) recommended further studies to continue verification that design dispositions and lesson design practices have directly impacted teachers' perceptions of the TPaCK instructional framework.

The technological pedagogical content knowledge (TPaCK) survey from the Koh et al. (2014) study pairs teachers' use of the TPaCK coupled with design decisions. Teaching with educational technology and the designing learning activities are complementary activities since both contain iterative cycles (Laurillard, 2002a, 2012) and reflective practice (Schon, 1983). Combining TPaCK and design decision characteristics will make a difference in instructors' professional development because these characteristics can be combined and taught as a skill set. This skill set may also obliterate teachers' resistance to utilizing online and mobile technology affordances because it will first focus on the successful actions that prompt student engagement.

Socio-cultural learning principles in Vygotsky's social-constructivism and the TPaCK instructional framework are also transferable for employees in other fields. Applying socio-cultural learning principles benefits continuing online education initiatives featuring mobile technology that are prevalent in healthcare, banking, and sales.

How Current Research Differs From Previous Studies

TPaCK is the acronym for the collective framework that a teacher should have regarding the use of technological, pedagogical and content knowledge (Koehler & Mishra, 2009; Mishra

& Koehler, 2006). However, the TPaCK framework does not specifically address teachers' design activities nor the inclusion of mobile technology. There is an absence of studies examining how instructors design for the affordances of their students' mobile technology and implement their own technological, pedagogical, and content knowledge. TPaCK is a robust subject of research (Ritzhaupt, Huggins-Manley, Ruggles, & Wilson, 2016), but these studies omit the combination of instructors' design activities and mobile technology affordances. The Koh et al., (2014) research team addressed the combined frameworks of TPaCK and design but did not address mobile technology affordances or query online instructors.

The primary new knowledge contributed by this study is new checklist for teachers in online continuing education to self-assess their technological, pedagogical, and content knowledge (TPaCK), their instructional design activities, and their use of mobile technology. Most studies focus on each component individually but not a cohesive group. The study answers what next steps in instruction regarding TPaCK inclusion, particularly mobile technology are needed, where learners are conceptually, how they should proceed, and when the TPaCK skills are enacted (Grandgenett, 2008). The study adds new, combinatory research to the small amount existing literature in post-secondary continuing education, on the integration of TPaCK framework with design considerations and add the affordance of mobile technology. Currently, there are many studies of each component individually among varying grade classifications, but none that the researcher can find that address all three in the area for instructors in post-secondary, continuing education.

Mobile devices will continue their supremacy and therefore the need for multimedia online course content. More research is needed on instructional content message design for mobile learning (Wang et al., 2010). The study adds a new, cost-effective approach for educational professional development in the online continuing education arena, combining the

TPaCK theoretical framework, acknowledging the design decisions that course facilitators routinely make for technology in general and mobile technology specifically. A succinct, yet comprehensive skill set from the research in this study is a cost-effective way to provide educational, professional development in the post-secondary arena, where such opportunities for professional development usually do not occur. Combining these separate domains would leverage the pedagogical considerations preferred by course facilitators with the popularity of students' use of mobile technology and result in greater performance and stronger morale for course facilitators who see the acknowledgement of their efforts.

Chapter Summary

This chapter addressed teaching practices in online continuing education courses with mobile technology affordances. The socio-cultural theories of Constructionism and Social Constructivism, and the TPaCK instructional framework are foundational for instructors in online courses with mobile technology.

Online learning with mobile technology fits appropriately within the sphere of the socio-cultural learning theory (Koh, Chai, & Tsai, 2014). Constructivist collaboration occurs through scaffolded learner-directed discussion posts, peer-review, peer-discussion, instructor feedback, and improved professional practice. Design by course instructors for effective online learning trajectories include peer-to-peer interaction, iterative practice, and authentic learning.

Chapter 3: Research Methodology

This chapter describes the mixed methods research methodology to assess how online course instructors combine mobile technology, design principles, and the TPaCK instructional framework in their online course content. A mixed method research methodology was chosen to accurately describe quantitatively and qualitatively the skill set used by the online course facilitators. This study sought to contribute to the growing body of research and interest in measuring the integration of essential skills for continuing education faculty who teach courses online. The skill set that emerged from the research illustrated how online course facilitators in continuing education used the TPaCK instructional framework in their course facilitation. The skill set that emerged also illustrated how online course facilitators made design decisions for supplemental course content and configured content for mobile technology use.

The methods presented in this chapter include the restatement of research questions, research design, data collection, subject selection and recruitment, pilot study, and human subjects' considerations.

Restatement of Research Questions

The central research question addressed in this study is:

- How do selected online course instructors combine the components of mobile technologies, design, and the TPaCK instructional framework to improve online course content?

The Sub-questions addressed in this study are:

1. How do selected online educators demonstrate technological, pedagogical and content knowledge in their online courses?
2. To what extent do online teachers' design content for mobile technology access?
3. To what extent do online teachers utilize mobile technologies in their online courses?

Rationale and Assumptions for Mixed Methods Research Design

This study utilized a mixed methods research design to collect, analyze, and combine both quantitative and qualitative research data (Creswell & Plano, 2013). A sequential quantitative and qualitative data collection (Gay & Airasian, 1996) with equally weighted results was chosen as the most appropriate means to explore selected online educators' use of the TPaCK instructional framework and the choices they make for supplemental course content design, and mobile technology considerations. Quantitative data from the Koh et al, (2014) survey and qualitative interview data were collected, and analyzed by the researcher in keeping with Creswell's principles (2014). The results of the research are reported in Chapter 4.

Researcher's Role

Dewey concluded that it was necessary for teachers to have a "profound and accurate acquaintance with the subject in hand" (1916, p. 165). The researcher-as-practitioner benefits from confidence, open-mindedness, unity of purpose, and intellectual thoroughness (Dewey, 1916). Some researchers (Glaser & Strauss, 1999) view the role of the researcher as dualistic, positivist, or separate from the research process. However, recent researchers have taken the stance that the researcher's role is integral and interactive (Carter & Little, 2007). Further, they posit that the researcher is often a stakeholder in the object under study specifically and the field of practice in general (Darlaston-Jones, 2007).

The researcher's occupational choices reflect learner engagement, educational technology, community organizing, and innovative solutions to institutional issues. The researcher's longest work experience has been 25 years in education in California and Texas. Leveraging student interest and engagement with online learning, the researcher's students were in the first in Texas to produce, post, and maintain vocational ePorfolios online. For eight years, the researcher was an educational technology, professional development presenter for Classroom

Connect in El Segundo, California. In this role, she facilitated professional development experiences emphasizing inquiry and learning alongside teachers in 42 states. After working in hospital administration for four years, the researcher returned to education as a Program Manager of a Gerontological research center at a private university in Abilene, Texas. The researcher also served as a Research Assistant at Pepperdine University. Since 2005, the researcher has served on the online faculty of PBS TeacherLine, headquartered in Alexandria, Virginia. The common themes of learner engagement, innovative educational technology, and collegial interactions are included in the work history and in her researcher role.

Site and Subject Selection

The study collected data from online course facilitators in a continuing education and professional development environment. The site selection for the proposed study is the online portal known as PBS TeacherLine. Since 1990, PBS TeacherLine delivers online graduate and continuing education courses for adult learners. PBS TeacherLine offers more than 80 graduate level instructor-facilitated online courses for educators. PBS TeacherLine has a growing library of self-paced courses. A network of 45 PBS stations across the United States and several countries worldwide distribute the online course content. Online courses span the curriculum areas of Reading/Language Arts, Mathematics, Instructional Technology, Instructional Strategies, Science, and Social Studies/History. Although PBS TeacherLine's physical location is in Arlington, Virginia, all work by the course facilitators is accomplished in asynchronous online courses.

Typically, educational, professional development workshops or program are less than 14 hours and often fail to increase student learning or change teaching practices (Gusley & Yoon, 2009; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). PBS TeacherLine online courses typically span a six-week period. Approximately 30-50 hours are needed to complete required

course work. Because of this time investment, there is an opportunity for course facilitators and adult learners to cultivate a peer-to-peer network, unlike the typical professional development workshops or programs of much shorter duration.

Subject participants in this study included members of the teaching faculty of PBS TeacherLine. PBS TeacherLine uses the term *Facilitator* as the naming convention to refer to their online course faculty. As previously stated, the researcher has served as a PBS TeacherLine facilitator since 2005. The term Facilitator is used in the remainder of this narrative. All work by the course facilitators is not place-dependent on a centralized, onground location, rather, all course facilitation and design work is accomplished online.

Employment criteria to facilitate courses for PBS TeacherLine require a multi-faceted selection criteria process. PBS TeacherLine facilitators must attain exemplary status on instructor evaluations in their previous teaching location. They must have an earned Master's Degree from an accredited university. A majority of current course facilitators have earned the Ed.D. or Ph.D. designation. PBS TeacherLine online course facilitators must have 18 university hours in their content teaching field and submit previous employment supervisor recommendation letters in order to facilitate courses. Prospective facilitators must also complete an online facilitation, training program with periodic evaluations after employment.

Current PBS TeacherLine facilitators must participate in required staff development sessions offered four times per calendar year as well as moderated peer-to-peer discussion board sessions. PBS TeacherLine facilitators participate in systematic evaluation by the Course Manager during their course administration. Facilitators must score in the 90th percentile in course participant summative evaluations. There are over 60 active PBS course facilitators.

Data Collection Instruments

Data was collected in a quantitative survey and a qualitative interview. Surveys are reliable measures to assess teachers' integration of TPaCK components (Schmidt et al., 2009). The study administered the quantitative survey instrument *A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK)* (Koh et al., 2014). The Koh research team used the capitalization of all letters in the acronym and this format is used when referencing their survey.

The 2014 Koh et al. study bundled the TPaCK instructional framework with teachers' design dispositions and lesson plan practices in their survey, and it is the only study that the researcher can find with this combination. The Koh research team created a survey instrument was created, implemented, and validated by the research team of Joyce Hwee Ling Koh of Nanyang Technological University, Singapore; Ching Sing Chai, also from Nanyang Technological University; Huang-Yao Hong of Singapore National Chengchi University, Taipei, Taiwan; and Chin-Chung Tsai of the National Taiwan University of Science and Technology, Taipei (2014). This study proposes to deviate from the Koh et al. original participant group and location. Instead of face-to-face classroom teachers in Singapore, this study queried a participant group of online course facilitators in continuing education based in the United States.

The 2014 Koh et al. quantitative survey received clearance issued by the Institutional Review Board by the Nanyang Technological University. Then, the research team validated their survey. Cronbach's alpha was calculated to at least .90 for each value (Koh et al., 2014, p. 5). The researchers in the 2014 Koh et al. study used the structural equation model to analyze their data. Structural equation modeling is a statistical methodology for analyzing, estimating, and testing variables in a network, usually through an illustrated path diagrams (Suhr, 2006).

Structural equation modeling usually requires a theoretical model and variables that can be measured (Suhr, 2006).

The 18-question, psychometrically validated survey contains six questions each to analyze the criteria of technological pedagogical and content knowledge (TPaCK), design dispositions, and lesson plan practices. The survey's six TPaCK items came from the Meaningful Learning survey previously validated (Chai, Koh, & Tsai, 2011) with Singapore teachers. The 2014 Koh et al. survey itself was an extension of Jonassen, Howland, Marra, & Crismond's Meaningful Learning dimensions (2008). Confirmatory factor analysis and reliability analysis established the validity/reliability of the 18-question Likert-scale survey instrument developed and administered by the Koh et al. (2014) research team. The 2014 Koh et al. TPaCK survey measures responses on a 7-point Likert scale. Dr. Joyce Koh gave permission for the use of this survey with the PBS TeacherLine faculty (Appendix C). Dr. Koh expressed interest in viewing the results of the survey administration and resulting interview data.

The 2014 Koh et al., TPaCK survey measures relationships between three variables:

1.) the theoretical factor of TPaCK

2.) the behavioral factors of design dispositions

3.) the lesson planning practices.

All three theoretical frameworks discussed in Chapter Two are included in the research instrument. The survey also includes ordinal scope question and statements relating to design thinking (Appendix B).

The 2014 Koh et al. survey reflects the central research question of this study which is: How do selected online course instructors combine the components of mobile technologies, design, and the TPaCK instructional framework to improve online course content? The 2014 Koh et al. survey reflects the sub-questions of this study which are:

(a) How do selected online educators demonstrate technological, pedagogical, and content knowledge in their online courses? (b) To what extent do online teachers' design content for mobile technology access? (c) To what extent do online teachers utilize mobile technologies in their online courses?

Specifically, the central research question and sub-question #1 is addressed in questions from the 2014 Koh et al., TPaCK survey instrument labeled TPACK1 – 6 which are:

- TPACK1 – I can formulate in-depth discussion topics about the content knowledge and facilitate students' online collaboration with appropriate tools (e.g. Moodle Platform, Google Sites).
- TPACK2 – I can craft real-world problems about the content knowledge and represent them through computers to engage my students.
- TPACK3 – I can structure activities to help students to construct different representations of the content knowledge using appropriate ICT tools (e.g. Graphic Organizers, Surveys).
- TPACK4 – I can create self-directed learning activities for the content knowledge with appropriate ICT tools (e.g. Blog, Webquest).
- TPACK5 – I can design inquiry activities to guide students to make sense of the content knowledge with appropriate ICT tools (e.g. simulations, web-based materials).
- TPACK6 – I can design lessons that appropriately integrate content, technology and pedagogy for student-centered learning.

Research subquestion #2 of this study are addressed in the 2014 Koh et al. survey questions labeled LDP1-6 and DD1- DD6 which are:

- LDP1: When designing a technology-enhanced lesson, I start by considering a few lesson ideas.

- LDP2: When designing a technology-enhanced lesson, I consider several lesson ideas to see if they adequately address learners' needs before choosing one idea.
- LDP3: When designing a technology-enhanced lesson, I allow conflicting lesson ideas to coexist until I feel that I have adequately understood the learning problems.
- LDP4: When designing a technology-enhanced lesson, I continually refine my lesson ideas as I develop new understandings throughout the design process.
- LDP5: When designing a technology-enhanced lesson, I consider the consequences of adopting particular lesson ideas before working out details.
- LDP6: When designing a technology-enhanced lesson, I am prepared to completely change my lesson ideas if needed.
- DD1 – I am comfortable with the presence of uncertainty.
- DD2 – I am open to new experiences.
- DD3 – I am comfortable to explore conflicting ideas.
- DD4 – I am comfortable to deviate from established practices.

  DD5 – I am comfortable with occasional failures from trying out new approaches for course modules.
- DD6 – I am constantly seeking to turn constraints into opportunities

Although questions labeled TPACK6, DD1, and DD2 were removed from analysis by the Koh research team in the original 2014 Koh et al. survey administration, this study included them. This is because the questions correspond to the socio-constructionist theoretical principle of tinkering and tolerance of uncertainty. Interview data gathered from PBS TeacherLine course facilitators informed sub-questions #3.

Initially, the 2014 Koh et al. survey instrument's administration occurred among secondary ICT teachers. The study implemented two deviations for data collection from the

2014 Koh et al. survey administration. First, the survey was administered to a group of American educators. Secondly, the educators are online course facilitators from PBS TeacherLine, a national, online professional development, continuing education institution. This deviated from the 2014 Koh et al. study which was administered to 201 information and communications technology (ICT) teachers in Singapore who teach in face-to-face classroom settings.

Likert scales feature declarative statements and ask participants to agree or disagree with them on an incremental scale (Gray, 2010). One weakness of Likert scales is that participants tend to self-report at unreliable levels. Likert-scale surveys are primarily used to measure preferences and attitudes (Gray). Additional methods are needed for a complete assessment and balance, and this will occur through an interview of subjects in Phase 3.

Data collection in this dissertation added twelve qualitative, semi-structured interviews to learn more about online, continuing education teachers' perception of their TPaCK and supplemental course design use and if this use extends to mobile technology tool utilization in their courses. This deviates from the 2014 Koh et al. study which collected data solely from the survey and did not collect data from qualitative interviews.

Validity of Survey Instrument: Phase 1 – Pilot Study

The research procedures of the study followed a systemic inquiry through a three-phase approach. In Phase 1, the researcher completed a pilot study. The pilot study was a preliminary test to validate the dependability, content validity, and reveal any areas of improvement of the survey questions (Creswell, 2014) prior to the administration with the participant pool. The researcher randomly chose the data of September 8, 2016 for the pilot study.

Immediately before the pilot study, the researcher keyed the survey questions from the 2014 Koh et al. survey, along with introductory and concluding communication pieces into the Qualtrics Online Survey Software Platform. As a means of procedural scaffolding, (Huang, Wu

& Chen, 2012), the researcher created a QR-code and personalized survey URL for ease of access and mobile accessibility (Ferguson, Mentzelopoulos, Protopsaltis, & Economou, 2015). QR-code stand for Quick-Response Code (Lee, Lee, & Kwon, 2011). These are extensions of bar-code technology and can be read by specialized software on mobile phones and computers (Shin, Jung & Chang, 2012). QR-codes increase the ease of survey access and interactivity with scans taking an average of 8 seconds versus 24 and 82.5 seconds each for typing short and weblinks (Lo, Coleman & Theiss, 2013). QR-codes do not inhibit the reflection skill needed for survey completion and they may encourage participation and reflection (Chen, Teng & Lee, 2011; Fuegen, 2012; Lo et al., 2013).

A subset of seven people, which was 10% of the researcher's intended survey pool, were chosen for a pilot study. While a survey pilot was proposed with the current PBS Learning Media Project Manager, the Facilitation Manager, and three previous PBS TeacherLine Course Facilitation Coordinators, a slight variation occurred in the pilot study. The pilot study was conducted with the current PBS Learning Media Project Manager and six participants. Participants reflected various locations in the United States. Participants resided in Virginia, Louisiana, Texas, and California. The six pilot study participants were online education professionals with experience as online course facilitators who also had course content design experience or as continuing education online course students who also had course content instructional design experience.

Pilot study beta-testers received an anonymous survey link for the quantitative survey, *A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK)* (Koh et al., 2014). The pilot test participants were asked to complete the survey and evaluate the survey question

language, the way Qualtrics rendered the survey questions through various browsers and operating systems, the accuracy of the survey link, and the QR-code.

Specifically, the pilot study participants were given seven tasks. First, they beta-tested the operability of the survey link and the QR-Code on Firefox, Safari, Chrome, and Internet Explorer internet browsers and mobile phone models. Second, they scrutinized the survey instructions for readability and understanding. Thirdly, they scrutinized the survey questions for clarity. Fourth, they scrutinized the survey question language for cultural, regional, gender, or racial bias. Fifth, they assessed if the question prompt was thorough enough for adequate answers from respondents. Sixth, they assessed the relevance of the question to what was being measured. Finally, the beta testers recorded the length of time they needed to complete the survey. The pilot test survey administration was collected in a separate section in the Qualtrics survey platform. The pilot study participants sent their responses to the seven tasks to the researcher by email. The beta- testers' recommendations were collected in a Google Document. All information gathered from the pilot study was reviewed and considered. The researcher worked with the Dissertation Chair to correct typographical errors and modifications of question wording. Only three minor modifications were made to the 2014 Koh et al. survey questions with the approval of the Dissertation Chair

First, the digital examples in questions TPACK 3, TPACK 4, and TPACK 5 were adjusted to more closely reflect online course activities. In the second modification, the letters for the acronym "ICT" used in the original 2014 Koh et al. wording were deleted from TPaCK-related questions #1-6 and LDP-related questions 7-12 since ICT is not an acronym of the PBS TeacherLine course nomenclature and it was not known whether the survey participants would be familiar with the acronym. Third, the word "students" was replaced with the word "learners" to reflect PBS TeacherLine nomenclature. The 2014 Koh et al. survey questions and the

readability report of the survey language, as rendered after the pilot study, are found in Appendix E and F, respectively.

Phase 2 – Administer Survey and Gather Survey Responses

In Phase 2, the researcher administered the survey and gathered the responses. Data collection began following the pilot test on September 12, 2016 and was completed on October 30, 2016. Initially, the researcher proposed to request access to the current PBS TeacherLine email database in order to reach the study's maximum effectiveness standards (Gray, 2010). In an advantageous research development, the PBS TeacherLine project manager sent an email to the 67-member facilitator database of current and on-hiatus facilitators. The project manager's aegis asked for interested facilitators' participation. Further, it requested that potential study participants email the researcher at her Pepperdine email address. The researcher then sent informed consent information in separate reply emails to the interested online course facilitators (Abstract B). The emails offered an invitation to participate in the study with a list of the proposed research objectives. The emails concluded with an invitation requesting facilitators to indicate their willingness to participate in the 2014 Koh et al. quantitative survey and potential follow-up interview through a reply to the informed consent email. As a second contact outreach, the researcher posted a global request to the facilitators' collective discussion forum. All PBS TeacherLine course facilitators are auto-subscribed to this forum.

The researcher downloaded the data collected from the survey at Qualtrics to an Excel spreadsheet file. At this point, the data was checked and organized to correlate to the research questions. The researcher checked the dataset for minimum and maximum values. For example, values less than one and greater than seven would indicate a possible data entry error. Results of the U.S. online teachers' survey and the 2014 Koh et al. survey were compared.

3-Part Data Collection: Phase 3 – Qualitative Interviews

For Phase 3, the researcher systematically gathered information in qualitative interviews of participants randomly selected from the initial respondents. Qualitative interviews explore narratives of richer expression (Rallis & Rossman, 2012; van den Beemt & Diepstraten, 2016) and allow for "views and opinions from participants" (Creswell, 2014, p. 190). Qualitative interviews expanded the snapshot of data gathered from the 2014 Koh et al. survey. An interview phase was initially proposed to allow the researcher to verify indications from the Koh et al. (2014) survey instrument and boost a richer, fuller narrative from respondents. For this reason, Phase 3 interviews occurred during the latter part of Phase 2.

The interviews supported the findings of the survey results and provided more insight into the specific ways in which online course facilitators integrated the TPaCK instructional framework, design principles, and mobile technology. The interviews revealed useful insights into online facilitators' combinatory processes of TPaCK, design activities, and mobile technology affordances. The interview explained in more detail the specific ways that online instructors designed online learning experiences, the affordance they give to mobile technology, and their perceptions of their own inclusion of the TPaCK instructional framework components.

One advantage of qualitative interviews is the deriving of a "meaning-making system that makes sense out of the chaotic mass of perception and experiences" (Gubrium & Holstein, 1995, p. 33). Interviews also provided time to explore, in greater depth, the online course facilitators' perceptions of their utilization of the TPaCK instructional framework. Interviews also addressed the affordance of mobile technology in the lesson plan practices and design considerations of the online course facilitators. The qualitative interviews with the online course facilitators provided concentrated focus on the research questions. The interviews employed the option of follow-up

questions. The emphasis on research questions and follow-up questions yielded rich descriptions through online course facilitators' illustrative narratives (Holstein & Gubrium, 2004).

Interview Questions

Open-ended interview questions (Richards & Morse, 2013; van den Beemt & Diepstraten, 2016) were used in the interviews since participants prefer to give verbal responses (Gray, 2010) and are inclined to give extensive and richer responses to them (van den Beemt & Diepstraten, 2016). Open-ended interview questions were asked to give more insight into the specific ways in which online course faculty integrate mobile technology, the TPaCK instructional framework, and their design decisions for supplemental course content. Specifically, the interview questions addressed both participants' understanding of their "dimensions of experience" (Richards & Morse, 2013, p. 30) with TPaCK, course component design, and mobile technology inclusion. Interview questions sought the "views and opinions from participants" (Creswell, 2014, p. 190). The researcher followed Creswell's (2014) interview protocol that features seven components. These components are as follows: heading, interviewer instructions for standardization, questions, question probes, area for responses, concluding statement of gratitude, and document log. The researcher conducted the interviews and engaged in reflection-in-action (Schon, 1983). Following the interviews, the researcher wrote a short reflection to record her attitudes and reactions (Doucet & Mauthner, 2008). These reflections charted possible bias or assumptions made by the researcher that may have affected "interpretation of the respondents' words, or how she may later write about the person" (Doucet & Mauthner, 2008, p. 405).

The researcher used interview question probes, when possible during the interview. Interview question probes use participants' answers to extend responses, show interest or ask clarify questions (Creswell, 2014; Dane, 2011; Gray, 2010). Both verbal and non-verbal question

probes were proposed, approved by committee, and used. Verbal probes are classified into three categories: attention probes, conversational management probes, and credibility probes (Rubin & Rubin, 2011). Attention probes encourage the conversational partner to elaborate and speak at length (Rubin & Rubin, 2011). Online interviews pose challenges for the researcher to signal attention or for interviewees to see the researcher taking notes. To address this challenge, overt attention prompts such as "This is great stuff" and "I want to write this down" (Rubin & Rubin, 2011, p. 140) signaled interest and attention. Non-verbal attention probes include question wait-time, leaning forward to show interest, taking notes as the interviewee speaks, and alternately nodding, and looking back to the interviewee after taking notes (Rubin & Rubin, 2011).

Examples of conversational management probes included statements such as "That reminds me, I wanted to ask you about…" (Dane, 2011, p. 231). Another example of a conversational management probe used in the study was "Could you go back to something I missed" (Rubin & Rubin, 2011, p. 141). Credibility probes were used to check for understanding when interviewees referred to dates, people, acronyms, or situations that were unfamiliar to the interviewer (Rubin & Rubin, 2011). Although question probes are supposed to be used cautiously (Rubin & Rubin, 2011), they served a purpose in the resulting interview protocol of the study. In the study, the use of question probes added a personalized component to the conversation. Personalization and conversational affordances were deemed necessary by the researcher, especially since interviews occurred online through the Skype interface.

Procedures for Research Study Validity- Interview

Qualitative validity procedures check and edit the accuracy of the research findings throughout the research process (Creswell, 2014). Qualitative validity occurred through procedures that assessed the semi-structured interview questions for trustworthiness, authenticity, and credibility (Creswell, 2014). Qualitative validation also occurred through

editing for accuracy, interpreting themes and descriptions, coding data, checking all data transcripts, and organizing data for analysis (Creswell, 2014). Qualitative reliability through a pilot study assured interview consistency (Creswell, 2014). A pilot test was completed with two people who represented 17% of the potential interview participant pool. In the pilot test, a validation check occurred with two colleagues who looked at the interview questions a colleague who also checked the dataset and its organization. First, to maintain reliability, the researcher presented the interview question, sub-questions, and question probes to two colleagues from the survey pilot test who were familiar with TPaCK, course design characteristics, online courses, and mobile technology. The colleagues assessed whether there was a match between the interview questions and the intent of interview. Next, a third colleague who has conducted research interviews was asked to examine the proposed interview questions, sub-questions and question probes for leading, confusing language, cultural responsiveness, and gender neutrality.

Proposed Interview Questions

For the preliminary proposal and the pilot test, the researcher initially proposed the following questions to guide the interviews:

1. Do you access the online course you teach with a mobile device? Please elaborate.
2. Please describe the last time you combined mobile technology within your course content. Did anything occur that you did not expect? Please explain.
3. Have you designed any course components to maximize mobile technology? What did you design? For example, have you created a QR-code or shortened a link for students to access content from a mobile device?
4. Clay Shirky (2008) described new media content as "Publish, Then Edit." Have you experienced incidences of "Publish, Then Edit"? Please elaborate.
5. Do you ever use mobile apps in your course? What are the features of the app(s) you use?

6. How have your learners responded when you have added mobile technology/apps in your course?
7. Please reflect on what techniques do you use to integrate technological, pedagogical, and content knowledge in your course.
8. Is there anything else you would like to share?

Since interviews were to be completed online through the Skype platform, the researcher sought to enunciate each question clearly and paused to emphasize the key words in each question. The researcher also continually asked participants if the Skype transmission remained clear. Based on information gathered during the pilot study, the proposed interview questions were modified slightly and two questions checking Skype transmission were added. Two questions regarding acknowledgement and years as a PBS TeacherLine course facilitator were also added.

Modified Interview Questions

1. Thank you for your participation in this interview. How is the Skype transmission? Can you see and hear all right through the Skype interface?
2. Are you aware that we are doing an interview as part of my dissertation research and that you are being recorded?
3. Approximately, how many years have you served as a PBS TeacherLine online course facilitator?
4. The next set of questions address mobile technology: Do you access the online course you teach with a mobile device such as iPhone, iPad, Android phone… (If yes, then "Please elaborate." If no, then go to Question 5.)
5. Have you designed any course components to maximize mobile technology? For example, have you created a QR-code or shortened a link for your learners to access content from a mobile device? (If yes, then "Please elaborate." If no, then go to Question 8.)

6. What did you design?
7. Have you added content and referred to accessing it with mobile technology?
8. Do you ever use mobile apps in your course and, if so, what are the particular features of the app(s) you use?
9. Please describe the last time you combined any type of mobile technology within your course content. Did anything occur that you did not expect? Please explain.
10. How have your learners responded when you added mobile technology/apps in your course?
11. Author Clay Shirky (2008) described new media content as following a "Publish, Then Edit" cycle. Have you experienced incidences of "Publish, Then Edit" in your PBS TeacherLine courses? Please elaborate.
12. Please reflect on what techniques you use to integrate technological, pedagogical, and content knowledge in your course.
13. Is there anything else you would like to share?

After the first interview, the researcher also composed the following introductory script. This script was pasted into the Skype chat box prior to the interview. The researcher read this script, with verb tense changes to reflect real-time administration, at the beginning of the interview:

> Thank you for sharing your time for our interview today, ____(date) at (time and time zone). I will initiate the Skype call to you and we will check our connection and we will have some time to get acquainted before the interview. Your identity will remain confidential and will not be revealed. A pseudonym will be used for identification purposes. I will listen and take notes while you speak. I will also use active listening pauses to give you time to complete your thoughts and so I don't interrupt you. You may notice more formality than familiarity in my tone and this intentional to maintain objectivity and avoid leading. We can take a break at any time that you indicate, should

you need that. If we are disconnected, I will initiate one call back through Skype. If this callback is unsuccessful, I will send an email to you to reschedule. In this way, we won't waste a lot of time with transmission. Looking forward to speaking with you.

Managing and Recording Data

Measures were implemented to maintain security and reliability. Handwritten interview notes were taken as a back-up plan in case of unexpected, technological issues (Creswell, 2014). Pseudonyms were assigned to interviewees and used in the transcription process and in the researcher's notebook. Interviews were recorded as "camrec" files using Camtasia video capture software. All transcript "camrec" files were produced to mp4 files immediately following the interviews while the researcher and the interview participant waited. This procedure was an added check to make sure that recordings were not affected by transmission difficulties or errors by the researcher. The interview files were transferred to a Samsung portable storage device. The researcher's notes from all interviews were included in notebook.

Reliability of data was implemented in three rounds. In Round 1, communication with the participant served as a further check for accuracy and clarity. Using the playback feature of Camtasia, the first interview (G7) was transcribed immediately following the interview and emailed to the participant for review prior to additional interviews. The first interview participant (G7) read the transcript and replied with comments through email. The researcher edited the interview transcript for accuracy and noted the typographical errors found by the participant.

Based on the researcher's review of the transcript, additional examples of the Kindle Fire, and tablet mobile technology devices were added to interview question four. In question eight, based on the review of the G7 transcript, the researcher added an additional example of the facilitators' checking and composing email in their courses for the rest of the interview participants.

Round 2 commenced with the remaining eleven interviews. The researcher listened to the audio recordings of the communication immediately following the interview and made notes to add to the notes taken during the interview. Every effort was made to begin transcription within 1-4 hours of the interview. While transcribing, the researcher added notes relating to her impressions, the ideas repeated by participants, the emerging themes, and connections to literature. After all of the interviews were transcribed, the researcher combined all of the transcripts into one digital file. The researcher read analyzed the combined file to identify commonalities, emerging themes, and nascent conclusions made from the totality of the data.

Because using the playback feature of Camtasia took between 5-7 hours to complete, the researcher transcribed all the remaining interviews into Microsoft Word documents using either TranscriberPro or Scribe digital transcription software. Both of these transcription tools allowed the researcher to use hotkeys to more quickly stop, playback, and restart the interviews. Each of the interviews #2-11 took an average of 3-5 hours to transcribe.

Speech-to-text features were considered and beta-tested by the researcher in interview #6 and #7, but they proved reliable only in regards to the rendering of the researcher's voice and unreliable to the participant's voice. This actually became more time-consuming so the researcher discontinued their use.

Data Analysis Procedures – Interviews

Qualitative coding is the "process by which segments of data are identified as relating to or being an example of a more general idea, instance, theme or category" (Levin & Silver, 2014). Coding addresses what the data reveals and ultimately may point to the need for additional data gathering (Charmaz, 2008). Data analysis methods uncovered useful insights from online course facilitators' use of the data analysis of online teachers' combinatory usage of mobile technology affordances, design decisions, and the TPaCK instructional framework.

Because the researcher had only assumptions of what the data may reveal, open coding processes (Glaser & Strauss, 2009; Strauss & Corbin, 1998) were proposed and implemented instead of a priori coding. A priori coding (Creswell, Hanson, Plano, & Morales, 2007) was not proposed or implemented because it begins with preset codes which might become too confining. The researcher preferred to let the themes emerge from the quantitative and qualitative interview data. Themes did emerge and are explained in specific detail in Chapter 4.

A combination of content analysis and constant comparison formed the context of the design (Leech & Onwuegbuzie, 2007). Data was revisited and compared following a constant comparison method (Glaser & Strauss, 2009). The researcher also used memo writing (Charmaz, 2008) continuously in the research process. Memo writing has been described as "the methodological link, the distillation process, through which the researcher transforms data into theory" (Lempert, 2007, p. 245). Memo writing keeps researchers engaged and with "minds-on" (Duckworth, 1972, p. 217-233). Among examples of memo writing components are anecdotal information from interviews, ideas that occur to the researcher, questions that arise for the researcher, sequential timelines from the interview discourse, accounts, speculations, possible conclusions, and emerging patterns.

Inductive content analysis was proposed, approved by committee, and implemented for the interview data. Content analysis on qualitative material "attempts to identify core consistencies and meanings" (Patton, 2002, p. 453). Constant comparison occurs when switching back and forth between interview data and empirical literature. This process continued until the researcher, under the Chair's supervision, determined that concept saturation was reached.

The researcher used HyperRESEARCH™ coding software, a text analysis tool for evaluating and interpreting interview conversations. The researcher used initial coding and line-by-line coding (Charmaz, 2008) and created a code book in HyperRESEARCH™ with an

electronic back-up. The code book and back-up were kept separate from both the data transcripts and the field notes.

The researcher first transcribed addressing codes that corresponded to the research question and sub-questions. Then the researcher utilized inductive reasoning to transcribe again and in so doing, create a codebook of emerging words, patterns, and themes resulting from the interviews (Braun & Clark, 2006; Creswell & Plano, 2013). The researcher gathered thick descriptions (Creswell, 2014; Creswell & Miller, 2000; Lincoln & Guba, 1985) from the interview narratives. The researcher engaged in reflection-on-action (Schon, 1983) by thinking about the interview process, the study participants, and the emerging data themes.

The researcher heard and used playback features at least six times on each recorded interview file. Each resulting transcript read at least twice before it was sent to the interviewee. Further readings of the transcripts continued and typographical errors corrected. The researcher analyzed the interview transcripts at least six times per each to generate codes and themes that answered the question, 'what is happening here?' (Charmaz, 2006). Working back-and-forth between analysis of field notes, reflective summaries and interview themes, an emerging storyline developed (Doucet & Mauthner, 2008; Strauss & Corbin, 1998).

The researcher added two codes to the emerging Hyper-RESEARCH™ codes to reflect ongoing efforts at accuracy and narrative. A code labelled "Quotes" was added to harvest quotes that the researcher deemed significant from the interviewees. Timestamps were added and checked to the original recorded file for accuracy. A code called "Mistakes/Typos" was added to catch typographical errors that the researcher missed during the initial transcription and proofreading. The researcher corrected the typographical mistakes in the transcripts.

To evaluate the rigor and enhance the trustworthiness of the qualitative data, Lincoln and Guba's (1985) criteria were proposed and approved by the dissertation committee. These criteria

include credibility, transferability, dependability, and conformability. Credibility in qualitative research studies was established through peer-checking and interrater reliability (Lincoln & Guba, 1985). Interrater reliability is the consistency judgments regarding data (Creswell, 2014). To achieve interrater reliability, from October 31, 2016 through November 9, 2016, the researcher asked two experienced researchers to view the codebook and code the transcript of participant with the pseudonym Q17. The resulting coded transcripts were compared and discussed. Also, the researcher asked one peer-examiner reviewed the coded transcripts and the resulting codebook in Hyper-RESEARCH™ and provided feedback. One feedback discussion was conducted via Skype and short recorded videos from the peer-examiner and online through Google Docs. Two feedback discussion were conducted through email and Google Docs. Discussions with the experienced researchers and peer-examiner determined, with slight modifications, that the data had been coded accurately. This practice of peer-review, discussions and implementation of slight modifications established inter-rater reliability (Gray, 2010).

To ensure study validity, strong validation methods and procedures added quality and emphasis to data analysis (Onwuegbuzie, & Collins, 2007). “Member checking” allowed participants to analyze a draft of the final report of themes to check for accuracy (Creswell, 2014). Member checking occurred online through the email exchanges and transcript sharing with participants. Transcripts were returned for review for interviews #1-10. Four interviewees returned their transcripts with typographical errors to that the researcher corrected.

To verify that codes and themes developed by the researcher were valid, two study participants, G7 and Q17, received a full transcript and summary of their coded interviews. They were asked to verify whether the codes derived from their interviews reflect their point of view and are a good fit (Corbin & Strauss, 2014; Strauss & Corbin, 1998). Conversations followed with the participant reviewers and their comments and their feedback were considered. The peer

reviewers verified that the distilled themes accurately reflect the spirit and intention of the interviews. Peer debriefing gave an external check of bias that may have occurred in the data analysis process. Peer debriefing was accomplished by sharing the data and ongoing analysis with two senior colleagues. The researcher reviewed and considered all feedback. Both dependability and conformability was achieved via the researcher's field notes and post-interview summaries.

Member checking also occurred with the PBS Learning Media Project Manager, through email and onsite at PBS TeacherLine headquarters in Arlington, Virginia. A summary report of thematic classifications and empirical research correlations was shared onsite with senior administration at PBS TeacherLine headquarters on November 15, 2016. During the onsite visit, the researcher shared thematic classifications with twenty-five PBS TeacherLine management officers and senior staff. Identification of the subject participants, either from the survey group or the interview group was not shared. Study participants were identified only by pseudonyms. Both member checking opportunities were well-received with opportunities for further discussions planned. The researcher received a request to share copies of the dissertation with the PBS Learning Media Project Manager and senior administration. The dissertation will be made available to study participants and peer-reviewers.

Data triangulation is one method to "balance out any of the potential weaknesses in each data collection method" (Gray, 2010, p. 36). Data triangulation converges data and provides greater insight than would be obtained by using either type of survey data or interview data separately (Creswell & Clark, 2011; Gray, 2013; Richards & Morse, 2013). The three converging data sources in the research study were the 2014 Koh et al. survey, the video interviews, and the transcript analysis based on empirical literature from the field. The depth of these data sources provided accurate data triangulation (Creswell, 2014; Creswell & Clark, 2011;

Gray, 2013; Richards & Morse, 2013). Inaccuracies, inconsistencies, and contradictory perspectives emerging from pilot study participants, peer interview review, member checking, and peer debriefing were discussed with survey participant raising the issue and every effort was made to correct the issue. No inconsistencies or contradictory viewpoints that differed from the emerging themes were discovered.

The entire research process was supervised by the researcher's Dissertation Chair. Regular email and Skype communication continued with the Dissertation Chair. The researcher created a video summarizes the data collection process for the Dissertation Chair. The researcher reported and shared results of the validation methods, and both the survey data and the semi-structured interviews with her Dissertation Committee. Pertinent themes were highlighted. Correlations to the literature review in Chapter Two because of the participant data in the study are included in Chapter 4. Suggestions for further research are included in Chapter 5.

IRB Protection of Subjects

Research studies involving human subjects must have protective and ethical practices in place (Rallis & Rossman, 2012); consequently, universities and organizations who receive federal funds must comply with these standards. The Institutional Review Board (IRB) monitors compliance with ethical standards and categories of research classification (Rallis & Rossman, 2012). The IRB functions under the themes of individual autonomy, privacy, and harm (Rallis & Rossman, 2012). The researcher has completed the CITI Human Subjects Training course for Social-Behavioral- Educational-Human Subjects Training.

There are four different research classifications which are non-human subject research, exempt research, expedited review, and research involving protected groups. This study falls under the 45CFR 46.101(b) Institutional Review Board as Exempt status because it involves no

more than minimal risk to subjects and only involves human subjects who are able to act as "independent agents" (Rallis & Rossman, 2012, p. 63).

The study participants all served as online course facilitators from PBS TeacherLine at the time of data collection and data analysis. PBS TeacherLine course facilitators are independent contractors on at-will contracts. Participation in this study was voluntary and there was very minimal risk to any participant. Identifying data such as participant names, online courses taught, and the state they reside was removed. As described earlier in this chapter, for both the survey and the interview, each participant was given an alphanumeric code to replace their name on the survey and the interview transcripts.

The online course facilitators who served as participants met the designation of subjects who can act as independent agents and who can give informed consent. An informed consent form assured participants that their personal, identifying information would be protected (Rallis & Rossman, 2012). Before data collection, informed consent forms were emailed to participants and described the purpose of the study, and the participants' rights and limited risks during the study (Appendix C). The informed consent also gave participants the option to "opt-out" of the study. Following the informed consent acceptance, each participant received an individualize email generated by Qualtrics that included a link and a QR-code to access the online survey.

The study procedures themselves, as proposed, involved participation in an online survey questionnaire with randomly selected members of the target population asked to also participate in an interview. There was minimal possibility of physical or mental harm to the participants. Identifying data such as participant names and online course numbers were removed. The state of residence for the qualitative interview participants was noted for classification purposes because it became significant to the researcher. For both the survey and the interview, each participant was assigned an alphanumeric code to replace their name on the survey and the

interview transcripts. The alphanumeric code was used to reference the human subjects in the upcoming Chapter Four and any potential future presentations or correspondence regarding data finding. Identifying data was removed from cover sheets, post-it-notes, digital file names, and/or digital back-up files with names, email addresses, Skype usernames, and/or telephone numbers.

As a further means of protecting subjects, the researcher transcribed the interviews, and created, and maintained the codebook. To preserve confidentiality in coding, identifying information had alphanumeric codes as pseudonyms. The researcher kept the codebook and the interview transcripts in separate locations. All research documents and records were stored in locked cabinets. Data will be stored securely in this manner for five years. These measures of confidentiality and data security will provide security that identifiable information will be protected in the unlikely event that data is compromised.

The Institutional Review Board application was submitted on July 22, 2016. Exempt review was granted on August 15, 2016. The IRB protocol ID# 16-07-341 (Appendix D).

Chapter Summary

This chapter summarized the methodology for a study to determine the perceptions of online course facilitators in continuing education. Of specific focus are the instructional design choices that online course facilitators make to include mobile technology and the use of the TPaCK instructional framework during their online course administrations. A mixed methods design of a quantitative survey followed by a qualitative interview was proposed in preliminary proposal and accepted for the research study by the researcher's dissertation committee.

The study utilized a mixed methods approach of a quantitative survey and a qualitative interview. To achieve this approach, the researcher explored how online course facilitators perceived their use of mobile technology, their instructional design decisions, and their use of TPaCK instructional framework. The study further proposed a research design in three phases.

Phase 1 conducted a pilot study on the survey instrument called *A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK)* (Koh et al., 2014) and one the interview questions. Phase 2 gathered survey responses from online, continuing education course facilitators. Phase 3 randomly selected 12 participants from the survey pool of online course facilitators and completed in-depth Skype interviews with them.

Concrete findings from the survey, statistical analysis, and interview content analysis were applied to the problem of how to prepare continuing education instructors to teach in online environments mediated with mobile technology. The research findings add best practices to limited research in the field of online education and online learning in continuing education.

Chapter 4: Results

I'd like for (learners) to think of me more as 'one of' rather than 'outside of.'

- Facilitator F6, interview, October 15, 2016

This study sought to contribute to the growing body of research and interest in assessing the integration of essential skills for continuing education faculty who teach courses online. This chapter describes the results of the quantitative survey and the qualitative interview. It begins with a description of the study participants. This chapter includes the answers to research questions which are re-stated below. The researcher sought to "intentionally attend to the perspectives, attitudes, and beliefs that shape(d) the research study" (Paulus, Lester, & Dempster, 2014, p. 13) in order to understand the data.

Results of the quantitative survey and qualitative interviews are included. The interview participants were considered by the researcher as "constructors of knowledge in collaboration" (Gubrium & Holstein, 1995, p. 4) with the researcher. Participants' quotes from twelve semi-structured interviews that illustrate the methods that online course facilitators use to integrate mobile technology with the TPaCK instructional framework are included. The chapter concludes with a summary of the themes that emerged from both the survey and interviews.

Restatement of Research Questions

The central guiding research question addressed of the study was:

- How do selected online course instructors combine the components of mobile technologies, design principles, TPaCK, to improve online course content?

The sub-questions of the study were:

1. How do selected online educators demonstrate technological, pedagogical and content knowledge in their online courses?
2. To what extent do online teachers' design content for mobile and digital technology access?
3. To what extent do online teachers utilize mobile technologies in their online courses?

Description of Participants

The participant pool consisted of PBS TeacherLine online course facilitators. Initially in the first three days following the request from the PBS TeacherLine Program Manager, 18 online course facilitators responded. An additional 16 participants responded either to the request and/or to an announcement posted to the facilitators' collective-community forum. At that time, due to the virtual nature of PBS TeacherLine, the researcher had never met the PBS TeacherLine Program Manager, PBS Facilitation Manager, or the online course facilitator participants in person. Although, virtual collaboration occurred previously in the facilitators' community of practice discussion forums, introductions with participants occurred during the Skype interview

After incorporating feedback from the survey and interview pilot tests, the researcher sent study participants an informed consent email through the Qualtrics platform. The email contained an anonymous survey link and QR-code generated by Qualtrics. Participants were asked to complete the survey within one week. Participants were assured that their personal identity would not be released in the dissertation. Participants who had not completed the survey during this time frame were sent an automatically generated email from the Qualtrics platform. In case this reminder might have been delivered to participants' spam filters, the researcher send a follow-up reminder email after two weeks.

The final total sample population was 34 respondents out of 67 people in the Facilitation Manager's database. This was a 51% response rate. By October 31, 2016, there were a total of 33 completed surveys, a 97% survey completion rate. One respondent began but did not complete the survey and was not included in the final participant count.

Although specific location information was not collected, the researcher confirmed that all current course facilitators in the Program Manager's database were located across the United

States. The survey responses were completed anonymously using the Qualtrics platform. Identifying information was not kept either by the researcher or through the Qualtrics platform.

Findings from Phase 2: Quantitative Survey Results

Phase 1 of the study tested the usability of the survey instrument through a Pilot Test, with seven qualified persons as described in more detail in Chapter Two. Three minor modifications to the survey were identified from the pilot study participants and revised in collaboration with the Dissertation Chair.

Phase 2 of the study addressed the results from the administration of *A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK;* Koh et al., 2014). The survey sought to answer the central research question and two of the three sub-questions. The following information represents the results of the data collection for Phase 2.

Survey Results for Central Research Question and Sub-question 1

The central research question and sub-question #1 were addressed in questions labeled as TPACK1 – 6 of the 2014 Koh et al., survey. Specifically, the central research question and sub-question #1 is addressed in questions labeled TPACK1 – 6 which are:

- Survey Question 1- TPACK1 – I can formulate in-depth discussion topics about the content knowledge and facilitate students' online collaboration with appropriate tools (e.g. Google Sites, Moodle Platform).
- Survey Question 2- TPACK2 – I can craft real-world problems about the content knowledge and represent them through computers to engage my students.
- Survey Question 3- TPACK3 – I can structure activities to help students to construct different representations of the content knowledge using appropriate ICT tools (e.g. Mindmaps, Wiki).

- Survey Question 4-TPACK4 – I can create self-directed learning activities for the content knowledge with appropriate ICT tools (e.g. Blog, Webquest).
- Survey Question 5-TPACK5 – I can design inquiry activities to guide students to make sense of the content knowledge with appropriate ICT tools (e.g. simulations, web-based materials).
- Survey Question 6- TPACK6 – I can design lessons that appropriately integrate content, technology and pedagogy for student-centered learning.

Survey questions #1-6 were completed by 33 participants. Survey results from the positive choices of "Strongly agree", "Agree," and "Slightly agree" were combined and represented on the graph with the word "Yes." The negative choices of "Strongly disagree," "Disagree," and "Slightly disagree" were combined and represented with the word "No." The results of the online course facilitators who responded with "Neither agree or disagree" are combined and represented as "Neither" (Figure 4).

Survey questions #1-6 asked the 33 online course facilitators to consider a reflection-on-action (Schon, 1980) from past courses they facilitated. Survey questions #1-6 addressed the online course facilitators' perception of the ways in which they integrated TPaCK categories of technological, pedagogical, and content knowledge in their online course facilitation.

Survey Question #1 (TPACK1) addressed the course facilitators' ability to prompt and promote communication and collaboration online. Survey Question #1 (TPACK1) was completed by 33 participants with 100% of the participants answering in the affirmative choices of "Strongly agree," "Agree," and "Slightly agree" (Figure 3).

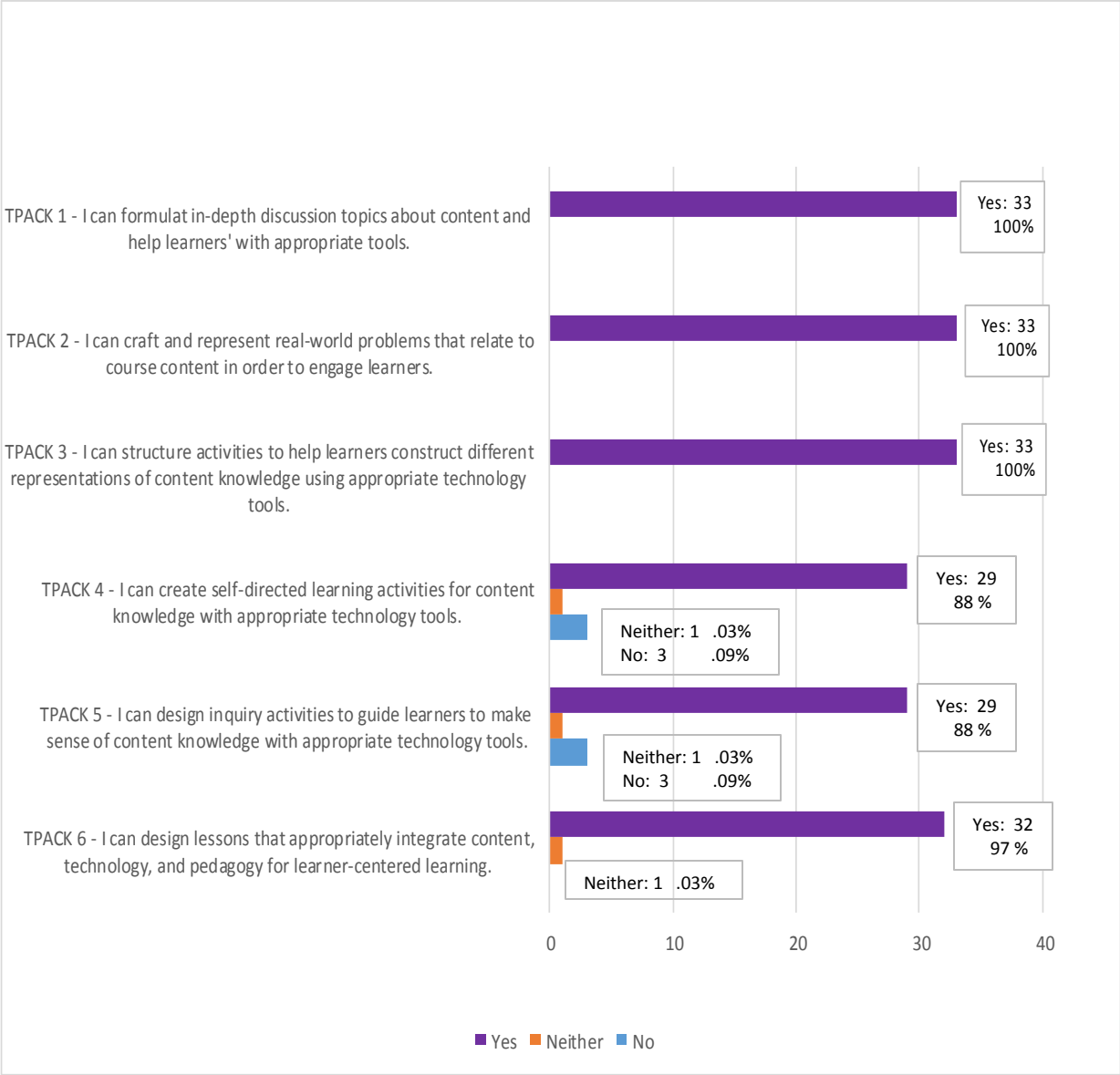

Figure 3: Frequency Distribution of TPaCK Use by Online Course Facilitators (*n* = 33). Adapted from "*A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK)"* by J.H.L. Koh, C.S. Chai, H.Y. Hong, & C.C. Tsai (2014). *Asia-Pacific Journal of Teacher Education. Volume 34*(5) pp. 7. Copyright 2014 by J.H.L. Koh, C.S. Chai, H.Y. Hong, & C.C. Tsai. Reprinted with permission.

Responses to survey questions #1-6 may indicate online course facilitators' positive comfort level with discussion forums and troubleshooting technology issues arising from the use of online tools. The survey findings for survey question #1 are supported by the interview responses to interview question #12. This interview question invited participants to elaborate on what specific techniques they used to integrate technological, pedagogical, and content knowledge in their online courses. Specific interview responses are listed later in this chapter.

Survey Question #2 (TPACK2) queried online course facilitators' aptitude to include real-world scenarios into authentic instruction. Survey Question #2 (TPACK2) was completed by 33 participants with 100% of all participants answering in the two highest criteria of affirmation of "Strongly agree" and "Agree," (Figure 3). Because of the rich experience and tenure of all the study participants, these responses may indicate online course facilitators' positive comfort level with guiding learners to make connections to their professional practice. This practice mirrors the emphasis in empirical literature on Adult Learning Theory (Knowles, 2014) on the importance of connecting course activities to the learners' professional practice.

Survey Question #3 (TPACK3) addressed the course facilitators' skill at structuring activities to achieve greatest learning retention and avoiding cognitive load. Survey Question #3 (TPACK3) was completed by 33 participants with 100% of all participants answering in varying degrees of affirmation of "Strongly agree," "Agree," and "Slightly agree" (Figure 3). These responses may indicate the online course facilitators' ability to combine technology and content knowledge (TCK) with pedagogical knowledge (PK) while adopting the constructivist identity of the More Knowledgeable Other (Vygotsky, 1978) discussed in Chapter 2. The emphasis in Survey Question #3 (TPACK 3) encourages multiple representations of data. This fits with the need for educators to have as many ways to present content as students need to master concepts.

Survey Question #4 (TPACK4) addressed online course facilitators' ability to construct activities to promote the self-direction of their learners. Survey question #4 (TPACK4) was completed by 33 participants with 29 participants (88%) answering in varying degrees of affirmation, of "Strongly agree," "Agree," and "Slightly agree" (Figure 3). One participant, (.03%) answered "Neither agree nor disagree." One participant answered "Slightly disagree" and two participants answered "Disagree" for a total range of .09% of negatively scaled responses (Figure 3). The strong trending of positive responses may indicate that a majority of online

course facilitators' combine specific technology and content knowledge (TCK) skills for instructional models such as Blogs and Webquests with the pedagogical knowledge (PK) of the constructivist More Knowledgeable Other (Vygotsky, 1978) and guide on the side (Koskey & Benson, 2017) discussed in more detail in Chapter 2.

Survey Question #5 (TPACK5) contains the first mention of design skills of online course facilitators. Survey Question #5 (TPACK5) was completed by 33 participants with 29 participants (88%) answering in varying degrees of affirmation with the choices "Strongly agree," "Agree," and "Slightly agree" (Figure 3). One participant, (0.03%) answered "Neither agree nor disagree" Two participants answered "Slightly disagree" and one participant answered "Disagree" for a total range of .09% of negatively scaled responses. These responses may indicate that most of the online course facilitators' self-report that they value the abstract pedagogical knowledge (PK) of inquiry-based learning and that the course facilitators can combine specific technology and content knowledge (TCK) skills.

Survey Question #6 (TPACK6) specifically addressed the combination of TPaCK skills with design skills (Figure 4). Survey Question #6 (TPACK6) was completed by 33 participants with 32 participants, (97%) answering in varying degrees of affirmation with the choices of "Strongly agree," "Agree," and "Slightly agree" (Figure 3). One participant, (.03%) answered "Neither agree nor disagree." These responses may indicate the ease with which most of the online course facilitators navigate between the TPaCK instructional framework and design on behalf of their learners. Responses to these questions may also signal the participants' comfort with serving as an instructional designer with supplemental course content in their courses. The survey findings for survey questions #1-6 were supported with three interview questions, (#2, #4, and #7) that requested specific examples from twelve randomly selected interview participants. The interview responses are discussed later in this chapter.

Survey Results for Central Research Question and Sub-question 2: Design Practices

The central guiding research question and sub-question 2 sought to understand online course facilitators' lesson design practices (LDP). These questions were addressed in the 2014 Koh et al. survey questions #7-12 labeled LDP1 – LDP6 which are:

- Survey Question #7 - LDP1: When designing a technology-enhanced lesson, I start by considering a few lesson ideas.
- Survey Question #8 - LDP2: When designing a technology-enhanced lesson, I consider several lesson ideas to see if they adequately address learners' needs before choosing one idea.
- Survey Question #9 - LDP3: When designing a technology-enhanced lesson, I allow conflicting lesson ideas to coexist until I feel that I have adequately understood the learning problems.
- Survey Question #10 - LDP4: When designing a technology-enhanced lesson, I continually refine my lesson ideas as I develop new understandings throughout the design process.
- Survey Question #11 - LDP5: When designing a technology-enhanced lesson, I consider the consequences of adopting particular lesson ideas before working out details.
- Survey Question #12 - LDP6: When designing a technology-enhanced lesson, I am prepared to completely change my lesson ideas if needed.

Survey questions #7-12 asked 33 online course facilitators to engage in reflection-on-action (Schon, 1980) and to consider their supplemental course content design activities. Survey questions #7-12 were completed by 33 participants. Survey results from the positive choices of "Strongly agree," "Agree", and "Slightly agree" and the negative choices of "Slightly disagree," "Disagree," and "Strongly disagree" were combined in the representation. The results of those

who chose to respond with “Neither agree nor disagree” are represented with the word “Neither” (Figure 4).

Survey Question #7 (LDP1) highlighted the lesson design practice of distilling the best approach to showcase new content for learners. This question infers that there are a myriad of instructional approaches available to online course facilitators and seeks online course facilitators’ perceptions of their ability to choose the best option for course content delivery. Survey Question #7 (LDP1) was completed by 33 participants (Figure 4). Of all 18 survey questions, this question had the most variation of responses. The majority of 29 participants (88%) answered in varying degrees of positive affirmation. One participant, (.03%) answered “Neither agree nor disagree.” One participant each answered “Slightly disagree,” “Disagree,” and “Strongly disagree” for a total of three participants (.09%) who answered in varying degrees of disagreement. Participants who disagreed or remained neutral may have considered that PBS TeacherLine courses are pre-populated with course content modules and that they do not design the lesson itself but supplemental lesson content through the use of apps and other digital tools and software. Additionally, rather than “playing with a few lesson ideas” as stated in the survey question text, the participants who supplied neutral or negative responses may have reacted negatively to the use of word “playing.” The survey participants may have interpreted the word “playing” in the context of “frivolous” instead of a productive aspect of iterative design. The results of this survey question prompted the researcher to ask specific questions in the interview. The specific interview questions probed for specific design processes and design tasks.

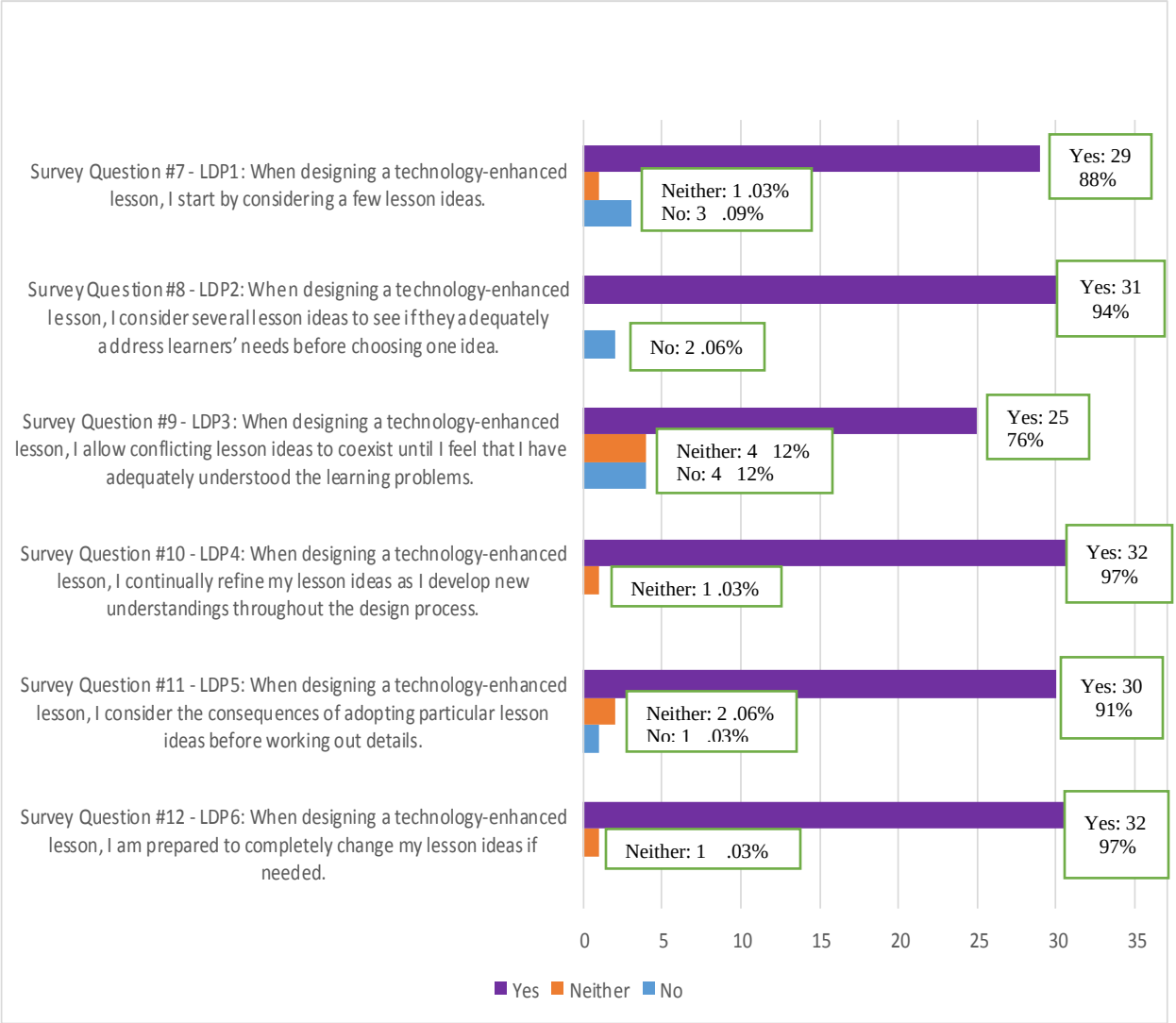

Figure 4: Frequency Distribution of Supplemental Course Design Activities by Online Course Facilitators (*n* = 33). Adapted from "*A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK)"* by J.H.L. Koh, C.S. Chai, H.Y. Hong, & C.C. Tsai (2014). *Asia-Pacific Journal of Teacher Education. Volume 34*(5) pp. 7. Copyright 2014 by J.H.L. Koh, C.S. Chai, H.Y. Hong, & C.C. Tsai. Reprinted with permission.

Survey Question #8 (LDP2) addressed individualizing instruction (Figure 4). Survey Question #8 was completed by 33 participants with 31 participants, (94%) who answered in varying degrees of affirmation. One participant, (.03%) answered "Slightly disagree" and one participant answered "Disagree" for a total of .06% negative responses. The survey question responses may reflect the online course facilitators' ability to apply Knowles Adult Learning Theory (2014) model of connecting course activities to the learners' professional practice.

Survey Question #9 (LDP3) related to the lesson plan practice of considering conflicting lesson ideas (Figure 4). Survey Question #9 (LDP3) was completed by 33 participants. Although responses to the question still reflected the majority opinion, this question had the least number of positive range of response with 25 participants (78%) answering in varying degrees of affirmation. Four participants, (12%) chose the neutral response of "Neither agree nor disagree." Survey Question #9 (LDP3) also contained the greatest concentration of disagreement among the participants with four participants, (12%) who answered "Disagree." This may reflect survey participants' view that since their online course is pre-populated with content modules, it is unnecessary to consider conflicting lesson ideas.

Survey Question #10 (LDP4) addressed iterative lesson design (Figure 4). Survey Question #10 (LDP4) was completed by 33 participants with 32 participants (97%) answering in varying degrees of affirmation. One participant, (.03%) answered "Neither agree nor disagree." Such a strong positive response may indicate a correlation between online course facilitators' comfort level with the constructionist principle of tinkering and tweaking (Papert, 1980) and the necessary trail-and-error process inherent in iterative design (Al-Nassar, 2017). Trial-and-error and iterative design are discussed in more detail in the literature review in Chapter 2.

Survey Question #11 (LDP5) considered the ability of online course facilitators to design lessons with the goal toward knowledge transfer (Wiggins, 2010) as stated in more detail in Chapter 2. Survey Question #11 (LDP5) was completed by 33 participants with 30 participants, (91%) who answered in varying degrees of affirmation (Figure 4). Two participants, (.06%) answered "Neither agree nor disagree" and one (.03%) participant answered "Disagree." The strong number of positive responses may reflect PBS TeacherLine's professional development emphasis on building a socially mediated culture to encourage knowledge transfer.

Survey Question #12 (LDP6) alludes to the importance of iterative design for knowledge transfer (Figure 4). This question was completed by 33 participants with 32 participants, (97%) who answered in varying degrees of affirmation. One participant, (.03%) answered "Neither agree nor disagree." The preponderance of responses in the positive range may indicate the online course facilitators' acceptance of and tolerance for the constructionist principle of tinkering (Papert, 1980) as discussed in more detail in Chapter 2. Since the participants' responses to Survey Question #12 (LDP6) also hint at their comfort with interim failure, the researcher chose to include a question addressing productive failure in later interviews #3-12.

Survey Results for Central Research Question and Sub-question 2: Design Designs

Research sub-question #2 of this study relates to questions that the 2014 Koh et al. research team labeled as "design dispositions" and labeled as DD1- DD6 which are:

- Survey Question #13 DD1 – I am comfortable with the presence of uncertainty.
- Survey Question #14 DD2 – I am open to new experiences.
- Survey Question #15 DD3 – I am comfortable to explore conflicting ideas.
- Survey Question #16 DD4 – I am comfortable to deviate from established practices.
- Survey Question #17 DD5 – I am comfortable with occasional failures from trying out new approaches for course modules.
- Survey Question #18 DD6 – I am constantly seeking to turn constraints into opportunities

Survey questions #13-18 asked 33 online course facilitators to reflect on their temperament or disposition, toward design (DD). Survey results from the positive choices of "Strongly agree," Agree," and "Slightly agree" and the negative choices of "Slightly disagree," "Disagree," and "Strongly disagree" were combined in the bar chart representation. The results of those who responded with "Neither agree or disagree" are represented as "Neither" (Figure 5).

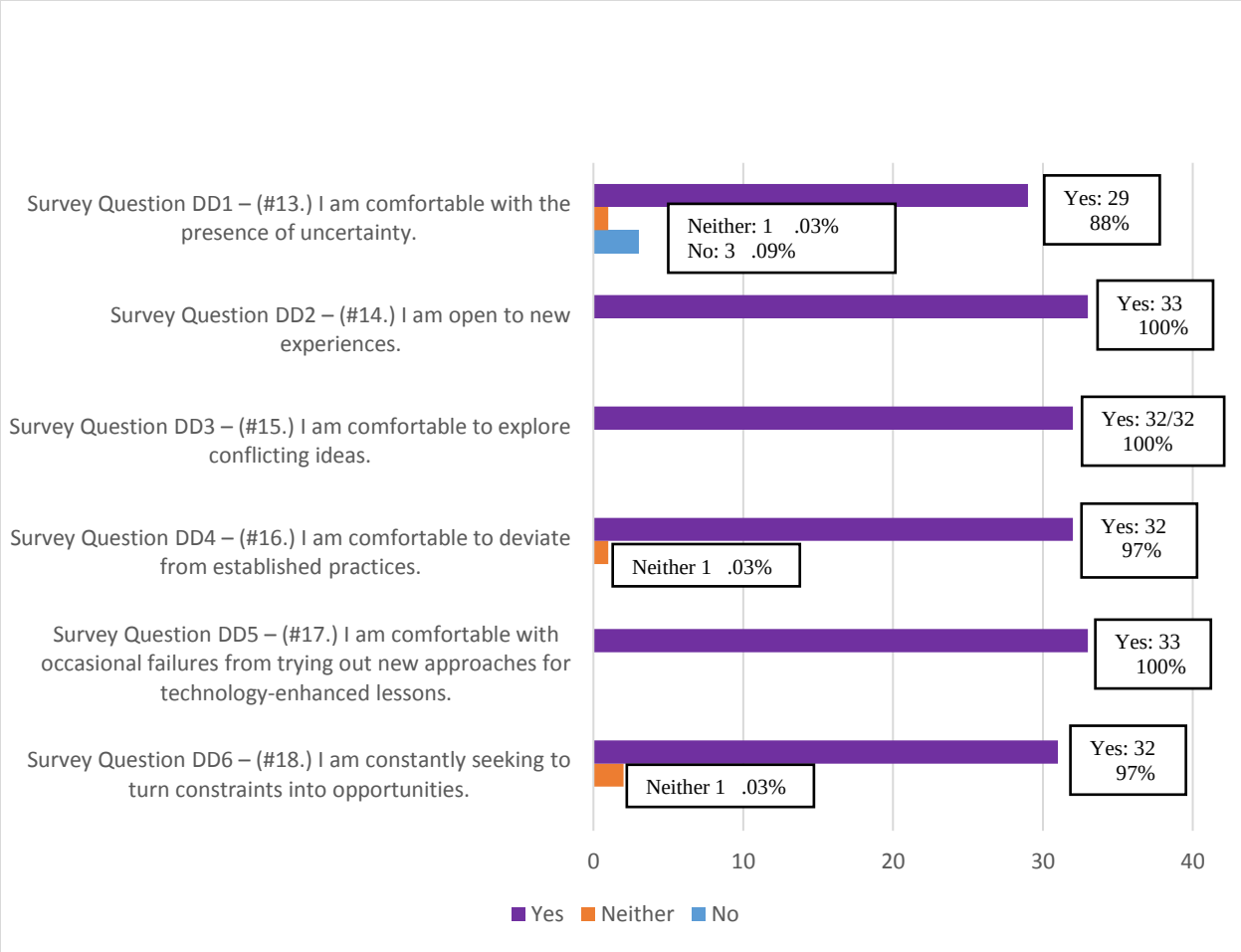

Figure 5: Frequency Distribution of Design Characteristics by Online Course Facilitators (*n* = 33). Adapted from "*A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK)"* by J.H.L. Koh, C.S. Chai, H.Y. Hong, & C.C. Tsai (2014). *Asia-Pacific Journal of Teacher Education. Volume 34*(5) pp. 7. Copyright 2014 by J.H.L. Koh, C.S. Chai, H.Y. Hong, & C.C. Tsai. Reprinted with permission.

Both Survey Question #13 (DD1) and Survey Question #14 (DD2) addressed complementary ideas of uncertainty and novelty (Figure 5). Survey Question #13 (DD1) addressed comfort with uncertainty. It was completed by 33 participants with 29 participants answering in varying degrees of affirmation. One participant chose the neutral response "Neither agree nor disagree." Three participants chose the negative response "Slightly disagree."

Since Survey Question #14 (DD2) addressed openness to new experiences which are fraught with uncertainty, the researcher predicted that the results would be similar. However, this prediction was disproved. Survey Question #14 (DD2) was completed by 33 participants with

100% who answered in varying degrees of affirmation. These responses may indicate that online course facilitators' willingness to explore new technology advances. It may also indicate that facilitators' are adept at figuring out applications for new technology tools. However, online course facilitators may not view their skill as "openness" since they already possess an overall familiarity with tinkering with technology tools. Since these two survey questions and survey questions #10, #12, and #16 addressed tinkering, the researcher decided to include an interview question to probe deeper into the distinctions surrounding online course facilitators' perceptions of newness, novelty, and uncertainty.

Survey Question #15 (DD3) asked participants about their ability to explore multiple viewpoints. Survey Question #15 (DD3) was completed by 32 participants (Figure 5). One participant did not complete this question. All participants, (100%) answered in varying degrees of affirmation with 42% choosing "Strongly agree" and 42% choosing "Agree" and 12% choosing "Slightly agree". These responses may indicate the facilitators' depth of practice to closely read learners' multiple views in discussion forums. These responses may also point to the facilitators' ability to synthesize learners' views when they create landscape posts (Collison et al., 2000) described in more detail in Chapter 2.

Survey Question #16 (DD4) asked participants to gauge their tendency to depart from customary procedures. Survey Question #16 (DD4) was completed by 33 participants with 32 participants, (97%) who answered in varying degrees of affirmation (Figure 5). One participant answered "Neither agree nor disagree." As discussed previously in this chapter, these responses may indicate the facilitators' comfort with trial-and-error and tinkering (Papert, 1980). Deviating from established practices promotes a pattern of learning new technological tools and processes.

Survey Question #17 (DD5) did not allude to concept of productive failure as Survey Question #12; it directly asked for facilitators perceptions of their acceptance of "occasional

failure." Survey Question #17 (DD5) was completed by 33 participants with 100% of participants who answered in varying degrees of affirmation (Figure 5). These responses are consistent with results to questions #12 – 14. These questions also found high levels of facilitators' resilience and their acceptance of the benefits of the constructionist principle of tinkering (Papert, 1980) and trial-and-error with technology and new media adoption.

Survey Question #18 (DD6) queried participants view of their own challenges into opportunities (Figure 5). This skill is vital, especially in the constantly changing arena of educational technology. Survey Question #18 (DD6) was completed by 33 participants with 31 participants, (94%) answering in varying degrees of affirmation. Two participants, (.06%) answered "Neither agree nor disagree." These responses are consistent with the previous design disposition questions and may highlight the online course facilitators' aptitude with technology and new media adoption.

Findings from Phase 3 Qualitative Interview Results

The central guiding research question and sub-question #3 were addressed through qualitative semi-structured interviews. Qualitative interviews were primarily constructed to provide detailed insight into the precise ways in which online course facilitators combined the affordance of mobile access and the use of mobile technology in their online continuing education courses. The interviews were also intended to provide time to explore, in greater depth, the online course facilitators' perceptions of their utilization of the TPaCK instructional framework (Koehler & Mishra, 2009; Mishra & Koehler, 2006).

A random sample of 12 individuals comprised the interview pool. The members of the interview pool were determined from among the survey participants who sent a reply email indicating their willingness to be interviewed following receipt of the Informed Consent (Appendix B). Since more than 12 respondents indicated an interview willingness, a random

selection process determined the 12 participants. Initially, randomization was achieved using the RAND function in EXCEL. The RAND function is an EXCEL generated a set of random, 8-digit numbers. The last two digits of each number were selected, one at a time, from 01 to 17. This selection process continued until the 12 participants were chosen. Alphanumeric pseudonyms were assigned to each interview participant combining their random number with its corresponding alphabet letter (i.e. G7). Interview participants were informed at the start of the interview that pseudonyms would be used to protect their privacy. All interview files were saved with same file protocol: Year/date/participant's pseudonym.

As a means of notification, each of the twelve interview participants received an email with instructions to self-select an interview day and time that was most convenient for them within the range of September 24 – October 10, 2016. Scheduling was managed using the "YouCanBookMe" desktop and mobile app (https://www.youcanbook.me/) via a personalized link: https://helenteague.youcanbook.me/. With two exceptions, all scheduled appointments were kept. One scheduled appointment was a "no-show" and further attempts to reschedule were unsuccessful. This participant was replaced with the 13th randomly selected participant. One interview had to be cancelled due to the participant's evacuation during Hurricane Matthew. This participant was replaced by another participant.

The researcher conducted and recorded eleven of the interviews over the Skype video conferencing platform combined with the "record the screen" feature of the Camtasia video recording software. One interview participant requested to complete the interview with questions emailed and answers received via email as a health modification at the participant's request.

Interviews began on September 24, 2016 and concluded on October 10, 2016. One interview extended passed the October 6th original cut-off date due to hospitalization of a family member. The twelve interviews totaled 615 minutes of recorded conversation. Ten of the twelve

interview participants held educational positions in higher education and/or K-12 public education. Four of the participants held Ed.D. or Ph.D. designations. The remaining eight interview participants held Master's degrees in either education, library science, or course specific fields, such as English and history.

During the interviews, participants shared anecdotal information regarding the locations in which they lived. The researcher noted the state abbreviations only in the field notes notebook and tallied the results. The interview participants resided in ten states across the United States. The interview participants had public school and/or higher education teaching involvement. The variety of state locations reflected not only regional but also a range of different instructional philosophies, approaches to delivery of curriculum, and experience with educational technology.

Restatement of Qualitative Interview Questions

The following modified qualitative interview questions were described in Chapter 3: Interview Questions

1. Thank you for your participation in this interview. How is the Skype transmission? Can you see and hear all right through the Skype interface?
2. Are you aware that we are doing an interview as part of my dissertation research and that you are being recorded?
3. Approximately, how many years have you served as a PBS TeacherLine online course facilitator?
4. The next set of questions address mobile technology: Do you access the online course you teach with a mobile device such as iPhone, iPad, Android phone… (If yes, then "Please elaborate." If no, then go to Question 5.)

5. Have you designed any course components to maximize mobile technology? For example, have you created a QR-code or shortened a link for your learners to access content from a mobile device? (If yes, then "Please elaborate." If no, then go to Question 8.)
6. What did you design?
7. Have you added content and referred to accessing it with mobile technology?
8. Do you ever use mobile apps in your course and, if so, what are the particular features of the app(s) you use?
9. Please describe the last time you combined any type of mobile technology within your course content. Did anything occur that you did not expect? Please explain.
10. How have your learners responded when you have added mobile technology/apps in your course?
11. Author Clay Shirky (2008) described new media content as following a "Publish, Then Edit" cycle. Have you experienced incidences of "Publish, Then Edit" in your PBS TeacherLine courses? Please elaborate.
12. Please reflect on what techniques you use to integrate technological, pedagogical, and content knowledge in your course.
13. Is there anything else you would like to share?

The interview data was collected by the researcher and linked to the central research question and three sub-questions. As discussed in Chapter 3, interviews were conducted, transcribed, and coded by the researcher. Ten interview participants participated in member checking of transcribed data. Intercoder reliability measures found that two coders reached consensus among the application of codes reflecting in the research questions and codes that emerged from the qualitative interviews of online continuing education course facilitators from PBS TeacherLine.

Codes Resulting from the Qualitative Interviews

In addition to coding procedures discussed in Chapter 3, the researcher listened actively and intently to the online course facilitators during the interviews. The researcher utilized active listening, accurate transcription practices, playback and review of the Skype interview videos, and repeated close reading of the participant reflections. These interview and coding procedures in the interview transcripts uncovered what Freire described as the "fragments of theory…involved in the practice of each teacher" (Saul & Saul, 2016, p. 63). The following codes emerged from the 12 interview discussion narratives and reflect the central research question and three sub-questions (Table 1):

Table 1.

Research Questions Addressed in Qualitative Interviews (*n* = 12)

Codes	Frequency
RQ1 TPaCK	12/12
RQ1a Design Supplemental Course Content	12/12
RQ1a Landscape Posts	12/12
RQ2 Mobile Design- No	2/12
RQ2 Mobile Design- Yes	10/12
RQ3 Mobile App Use - No	2/12
RQ3 Mobile App Use-Yes	10/12
RQ3 Mobile Use Unexpected Things	10/12
RQ3 Mobile Access & Use In Course-Yes	11/12
RQ3 Mobile Access& Use In Course-No	1/12

Note. (*n* = 12)

Results from Interviews

Interview Results for Central Research Question and Sub-question 1: Online Course Facilitators' Perception of TPaCK Integration

The central research question and sub-question #1 reflected online course facilitators' use of the TPaCK instructional framework in their online course facilitation, specifically, *How do selected online educators demonstrate technological, pedagogical and content knowledge in their online courses?*

Question prompts relating to TPaCK did not use the TPaCK acronym. Instead the use of the full representation of the words "technology, pedagogy, and content knowledge" was chosen by the researcher for clarity. Each of the twelve interview participants replied in the affirmative when asked if they combined technology skill, pedagogy, and content knowledge in their online courses for PBS TeacherLine.

The researcher used question probes to explore in more detail how the online course facilitators specifically combined TPaCK elements. Participant responses revealed the TPaCK instructional framework was reflected in a variety of specific course-implementation activities. TPaCK activities by facilitator in course management included facilitator's link checking and resource investigation, facilitator's thorough knowledge of interactive and innovative technology, and Facilitator's Assistance with technology work-arounds.

Interview Results for Central Research Question and Sub-question 1: TPaCK & Facilitator's Link Checking & Resource Investigation

Facilitator G7 observed the TPaCK instructional framework as integral to course set-up and lesson presentation, "I think starting with when you're assigned a course, you're working with the technology, making sure that every link works and I always keep a running list of, as I go, the URL for that particular page" (Facilitator G7, interview, September 24, 2016, 16:30). Facilitator N14 echoed the embedded nature of TPaCK, "everything's so embedded in to the course into the PBS TeacherLine course to begin with your pedagogy, how you're teaching, how you're philosophy of teaching is with the 'X' course content or what you know about the course content" (Facilitator N14, interview, October 4, 2016, 22:12).

The variety of various types of technology represented through the TPaCK components became a key element of instruction. Facilitator J10 observed the application of TPaCK in a learner-centered context: "In all of the [PBS] courses, there's a component where, you know, the

teacher are asked to use technology in some way, shape, or form as part of the class" (Facilitator J10, interview, October 6, 2016, 12:21).

Facilitators mentioned that they added personalized course content with just-in-time resources that were socio-culturally constructed by the learners:

> When (learners) say, 'I wish I had more information about so-and-so,' (or) … looking for ideas and examples, so, I'm a Google freak, so I will Google and put four or five links to a topic that they might be interested in. (Facilitator G7, interview, September 24, 2016, 26:50)

Interview Results for Central Research Question and Sub-question 1: TPaCK & Facilitator's Knowledge of Interactive Software & Innovative Technology

All facilitators referenced interactive software and innovative technology when asked to reflect on their integration of the TPaCK instructional framework in their online courses. All interview participants cited the use of software to increase interactivity such as the use of Avatar Vokis, iBooks, social bookmarking sites such as Diigo, video tools such as Screencast, subject-specific software, and speech-to-text software. For example, in referring to the use of innovative technology tools, Facilitator F6 said:

> I have had lots of people that (sic) have said, 'Ok, what is this?' 'I don't know what it is', 'This is really cool what you've done' … And it ends up that we've actually set up a little Diigo (social bookmarking site) group on the outside where people could post and share to that group to further share their (new) resources. (Facilitator F6, interview, October 5, 2016, 29:41)

Facilitator M13 reflected the use of interactive software in an online math course for teachers' recertification. "Courses are based on interactive software that encourages exploring linear equation graphs so that the content is built on that expression of the graph using the interactive software as a major factor of the course" (Facilitator M13, interview, September 28,

2016, 9:13). One facilitator used innovative speech-to-text software for learner communication and feedback (Y25, interview, October 10, 2016).

Facilitators were innovators in their exploration and evaluation of new technology tools, especially mobile apps. The efficiency of the speech-to-text software was an advantage for Facilitator Y25 who said:

> I feel like I'm able to give extensive feedback in my courses because I don't have to sit and type…while I'm on my computer I might be reading the discussion forum and I'm talking in the (voice-to-text software) so I don't have to write anything down. (Y25, interview. October 10, 2016, 2:47)

The interviews with participants revealed that included in their professional practice was the facilitators' tolerance for uncertainty and their willingness to learn new technology tools and processes. However, the facilitators did not express a feeling of being enamored with the latest technology tools, apps, and gizmos. Central to their professional practice was a methodical process and careful planning. The inclusion of innovative technology was not "as a substitute for themselves or for their planning, the hardcore planning" (Facilitator M13, interview, September 28, 2016, 25:55).

Interview Results for Central Research Question and Sub-question 1: TPaCK & Facilitator's Assistance with Technology Work-Arounds

Interview responses indicated that the online course facilitators integrated the TPaCK instructional framework through technology assistance, troubleshooting, and work-arounds. These responses align with the majority of course facilitators' affirmative survey responses regarding the acceptance of uncertainty, openness to new experiences, and comfort "with occasional failures from trying out new approaches for technology-enhanced lessons." As Facilitator F6 observed, "I look at it as being more willing to take risks" (Facilitator F6,

interview, October 5, 2016, 19:20). Facilitator Y25 explained comfort with uncertainty and willingness to apply work-arounds the following way:

> Researcher: "So, uh, would you that you're, um, comfortable with trying in the technology realm, do you think you're comfortable trying work-arounds and tweaking things and, and trying, um, to fix things that happen inevitably that go wrong?"
>
> Y25: "Yes, um, I'm very comfortable with that I part of it I guess the main reason is that it has to get done, the work has to get done and you know, and when it comes to working for someone else like PBS, their reputation is on the line so because of that I have no problem with the work arounds." (Facilitator Y25, interview, October 10, 2016, 17:11)

Decreases in requests for general technology troubleshooting reflect the learners' ease with technology. "Five years ago, we may have needed to walk somebody through or provide directions at the beginning of the course as to put something in the Dropbox" (Facilitator A1, interview, October 9, 2016, 18:59). Still, wise principles of technology integration permeate the philosophy of teaching online. "I tell everybody, 'You need a back-up plan' no matter what we learn in our classroom, no matter what we learn online, have a back-up plan" (Facilitator A1, interview, October 9, 2016, 19:45).

Interview Results for Central Research Question and Sub-question 1 and 2: TPaCK & Design: Learner-focused Scaffolding Activities

The TPaCK instructional framework and instructional design was integrated in a variety of specific learner-focused scaffolding activities. As discussed in Chapter One, scaffolding refers to the supports that a mentor can provide to help learners achieve beyond their original capacity (Wood et al., 1976). Scaffolding helps learners to integrate content and prepare for new content.

Facilitators' interview comments related to their perceptions of their TPaCK scaffolding reflected their ability to use a variety of learning scaffolds. The facilitators' TPaCK scaffolding

activities included scaffolding through communication to all learners, quick communication responses and personalized feedback to the learners in their courses, and their design of supplemental course content.

Interview Results for Central Research Question and Sub-question 2: Facilitator's TPaCK Scaffolding through Quick Communication Response to Learners

As mentioned in Chapter 1, PBS TeacherLine's guidelines set a facilitator-to-learner response time at 24 hours, but all the course facilitators said that they provided much faster response times. Facilitator I9 said:

> When teaching math, whether it's in public school to any age student at the university level and online classes for PBS, I think that you can't use just one method; you have to be able to pull all types of instructional and learning methods so that you can reach a larger audience. (Facilitator I9, interview, September 28, 2016, 12:23)

Facilitator J10 reflected a similar sentiment toward quick response during the interview. The facilitator described a modification on the PBS TeacherLine guideline:

> You know at PBS (TeacherLine), it was always held to the 24 hours and that's kind where I started, but typically it always faster than that. For me, twenty-four hours is a long time. So, I like to keep it to twelve if I can and you know, if I'm checking in once or twice a day, that's not very hard to do. (Facilitator J10, interview, October 6, 2016, 18:40)

Facilitator H8 linked quick responsiveness to successful online course facilitation, "I want to get to my people right away" (Facilitator H8, interview, October 4, 2016, 4:05). "One of the things I did is I always um, put their, their contact information into my contact list…so I can very quickly contact them" (Facilitator H8, interview, October 4, 2016, 6:20).

Facilitator K11 explained a practice of quick responsiveness that began on the first day of the course and continued throughout the course which created a consistent pattern of practice:

> Especially at the beginning of the course, I try to keep a more constant contact for learners who are just unfamiliar with the PBS format so that I can get them up and running and becoming successful in the course…as I'm more confident that the learners are more confident in what they're doing and they know how things run, then I may back off a little and maybe check it in the morning, check it around lunch, and then more in the evening. (Facilitator K11, interview, September 28, 2016, 14:50)

Interview Results for Central Research Question and Sub-question 1 and 2: Facilitator's TPaCK Scaffolding through Communication to All Learners

Online course instructors integrated TPaCK and instructional design components through scaffolding for overview of major curricular concepts and to "[be] sure that students are aware of what to expect" (Facilitator G7, interview, September 24, 2016, 16:01).

The refinement of the interview participants' online scaffolding grew proportionally with their teaching tenure. "You know, I think it gets easier with time and especially if you're teaching some of the same classes 'cause you get some tips and tricks. (Facilitator J10, interview, October 6, 2016, 20:05 – 20:25). Facilitator J10 recalled a practice that reflected change and transformational practice:

> I had a hard time with it when I first started facilitating and teaching online because, you know, you tend to want to be conversational like you might be in an actual classroom setting and you just can't do that, uh, it doesn't work, it doesn't translate in the same way so I think it is important to keep things on topic, um, it you're dealing with things like assignments, use things like rubric language …and to avoid using your own language … you know if you're talking due dates or timeline …just really try to keep things on topic …and not try to go off in other directions. (Facilitator J10, interview, October 6, 2016, 20:05 – 20:25)

The progression of technology among groups is described in Rogers' Diffusion of Innovation theory (2010). Rogers' stages follow a growing acceptance of technology on a continuum from Innovators, Early Adopters, Early Majority, Late Majority, and Laggards. In online classes, this progression also occurs and participants may include members from each of Rogers' stages. Online course facilitators noted the change among learners and a growing acceptance of new technology as they progressed through Rogers' Diffusion of Innovation stages (Rogers, 2010):

> When we were introducing some of them, (in previous years), there was frustration on the part of people, they didn't, they were having a hard enough time just dealing with the whole online environment, and so adding anything extra was like, 'I can't handle this' It's funny because over time it's changed. (Facilitator F6, interview, October 5, 2016, 14:49)

During the interviews, the online course facilitators discussed their utilization of TPaCK scaffolding to prevent cognitive overload for learners. Facilitators described a careful monitoring of their course participants for early signs of frustration or lack of assignment completion. All of the online course facilitators described the scaffolding practices they used to prevent cognitive overload for learners. Some of the facilitators adapted methods originally implemented in their face-to-face instruction. Some of the facilitators tried and continued to improve upon methods designed specifically for the online course environment. As Facilitator A1 described, "you've got to break things down for them, you don't want to send out that first announcement that is so overwhelming that you're going to scare them" (Facilitator A1, interview, October 9, 2016, 23:12).

TPaCK scaffolding was also used for resource sharing within the course community. As their online course community grew and flourished, both course facilitators and course

participants shared digital, print, mobile, and audio-visual resources in discussion forums. As Facilitator J10 remembered during the interview:

> Anytime I can share a resource, um, I can cite an app, a tool, it's well-received, um, and that's actually one of the techniques that I use a lot in the discussion because it is so well-received… you know, I might jump in (to the online discussion) and say, 'Hey, I see you're talking about x, y, and z and here's a tool that I've used' or 'Something that you might want to use with students' so, definitely you know, I do share things I've used myself. (Facilitator J10, interview, October 6, 2016, 13:47)

Interview Results for Central Research Question and Sub-question 1 and 2: Facilitator's TPaCK Scaffolding through Communication to All Learners

Online course instructors integrated TPaCK and instructional design components through scaffolding. Scaffolding occurred during the facilitators' troubleshooting of potential technology challenges. All of the interview participants maintained a discussion forum labeled "Help" to triage learners' technology issues. A centralized technical support hub also functioned as another scaffold for learners. Scaffolding occurred in the online course facilitators' overview of major curricular concepts, which served the purpose of a discussion forum collecting all the emails send globally by facilitators to learners which helped to "[be] sure that students are aware of what to expect" (Facilitator G7, interview, September 24, 2016, 16:35).

The refinement of the facilitators' online scaffolding grew proportionally with their tenure as Facilitator J10 recalled,

> You know, I think it gets easier with time and especially if you're teaching some of the same classes 'cause you get some tips and tricks…I had a hard time with it when I first started facilitating and teaching online because, you know, you tend to want to be conversational like you might be in an actual classroom setting and you just can't do that, uh, it doesn't work, it doesn't translate in the same way so I think it is important to keep

> things on topic, um, it you're dealing with things like assignments, use things like rubric language …and to avoid using your own language … you know if you're talking due dates or timeline …just really try to keep things on topic …and not try to go off in other directions. (Facilitator J10, interview, October 6, 2016, 20:05 – 20:25)

Interview Results for Central Research Question and Sub-question 2: Facilitator's Design Scaffolding through Feedback Personalized to Specific Learners

TPaCK scaffolding was also used in feedback between the course facilitator and learners. Facilitators' interview comments relating to their perceptions of their use of TPaCK scaffolds reflected the intention of facilitators to bridge the curriculum crevasse between content knowledge and application leading to implementation. Facilitator Y25 replied that TPaCK usage was reflected in the explanations provided to learners, "to be able to explain how that stuff in between working with students, between trying it and then refining it, how that was beneficial to students" (Facilitator Y25, interview, October 10, 2016, 30:22).

Online course facilitators described an awareness of the online environment learning space that may be lacking in a scripted instruction based environment. The intention toward understanding learners' needs and concerns is especially important in the online course environment devoid of verbal cues. The survey findings for survey questions #8, #12, #13, and #16 are supported by all interview responses, especially from Facilitators Y25 and I9. As Facilitator Y25 said, "I don't want to hear my voice [18:44], I want to hear their voice [18:46]… Everyone has a voice and they're expected to use it [21:43] (Facilitator Y25, interview, October 10, 2016, 18:44, 18:46, 21:43).

Online course facilitators described a heightened sense of their learners' cognitive process as it occurs asynchronously. "It's not impossible to do, but it is more demanding… You're looking for clues in anything- the way they do their assignment that let you know that there's a real interest in and involvement with the class or (if) they seem reticent and they're

holding back…Why? What's Happening? ... what do they need in order for me to get them to where they should be?" (Facilitator I9, interview, September 28, 2016, 32:46 – 35:21). Tolerance of and comfort with uncertainty leads to iterative thinking with people who comfortable with changing on the fly.

Survey question #10 sought to investigate participants' comfort of refining ideas through the design process. This was supported through the interview process in responses reflecting personalized feedback and close reading especially from facilitator I9 and Facilitator G7. Interview participants said that the majority of the clues for personalized feedback are found through close reading of discussion forum responses. As Facilitator I9 said, "As an online instructor, you need to learn how to read what the learner is writing. You have to interpret based on what you know about that one person and then give them feedback or ask them questions that gets into what's really going on in their head (Facilitator 19, interview, September 28, 2016, 33:42). Close, interactive involvement was described by Facilitator G7, "So, the pedagogy part I guess is there because I am involved in what they're talking about, what they are taking away from what they are reading and what they're getting from their content and how they're applying it in their classroom" (Facilitator G7, interview, September 24, 2016, 16:40).

Interview Results for Central Research Question and Sub-question 2: Facilitator's Scaffolding through Design of Supplemental Course Content

The central research question and research sub-question #2 of this study relates to design dispositions, specifically, "To what extent do online teachers' design content for mobile and digital technology access?"

Supplemental course content design also involved instructor feedback. Specifically, instructor feedback occurred through landscape posts and assessment feedback. Landscape posts and assessment feedback comprised the two main areas of supplemental course content design.

First proposed by Collison et al. (2000), Landscape Posts continued as a design element for online course facilitators. Interview discourse from the facilitators indicated that they were very comfortable with conveying information to their course learners through the means of landscape posts and assessment feedback. At least two facilitators during the Skype interviews sought to located examples of their landscape posts in files resident on their computers. Facilitators defined Landscape Posts, as

> help(ing) the learners understand what's going on, highlights from the conversation for the week, um, it also helps to draw attention to certain students and everybody likes to be called out in a positive way from time-to-time, so it gives them recognition that 'Hey the instructor saw what I said and thought it was valuable enough to put in this Landscape Post.' Um, and then it also helps, if conversations have maybe gotten off track, um, you know choosing the right things to put in the Landscape Post can help get it back on track. (Facilitator J10, interview, October 6, 2016, 25:10)

Another participant recalled the advantage of landscape posts as a synchronizing affordance among all online course participants who were separated by distance and time zone.

> It's like a multiple view post and they understand that, but then I also sometime pull, like, 'so-and-so gave us this link and ask this question and wouldn't it be interesting if we followed up a little while on this' and 'ok, here's what we're going to think about next and here are some additional questions you might have.' (Facilitator G7, interview. September 24, 2016, 17:50)

All facilitators reported positive opinions regarding Landscape Posts, for example:

> I like the Landscape Posts. I've always really liked that um, and I think if you're just waiting until the end of the week and doing a landscape post once that's not going to cut it, um, in terms of being present. (Facilitator J10, interview, October 6, 2016, 24:03)

Facilitators cited Landscape Posts as a way to respond as a collaborative co-learner:

> I was really inspired by that and it really made me feel more a part of their (the learners') conversations because normally we would just be giving them feedback on everything, but this way I was able to get into the conversation. (Facilitator G7, interview, September 24, 2016, 19:53)

Interview Results for Central Research Question and Sub-question 3: Facilitators' Use and Design for Mobile Technology

The central research question and research sub-question #3 of this study relates to mobile technology, specifically, "To what extent do online teachers utilize mobile technologies in their online courses?" For the purposes of each interview, mobile technology was described as including cell phones, Androids, iPhones, iPads, Kindle Fire, tablets, Chromebooks, eReaders, or anything handheld. A majority of eleven interview participants indicated that they used mobile technology in their courses. The interview findings for interview question #4 - #10 and the central guiding research question and sub-question 3 are supported by the interview responses especially from respondents M13 and A1, who stated, "Mobile tech allows for quicker access to the instructor" (Facilitator M13, interview, September 28, 2016, 37:50). Mobile technology was used for quicker access to learners. "I use tablets to access my course on a regular basis and I will use my cell phone to check in on the [PBS TeacherLine course] Help Forum when I'm out and about. (Facilitator A1, interview, October 9, 2016, 2:56). As indicated previously for TPaCK scaffolding, one of the main advantages of mobile technology was quick response by the course facilitator and "the ability to answer questions quickly and easily on emails you know so even if I'm out shopping and I see an email from a learner I can quickly answer their questions (Facilitator N14, interview, October 4, 2016, 10:06). "I find I get really OCD about the thing (responding to emails) so I'm checking, especially in the beginning of the course, I'll check, I'll have the iPad all the time" (Facilitator K11, interview, September 28, 2016, 15:20).

Survey Question #6 and #7 addressed the combined aspects of TPaCK and lesson design, respectively and the survey findings are supported by the responses of 11 out of 12 interview participants who described "app smashing" which is the practice of using particular mobile apps for specific purposes. Facilitators mentioned apps such as Gmail, Symbaloo, Porta-portal, Color Note, Alto, Weebly, Diigo, Glogster, Kahoot, Library of Congress app, Prezi, Voki, and Speech-to-text translation apps. Mobile technology activities included course access, check learners' course activity, respond to learner-initiated correspondence, supply assistance for learners, supply assessment feedback, create supplemental course content, and assess how the course page rendered among mobile devices.

Summary of Research Findings

Both quantitative survey data and qualitative interview data are presented in alignment with the Central Research Question and sub-questions. Quantitative data was shared in Chapter 4 and triangulated with qualitative interview results and empirical literature, where appropriate. Implications of the findings, conclusions, and new applications are shared in Chapter 5.

- RQ1: How do selected online course instructors combine the components of mobile technologies, design, and the TPaCK instructional framework to improve online course content? Sub-question 1: How do selected online educators demonstrate technological, pedagogical and content knowledge in their online courses?
- Sub-question 2: To what extent do online teachers' design content for mobile technology access?
- Sub-question 3: To what extent do online teachers utilize mobile technologies in their online courses?

Finding 1 Relating to RQ1 and sub-question 1. Online continuing education course facilitators integrated technological, pedagogy, and content knowledge in their courses through

the use of mobile and digital tools. Data from both the survey and the interviews integrated indicated that online course facilitators in continuing education courses integrated technology, pedagogy, and content knowledge in varying degrees in their online course facilitation using digital tools.

Finding 2 Relating to RQ1 and sub-question 2. Online continuing education course facilitators made design decisions for both mobile and digital access through the creation of supplemental course content. Data from both the survey and the interviews indicated that a majority of course facilitators designed supplemental course content for their continuing education courses. All twelve of the online course facilitators who were interviewed described how they designed supplemental course content in an intricate scaffolding sequence. This sequence occurred prior to the start of the course and continued during the course.

Finding 3 Relating to RQ1 and sub-question 3. Online continuing education course facilitators utilize mobile technology in their online courses through an innovative inclusion of mobile devices and mobile apps. In the interviews, mobile devices included cell phones, Androids, iPhones, iPads, Kindle Fire, tablets, Chromebooks, iBooks, and eReaders. Eleven out of twelve online course facilitators access the courses they teach with at least one mobile device. Eleven out of twelve online course facilitators communicate with the adult learners in their courses using at least one mobile device. Eleven out of twelve course facilitators use apps and design supplemental course content for learners to access with mobile devices.

Findings Related to Literature

Empirical literature supports the study's findings. Improvements in the location and functionality of wireless communication technologies provide new opportunities for educators to create new educational prototypes. The rapid growth of mobile technology influenced the instructional and course design decisions of online course facilitators in the study. In the study's

interviews, online course facilitators explained their use of mobile technology in narratives that echoed three themes from current literature (Traxler, 2009). These themes were the use of mobile devices to overcome time and space barriers, personalize content for learners, and support a collaborative process.

In the study, online course facilitators scaffolded instruction through their online peer-to-peer, collegial conversations (Day & Leithwood, 2007; Guskey & Passaro, 1994) with the learners in their courses. Course conversations were mediated through intricate, personalized feedback delivered in course discussion boards, personalized emails, speech to text app, and an occasional phone call between course facilitators and learner. The feedback loop used in courses occurred between the course facilitator to learners, from learners to learners, and from learners in response to course facilitator. An additional outlet feedback related to course conversations occurred in the peer-to-peer facilitators' virtual forum where course facilitators shared ideas, answered questions posted by peers, and received announcements and information from administration.

Qualitative research is "interpretive research" (Creswell, 1994, p. 147). Through active, listening, questioning, and checking for understanding, the qualitative interviews in the study attempted to attain the designation of "researching people" (Freeman, 2016, p. 118). In qualitative interviews, the online course facilitators also referred consistently to their practice of scaffolding for online learning with mobile technologies through the supplemental course content they designed. The supplemental course content was composed of detailed and individualized feedback. Feedback existed in a variety of formats including discussion forums, multi-viewed landscape posts reflecting the rotating cross-sections of course participants, and email correspondence. One course facilitator described the process of detailed, individualized feedback as "taking the time to be in touch with each student personally" (Facilitator I9, 38:04).

Learning and learner engagement are formed in a socially mediated culture (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991). This principle also applies to digitally mediated spaces. The PCK instructional framework by Lee Shulman (1987) and the TPaCK instructional framework (Koehler & Mishra, 2009; Mishra & Koehler, 2006) provided an organizational structure for the combined skill set used by the participant group of online course facilitators in continuing education courses. Both PCK and TPaCK served as the vehicles to host the Transfer of Knowledge from the online course content, facilitators' supplemental course design, and the learner-initiated inquiry. As stated in more detail in Chapter 2, when information is organized into a conceptual framework combined with an instructional framework, greater knowledge transfer occurs. Transfer of Knowledge allows the learner to apply what is learned in new situations and internalize related information more quickly (Wiggins, 2010).

In face-to-face classrooms, course curriculum is delivered through a variety of methods. Traditionally, the vehicle for most course content is the textbook. In online course environments, the textbook is re-imagined in the course content modules residing in learning management system (LMS) or content management system (CMS). Most often it is the talent and skill of the instructor/course facilitator to navigate the engagement process for learners in any realm of learning, whether face-to-face, blended or completely online. The course facilitator is more than the virtual vehicle of content dissemination.

The research findings in this study indicates that something more occurs. Within the courses facilitated by PBS TeacherLine course facilitators, a constructivist ecosystem emerges and strengthens as the course progresses. This ecosystem is nurtured through the behaviors and skillset of the online course facilitator. It develops and changes in the span of just a few weeks and reflects not only constructivist *languaging [sic]* (Swain, 2006; Vygotsky, 1978), but also constructionist product creation and iterative design. The online course learners are discussing,

describing, proto-typing, tinkering, and peer reviewing projects and products that reflect their professional practice. These products include but are not limited to: multimedia creation, demonstration lessons for small and large groups of learners, reading interest surveys, campus reading initiatives, lesson plan creation, and intervention protocols for special needs learners. According to Freire, while in education groups, teachers experience best practices that they could return to their schools and initiate on their campuses. (Saul & Saul, 2016).

Somewhere during six short weeks, the pre-assigned identities of *instructor* and *student* transform into a new community of co-learners who co-create (Sameshima, 2007) supplemental course curriculum. For the online course facilitator, the transformation moves from a starting point of online coach among online learners to co-learner. A new community of co-learners emerges and strengthens. These environments function as socio-cultural "education groups" and "teacher collectives" (Saul & Saul, 2016, p. 64). In the qualitative interviews, some participants described incidences where learning continued by telephone (Facilitator H8, Facilitator I9), email, (Facilitator G7, Facilitator N14) and in online portals separate from the online course learning management system (Facilitator A1, Facilitator Q17, Facilitator Y25).

Although online and mobile learning exist in virtual spaces, beginning activities of conversational sharing progress effectively when informed by constructionist and constructivist learning principles. The learning activities include the transfer of knowledge, concept tinkering, recursive thinking and concept mastery. Completing the effective rendition of the socio-cultural learning online, both the facilitator/instructor and the learners retain concepts and create applications that inform and perhaps even benefit their own professional practice.

These groups function as a mediating factor in both Freire's Permanent Education (Saul & Saul, 2016) and Knowles' Adult Learning Theory (2014). The cultivation and harvesting of learner responses, comprised the "fragments of theory…involved in the practices of each

teacher" (Saul & Saul, 2016, p. 64). Applying relevant theory to their online course participants' professional practice is vital for online course facilitators and a primary characteristic of adult learning (Knowles, 2014). It is these responses that provide enduring value. Responses from course facilitators situated in teacher collectives of the online course provided a canvas for the research results.

Transfer of Knowledge encourages adult learners to exchange ideas and apply the knowledge and skills they learn to a variety of situations in their professional practice (Teague et al., 2016). Transfer of Knowledge is both a transmission of information and an exchange of ideas across virtual spaces (Teague et al., 2016). Despite the LANs, WANs, iClouds, and modems, at its core, transfer of knowledge online occurs through conversation. Course facilitators' knowledge of Adult Learning Theory (Knowles, 2014) framed the canvas for the research results. Freire's Permanent Education emanated from teaching practice as a focal point.

Chapter Summary

A mixed methods study was used to investigate the ways that online course facilitators in continuing education course utilized the TPaCK instructional framework, included mobile technology and design decisions in their course facilitations. Reflections by current online course facilitators were gathered through quantitative survey and qualitative interview. Quantitative survey data was gathered using the 2014 Koh et al. survey, *A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK)* (Koh et al., 2014). Qualitative data was gathered using inductive inquiry through semi-structured interviews with current online course facilitators. The qualitative data created twelve cases exploring online course facilitators' strategies for integrating mobile technology, design decisions, and the TPaCK instructional framework.

Survey data indicated that 100% (33 out of 33 online course facilitators) had varying degrees of positive perception toward their technological, pedagogical, and content knowledge perceptions in their online course facilitation. A majority of 97% (32 out of 33 online course facilitators) self-reported varying degrees of positive perception toward their lesson design decisions. A majority of 88% (29 out of 33 online course facilitators) had varying degrees of positive perception toward the design decisions that they make for the inquiry activities of their course. Only in the areas in designing for self-directed learning and inquiry did variations trend into disagreement. One online course facilitator disagreed with the statement, "I can create self-directed activities for content knowledge with appropriate technology tools." Three course facilitators disagreed with the statement, "I can design inquiry activities to guide learners to make sense of content knowledge with appropriate technology tools."

Questions relating to the specifics of lesson design practices, revealed the greatest variation on reflection on practice. A majority of 88% (29 out of 33 participants) begin their design process by "considering a few lesson ideas" and "considering several lesson ideas to see if they adequately address learners' needs." Although still in the minority range, the question relating to "considering a few lesson ideas" had the highest number of three participants self-reporting with varying degrees of disagreement. Although still in the minority range, the question relating to "considering several lesson ideas to see if they adequately address learners' needs." had two participants self-reporting with slight degrees of disagreement. Weighing "conflicting lesson ideas" was chosen as the lesson plan design schema among the smallest majority 76% (25 of the 33 participants) with four participants choosing "Disagree" and four participants unsure.

Iterative design was represented in two questions specified "refine my lesson ideas" and being "prepared to completely change my lesson ideas if needed" with 97% (32 out of 33

respondents) answering with varying degrees of affirmation and only one participant for each question unsure.

In information regarding the design dispositions (Koh et al, 2014) of a majority of participants reflect acceptance of uncertainty, openness to new experiences, willingness to explore conflicting ideas, and deviate from established practices. All participants were "comfortable with occasional failures from trying out new approaches for technology-enhanced lessons" (Koh et al., 2014, survey question #DD5).

The mixed-methods study found through interview data that 100% of the online course facilitators seamlessly combine technology, pedagogy, and content knowledge in both the set-up and administration of their online courses. Qualitative interview data also revealed that a 97% majority of online course facilitators use mobile technology during their online courses and made at least some of their supplemental course design decisions based on mobile technology. The most common need, identified by the interviewer participants, was not to equip online course learners solely with mobile tech tools but to scaffold instruction for online learners to achieve gains in course concept mastery and online community within the course.

Scaffolding and meaning-making was a recurring and paramount concern among online course facilitators. The online course facilitators constructed meaning through their reflection. The researcher also reflected upon the data gathered from the research to consider professional development aspects that would relate to successful scaffolding strategies. Improved scaffolding strategies that include the TPaCK instructional framework would replicate the successful practices of the online course facilitators who participated in the research. These scaffolding skills cluster a new online checklist that reflected both mobile and desktop-tethered applications. Research implications, conclusions, recommendations for further research and specifics of the new competency checklist will be discussed in more detail in Chapter 5.

Chapter 5: Summarization and Discussion of Results from Research

Experts are often unaware of the skills they have learned; they simply use them.

- Gregory Gargarian, *1996*

Introduction

This chapter presents a summary of the research and the conclusions synthesized from the data presented in Chapter 4. Further this chapter provides some of the implications for decision-making and suggests recommendations for further research. This chapter presents a brief synopsis of the conceptual framework and a summary of the study's findings. The chapter reviews the study's issues, research questions, conceptual framework, methodology, the study's strengths, and implications. This chapter synthesizes literature regarding the socio-cultural and instructional framework to propose conclusions, a new mobile instructional approach, and recommendations for further research.

Summary of the Study: Overview of the Issues

This study addressed the perceptions of online continuing education course facilitators about their use of mobile technology, instructional design, and the TPaCK instructional framework (Koehler & Mishra, 2009; Mishra & Koehler, 2006). Mobile technology, instructional design, and the TPaCK instructional framework have each influenced online education but the researcher was able to find few studies that ascertain their combined influence in an online course environment. The 2014 Koh et al. survey, *A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK)* addressed the combination of TPaCK, instructional design decisions by teachers, and lesson plan practices. However, it queried teachers in traditional, face-to-face classroom. The participant pool for this study was 33 online course facilitators, 50% of the available participant pool, for PBS TeacherLine, an online,

professional development, continuing education course provider and subsidiary of PBS Public Broadcasting System. The proposal for research was presented and defended at the West Los Angeles campus of Pepperdine University in mid-July, 2016. Institutional Review Board approval was received in mid-August, 2016. The pilot study and data collection of quantitative survey and qualitative interviews began in September, 2016, and ended on October 30, 2016. Data collection is described fully in Chapter 3.

Restatement of the Research Questions

The central guiding research question addressed in the study was:

- How do selected online course instructors combine the components of mobile technologies, design principles, TPaCK, to improve online course content?

The sub-questions of the study were:

1. How do selected online educators demonstrate technological, pedagogical and content knowledge in their online courses?

2. To what extent do online teachers' design content for mobile and digital technology access?

3. To what extent do online teachers utilize mobile technologies in their online courses?

Synopsis of the Conceptual Framework

The conceptual framework of the study addressed the perceptions of online course facilitators. Specifically, how do online course facilitators for adults in continuing education courses combine TPaCK to influence the design of supplemental course content for mobile technology access and use? Chapter 2 described pioneering socio-cultural learning theories served as the foundation for the research. The study centered on online course facilitators' perceptions of their instructional practices with adult learners in online course environments. It specifically asked participants about their perceptions of their use of the TPaCK instructional framework, mobile technologies, and design to improve online course content. Socio-cultural

theories of learning (Lave & Wenger, 1991; Papert, 1980), and especially the socio-cultural conveyance of scaffolding through the Zone of Proximal Development and More Knowledgeable Others (Vygotsky, 1978), informed the theoretical basis for the study.

Review of Methodology

The exploratory study was conducted in three phases. The following list gives a brief synopsis of the research.

1. For phase 1, the researcher piloted the 2014 Koh et al. survey.
2. For phase 2, the researcher incorporated results from the pilot study and distributed 2014 Koh et al. survey to 33 online course facilitators from PBS TeacherLine online course professional development provider.
3. For phase 3, the researcher conducted semi-structured interviews with a random group of twelve online course facilitators from the survey pool.

The 2014 Koh et al. survey was completed by 33 online course facilitators at PBS TeacherLine online professional development course provider. This was a 51% response rate A random sample of twelve course facilitators from this survey group completed a semi-structured interview. The combined tenure of these course facilitators who were interviewed reflected over 300 years in public, private, K-12 and higher education. Each online course facilitator had public, private, K-12 educational experience before he or she entered higher education, so their experience with students was not solely confined to post-secondary learners. In the interviews, the course facilitators were asked to describe their use of mobile technology, the TPaCK instructional framework, and their course content design activities.

The interviews occurred over a two-week period. The total time for 11 of the 12 interviews was 615 minutes. One interview was completed through completion of the survey questions across email. Survey and interview data from the online course facilitators revealed an

adherence to the principles of Adult Learning Theory (Knowles, 2014; Vaughn, 2016), Transfer of Knowledge (Huber, 1991), and an intricate application of scaffolding and close reading.

Interviews were conducted, transcribed, and coded by the researcher. Ten interview participants took part in member checking of transcribed data. Intercoder reliability measures showed consensus from among both the application of codes reflecting in the research questions and codes that emerged from the interviews.

Strengths of the Study

Some studies address aspects of an online educator's instructional practice (Cho et al., 2016). The researcher found few studies to address how educators combine mobile technology, pedagogy, content knowledge, and design in their online courses (U.S. Department of Education, 2014) with adult learners. Further, the researcher found that few studies addressed instructional practice from the instructor's point of view. With projections of mobile technology reaching 97% saturation point and course enrollments increasing for online courses, a study that addresses the nexus of these factors reflects timeliness of inquiry (Rallis & Rossman, 2012). A strength of the study is its timeliness addressing how practitioners use design decisions to support mobile technology. A second strength of the study is in its strong participation rate of 51% of the potential participant pool and 97% survey completion rate. A third strength of this study is the participants' rich descriptions of the specific ways in which they mediate their online course facilitation practices to include mobile technology.

Implications

Specifically, as the participants described their scaffolding activities in interviews, five characteristics emerged. The first characteristic included situating the instructional activity of their courses in conversational learning communities (Chen et al., 2003; Kukulska-Hulme & Traxler, 2009). The second characteristic involved scaffolding cycles of increasing competence

for adult learners. Online course facilitators interviews reveal a third scaffolding activity of quick responsiveness to learners' questions, posts, emails, and through their feedback procedures. In the fourth scaffolding characteristic, online instructors' use of leading activities (Leontiev, 1981) such as landscape posts (Collison et. al., 2000) to encourage and scaffold for the fifth characteristic of learner-initiated inquiry toward professional practice (Coltman, Petyaeva, & Anghileri, 2002; Knowles, 2014). These five characteristics increased socio-cultural learning for teacher-learners in a virtually created space that accommodated both tethered and mobile devices via a communication network (Abdulla & Iyengar, 2016).

Conclusions

Conclusion 1. Online Course Facilitators in Continuing Education Courses traverse many roles. Conclusion 1 supports the central Research Question: How do selected online course instructors combine the components of mobile technologies, design, and the TPaCK instructional framework to improve online course content? As found in previous research, (Wahlgren, Mariager-Anderson, & Sørensen, 2016), online course facilitators traverse many roles and instructional strategies such as TPaCK.

By analyzing survey data and interviews transcripts, the researcher discovered that these roles are instructional designer, technology innovator, trouble-shooter, online course community organizer, content curation specialist, subject matter expert, cheerleader, empathetic listener, and co-learner.

Conclusion 2. Close reading is an effective way to listen online. Interviews with the online course facilitator participants revealed that all have found a way to listen to learners in online course environments. The essential skill of listening in the face-to-face classroom is reimagined in the online arena by online course facilitators' practice of closely reading the submissions, posts, and textual communication of their learners. The researcher's original view

was that close reading was important as a competency to be nurtured in the learner, for the learner. However, in every interview, online course facilitators revealed that close reading was essential to their technological and pedagogical practice. Another unanticipated outcome from the research related to the amount of time that online course facilitators spend in close reading. As one facilitator explained:

> You need to learn how to read what the learner is writing. You have to interpret based on what you know about that one person and then give them feedback or ask them questions that get into what's really going on in their head. (Facilitator I9, interview, September 28, 33:42)

Conclusion 3. Effective practices when integrating mobile technology include quick responsiveness and message design. There is an intimacy with mobile technology and course facilitators promote this intimacy through quick responsiveness to learners and message design that includes individualization and personalization. Message design is the way that course facilitators present information for learners (Lohr, 2011; Wang & Shen, 2012). Instructional message design is the "manipulation and planning of signs and symbols that can be produced for the purpose of modifying the cognitive, affective or psychomotor behavior of one or more persons" (Lohr, 2011, p. 1). Previously, a majority of instructional design decisions resided with instructional design professionals. The research in this study indicates that mobile technology has had a disruptive influence on message design as course facilitators make instructional design decisions in situ. One of the messages they design is the Landscape Post, a multi-viewpoint informational text that intertwines course curriculum with learners' views (Collision et al., 2000). Through their construction of the Landscape Posts, online course facilitators describe their practice of close reading to learn from their learners. Online Course Facilitators are the

More Knowledgeable Other (Vygotsky, 1978) at first, then there is a switch and the facilitator becomes a co-learner in the virtual space of the online course.

Conclusion 4. Feedback in online continuing education courses is a multi-faceted and integral component of course communication mediated by close reading. Interviews with the online course facilitator participants and feedback is a rich, multi-part pedagogical format involving dual discourse. An unanticipated outcome of the study was the researcher's heightened view regarding new expressions of course facilitator feedback. Before the interviews, the researcher viewed feedback as a one-way assessment discourse from facilitator to the adult learner. The researcher's prior view was that feedback was an explanatory process detailing the relative merits and areas of improvement of a learner's assignment submission. Analysis of interview data supported the researcher's conclusion that feedback is not a process initiated solely for the learner and to the learner. Feedback is also a process initiated in partnership with the learner as co-participant.

Interview participants explained their pedagogical philosophy that co-participation between themselves and their learners extended beyond assessment on assignments to asynchronous discussion forums, landscape posts, group and individual email correspondence. One participant encapsulated this philosophy in the following quote, "what you bring to the course, you really bring to the course through discussions and feedback" (Facilitator N14, interview, October 4, 2016, 41:47).

Conclusion 5. The technological component of the TPaCK instructional framework includes mobile technology. Eleven out of twelve interview participants cited mobile technology either in their course access or in app utilization capacity. A majority of online course facilitators indicated an comfort with new experiences and this trend toward innovation was also found in interview responses. All interview participants reflected on their eagerness to tinker with new

technologies, and 11 out of 12 indicated that this extended to mobile technology access and use in their courses. One facilitator described the use of the use of a voice-to-text mobile app to provide quick and personalized communication to learners (Facilitator Y25, interview, October 10, 2016).

Implications from the Study

The study revealed the need for additional research to generalize and scale results among the growing population of online course educators. Combining technology use and design decisions may ensure that online faculty are properly trained in research-based pedagogies. To date, a national strategy does not exist to address the entry of mobile technology, pedagogy, and content knowledge in online courses. Although national strategies to address educational practices continue to emerge, it is often at the credit-granting institutional level where practice and education are planned, structured, and measured.

As mobile technology continues to increase, a new skill set of instructor competencies is needed. Without a scalable set of competencies, professional development for online instructors will fail to capitalize on the transfer of knowledge among co-learners. Online courses, whether they are accessible through tethered or mobile connections, sometimes feature only the function of competency attainment. While competency attainment may serve a purpose in skill-based recertification such as medical, dental, and machine-based training, professional staff development for educators requires a richer transfer of knowledge.

The online course facilitators are highly motivated individuals, often working alone from diverse locations on the time intensive task of co-creating an online learning community and reaching course curriculum goals to strengthen their learners' professional practice. The challenge for the researcher was to accurately represent the intense and time-consuming work of the online course facilitators. Through the mixed-methods of survey data, interview data, and

empirical literature, a narrative emerged among the voices of the online course facilitators. It emerged through repeated analysis of data and interview transcript and video review. From the conversations a pattern of practice began to emerge.

Many learner-centered approaches focus on mobile technology integration. New options for integration combine discussion forums, chatting, and sharing multimedia learning materials. However, many of these options focus on student learning. What is needed is a skill set to represent the views of the research participants in this study. Such a skill set would operationalize the intense work of the research participants who serve as course facilitators and the learning process they co-create with their learners. Co-creating (Sameshima, 2007) and commons-based peer-production (Benkler, 2006) are learning process that occur through a scaffolded skill set. The scaffolded skill set reflects socio-cultural attributes.

Reading information on mobile devices requires a continuous scrolling action. It is appropriate to reflect this action through an acronym to acknowledge the repeated scrolling through content on mobile screens. The acronym would serve as a new representation of the facilitators' mobile technology use, their instructional design, and their instructional choices in the TPaCK framework. Further, it would provide a useful method to operationalize in educational professional development.

The acronym known as "SCROLL" reflects the scaffolding activities used by online course facilitators to create communities of co-learners. It also represents the activities of learners who receive online course instruction and create and design artifacts to represent their concept mastery. A more complete descriptive naming convention would include the organized progression of the skill set through a checklist. The "SCROLL" mobile technology effectiveness checklist reflects six scaffolding characteristics grounded in the mixed methods research study results. The 6-point "SCROLL" mobile technology effectiveness checklist combines the results

of the quantitative 2014 Koh et al. survey, the qualitative interviews, and empirical research. It fuses technological innovation of both tethered and mobile devices with socio-cultural pedagogy with content knowledge tailored to learners' professional practice. The 6-point "SCROLL" mobile technology effectiveness checklist can be scaled for professional development. It can also be presented in a webinar format or made available as an eBook.

As synthesized from the research study findings, the SCROLL activities are:

- Scaffold instructional activity with innovative technology application in cycles of increasing competence to support learners' increasing competence and collaboration.
- Coach context-aware, conversational learning communities toward professional practice
- Respond to learners through personalized feedback, close reading, and landscape posts.
- Orchestrate quick response communication to overcome time and distance barriers.
- Leverage supplemental course content design to include mobile apps for instant use
- Link learner-initiated inquiry toward learner's professional practice mutual sharing.

Recommendations for Further Research

The research in this study explored an emerging phenomenon of increasing array of online courses accessed with mobile technology and how online course facilitators combine the areas of TPaCK, instructional design, and mobile technology in the successful learning experience for their learners. What emerged as an implication from the findings was a prevailing practice of a comprehensive 6-point scaffolding eco-system. The 6-point "SCROLL" mobile technology effectiveness checklist needs further research among participant groups of online course facilitators to see if it can be scaled as a professional development module option.

To determine if the results of this research are consistent in other settings, more research with additional or larger groups of online course facilitators at PBS TeacherLine and other online course providers might be helpful to strengthen correlative conclusions. Further research into the

combination of the TPaCK instructional framework, design thinking, and mobile technology in other onground higher education environments could also be considered.

The participants in this study were mid-career level educators who also had decades of experiences in face-to-face classroom environment. As demand increases for more online course offerings, it is predictable that additional course instructors will be hired who may not have face-to-face course teaching experience. Of interest to human resource professionals tasked with hiring would be the requisite skills needed in the job descriptions of future online course instructors. Additional research is needed to indicate if a lack of a face-to-face instructional reference point impacts the potential success of online course facilitators' ability to combine components of mobile technology, design, and the TPaCK instructional framework.

Further areas of study might include the intergenerational practices of course facilitators. Every course facilitators in this study described high levels of technological acumen, trouble-shooting ability, willingness to tinker, and tolerance for uncertainty and making mistakes. Every course facilitator in the study exceeded the age of "millennials". Their technological skills far exceeded those in younger generations. Further research is needed to ascertain whether the participant group's technological attitudes are representative of all online course facilitators or an outlier group of the 2.5% of innovators or 13.5% of early adopters (Rogers, 2010).

The study participants completed a survey and a random group described the ways in which they used rich and detailed feedback to transfer knowledge and deepen student-driven inquiry. What emerged from the research was the course instructors' practice of close reading for context clues in the posts of learners and designing this information as supplemental course content for mobile technology access. The process of close reading and creating detailed feedback learning products such as Landscape Posts is time-intensive. Further research is needed to determine if the detailed feedback through email, discussion posts, and landscape posts

contributes to learner completion of courses. Also, does the community created through the feedback and transfer of knowledge interplay serve an incentive for learners to enroll in future online courses? Results from these future research studies would help online course providers such as PBS TeacherLine continue to compensate online course facilitators at either the current price point or at a price point increase. Results from this future research would also inform an understanding of the revenue streaming potential of online courses mediated with mobile technology.

Chapter Summary

> The only thing I could probably add is that I learn so much. You'd think that all this content would just be overwhelming and reading everything, and you think you know everything. But I always learn something… I learn so much being a facilitator, beyond just, you know, being able to share ideas and things, that I am a learner as well as a facilitator I think that's the key right there.
>
> - Facilitator G7, interview, September 24, 2016, 33:10

Teachers, learning media specialists, instructional coordinators, and administrators are enrolling in online continuing education courses in increasing numbers (Ross-Gordon et al., 2016). These courses provide enhanced professional skills, continuing education credits, hours for professional development, renewal, salary scale points, highly qualified requirements, and recertification. However, just because online education is growing does not mean that courses and learning experiences should be hastily combined without regard to the delicate balance of teaching and learning online. Disingenuous procedures and approaches to online education result in low course completion rates and disaffected students. One disingenuous procedure is digitizing and uploading content from face-to-face courses without regard to the design features

needed for the online course environment. Another disingenuous process is underestimating the time and cost involved to develop the skill set necessary for online course facilitation. The growth of mobile technology continues to impact online instruction. An integrative approach to the practice of teaching online that is less tool specific and more pedagogically defined and systematic is needed.

Successful practices by online course facilitators who combine technological, pedagogical, content knowledge (TPaCK) with instructional design decisions, and mobile technology have the effect of producing digital pedagogues who "integrate technology and pedagogy and be more interactive teachers using the latest technologies (Maor, 2016). Creating online learning spaces where the identity roles of instructor and learner transform to co-learners is a time-intensive professional development experience. One of the quotients that remained to be discovered was "whether the challenge of the problem [was] matched by availability of resources" (Teague, 1965, p. 57).

Using survey data provided by 33 adults who facilitate online continuing education courses for PBS TeacherLine and 12 in-depth, semi-structured interviews of participants who were randomly chosen from the survey group, the study examined the perceptive associations between the TPaCK instructional framework, instructional design decisions, and mobile technology use among the course facilitators. The profile of the course facilitators who successfully combine online, mobile technology involves using the TPaCK instructional framework to design supplemental course content and scaffold instruction.

The research conclusions indicate that online course facilitators integrate technological, pedagogy, and content knowledge, make design decisions for both mobile and digital access, and utilize mobile technology in their online courses. These conclusions provide additional evidence that suggests the extensive role of scaffolding toward continuous course participation by learners

in online courses. A suggested effectiveness checklist reflecting the study's conclusions emerged from the analysis of quantitative survey data and qualitative interview days. The effectiveness checklist provides a cost-effective strategy to scale for the professional development and continuing education of pre-service and developing online course instructors. The design and scaffolding processes of the study participants can be scaled for cost-effective professional development.

A 6-part scaffolding framework for professional development was developed based on the conclusions from the research study and reinforced by socio-cultural literature of constructionist and constructivist learning. The working title and acronym of this professional development framework reflects a common activity of scrolling. This activity is associated with and inherent to the use of mobile devices. The "SCROLL" mobile technology effectiveness checklist is the acronym that emerged from the mixed methods research of the study.

The "SCROLL" mobile technology effectiveness checklist reflects the main activity of accessing content through mobile device. Scrolling is also an activity used with tethered, computer-mediated instruction so there are links to include many types of learning technologies. Each letter of the word "SCROLL" relates an activity, supported from the research of this study, to support learning with mobile and digital devices. These six checklist components were distilled from the survey and interview responses from online course facilitators in continuing education courses at PBS TeacherLine.

As synthesized from the study, the six "SCROLL" mobile technology effectiveness checklist activities are:

- Scaffold instructional activity with innovative technology application in cycles of increasing competence to support learners' increasing competence and collaboration.
- Coach context-aware, conversational learning communities toward professional practice

- Respond to learners through personalized feedback, close reading, and landscape posts.
- Orchestrate quick response communication to overcome time and distance barriers.
- Leverage supplemental course content design to include mobile apps for instant use
- Link learner-initiated inquiry toward learner's professional practice mutual sharing.

Previous research addressed what instructors did to content and for learners. Devoid of the pressure of teaching to the test, online course facilitators in the study were able to teach to individual needs of each learner through quick responsiveness, personalized message design, and close reading of learners' communication. The outcome was a partnership with the learner that strengthen learner-driven engagement toward the specific needs in the learners' professional practice.

The application of this study to professional practice endeavored to highlight the value of a socio-cultural community of co-learners (Polin & Moe, 2015, Riel & Polin, 2004; Sameshima, 2005; Wenger, 1998; Wenger et al., 2015). This community of co-learners emerges and grows throughout the duration of the course. The growth and continuation of the community is mediated by the instructional decisions learning opportunities mediated with mobile and digital technology and the strength of the communicative ties among the course participants (Polin & Moe, 2015; Riel & Polin, 2004; Wenger, 1998). These instructional decisions are first made by online course facilitators and then extended to online course participant learners as they make connections to their professional practice and create new constructionist products to demonstrate learning and transform their instructional practice. The community often continues after the online course reaches its official conclusion date and may extend to a landscape of practice (Wenger et al., 2015) where the practitioner "understands not just her own practice, but a good bit about those practices that impact hers" (Wenger et al., 2015, p. 2).

The intent of the research was to highlight a tangible way to combine pedagogical theory with the practices of online course facilitators in online continuing education courses. The findings and conclusions of the study promote new avenues for further research on the efficacy of the "SCROLL" mobile technology effectiveness checklist. The findings and conclusions of the study suggest further research on the scalability of new practices for educational professional development that include blended learning environments.

The results of the study reinforce additional online and mobile elements that emphasize current instructional practices among a group of online course facilitators in online, continuing education courses. The results of the study present what can be co-created with learners in online courses mediated by mobile technology, instructional design, and the TPaCK instructional framework.

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APPENDIX A

Example of Landscape Post

Thinking About Connections

This week we address the topic of whether the rich variety of Makerspace resources prompts teachers to think differently about constructing products. We agree unanimously that the University Makerspace is a treasure chest of resources, tools, machines, helpers, whiteboards, media, and information.

Several key concepts reappear with commonality among your posts, even though we do not all teach at the same campus. Resources matter. How we reflect on them and the questions we ask matters too. Kholo writes, "Reading the chapters in a textbook has its place in providing a general overview of a subject. But when I create products in the Makerspace, I think I learn so much more by asking questions. One question I have is 'How do I timeline for an activity that is messy, uneven, and time-consuming?'"

Order of operation is a key component of mathematics instruction...and, it appears to also play a role in new concept integration too. Burton addressed this potential issue in his reply post, "it is important to consider that in our classrooms, both online and face-to-face, we may have students who prefer 'big picture' first and some who prefer 'investigation first'...And there are probably several variants in between!"

Prior knowledge is the superhighway to the "Ah-Ha" moment because they help us construct our own meaning. Bertie explains, "These Maker Guild activities open up a lot of 'teachable moments' which we obviously cannot put into lesson plans." Cecelia offers, "When teaching students something new, I think you need to teach them to think about context – when, where, and why an event is taking place – and activate their prior knowledge as well. I know that will help me as I sew my CosPlay costume."

Talking with others about learning something new necessitates active "meaning making" that promotes more engagement and retention. Pam extends on this idea, "It leads the observer to create their own conclusions and connections instead of just reading about the subject in a textbook and absorbing what someone else thinks."

Let's go a little bit deeper and reflect on Kholo's question: "how do {we} plan a timeline for an activity that is "messy, uneven, time consuming and thrilling?

Looking forward to learning from your responses!

APPENDIX B

TPACK Assessment, Koh et al., (2014)

A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK).

Table 1. Descriptive statistics, factor loadings, and communality for the survey items.

Items	Mean	SD	Factor loading	Communality
Technological pedagogical content knowledge (TPACK, M = 4.64, SD = 1.25)				
TPACK1 – I can formulate in-depth discussion topics about the content knowledge and facilitate students' online collaboration with appropriate tools (e.g. Google Sites, CoveritLive).	4.52	1.36	0.88	0.77
TPACK2 – I can craft real-world problems about the content knowledge and represent them through computers to engage my students.	4.61	1.38	0.87	0.76
TPACK3 – I can structure activities to help students to construct different representations of the content knowledge using appropriate ICT tools (e.g. Webspiration, Mindmaps, Wiki).	4.46	1.41	0.95	0.90
TPACK4 – I can create self-directed learning activities for the content knowledge with appropriate ICT tools (e.g. Blog, Webquest).	4.57	1.36	0.92	0.85
TPACK5 – I can design inquiry activities to guide students to make sense of the content knowledge with appropriate ICT tools (e.g. simulations, web-based materials).	4.42	1.43	0.90	0.81
TPACK6 – I can design lessons that appropriately integrate content, technology and pedagogy for student-centred learning.	Removed from analysis			
Lesson design practices (LDP, M = 5.08, SD = 1.08)				
LDP1 – When designing an ICT lesson, I start by playing with a few lesson ideas.	5.05	1.23	0.89	0.79
LDP2 – When designing an ICT lesson, I consider several lesson ideas to see if they adequately address students' learning problems before choosing one idea.	5.11	1.24	0.91	0.83
LDP3 – When designing an ICT lesson, I allow conflicting lesson ideas to coexist until I feel that I have adequately understood the learning problems.	4.79	1.26	0.87	0.76
LDP4 – When designing an ICT lesson, I continually refine my lesson ideas as I develop new understandings throughout the design process.	5.12	1.26	0.94	0.88
LDP5 – When designing an ICT lesson, I consider the consequences of adopting particular lesson ideas before working out its details.	5.09	1.20	0.93	0.86
LDP6 – When designing an ICT lesson, I am prepared to completely change my lesson ideas if needed.	5.00	1.36	0.75	0.56
Design dispositions (DD, M = 5.29, SD = 0.94)				
DD1 – I am comfortable with the presence of uncertainty.	Removed from analysis			
DD2 – I am open to new experiences.	Removed from analysis			
DD3 – I am comfortable to explore conflicting ideas.	5.38	0.98	0.90	0.81
DD4 – I am comfortable to deviate from established practices.	5.35	1.06	0.85	0.72
DD5 – I am comfortable with occasional failures from trying out new approaches for ICT lessons.	5.16	1.09	0.80	0.64
DD6 – I am constantly seeking to turn constraints into opportunities.	5.26	1.12	0.85	0.73

APPENDIX C

Informed Consent

{Date}

Dear [redacted]

You are invited to participate in a research study conducted by Helen Teague, a current doctoral student in Learning Technologies at Pepperdine University and Dr. Jack McManus, Doctoral Committee Chair. Your participation is voluntary. Before you decide whether to participate, please take some time to read the information below. Please feel free to email any questions to at helen.teague@pepperdine.edu.

PURPOSE OF THE STUDY: My study is designed to investigate selected online course facilitators' perceptions of their lesson design practices and whether or not they include mobile technology in their courses.

PARTICIPANT INVOLVEMENT: If you agree to voluntarily to take part in this study, you will be asked to click on a link or scan a QR-code to go to a multiple-choice question, online survey with 18 questions. It should take approximately 10-20 minutes to complete the survey. Please complete the survey alone in a single setting.

PARTICIPATION AND WITHDRAWAL: Your participation is voluntary and you may refuse to participate and/or withdraw your consent and discontinue participation in the survey at any time by sending an email to me at helen.teague@pepperdine.edu. After completing the survey, you may also withdraw your consent at any time and discontinue participation.

CONFIDENTIALITY: There will be no identifiable information obtained in connection with this study. Your name, email address, course(s) you teach and/or other identifiable information will not be collected. Therefore, your identity will not be associated with your responses. The results of this research study may be published, but only reported as an aggregate summary of the group data collected. Pepperdine's University's Human Subjects Protection Program (HSPP) may also access the data collected. The HSPP occasionally reviews and monitors research studies to protect the rights and welfare of research subjects.

INVESTIGATOR'S CONTACT INFORMATION: My contact information is Helen Teague: helen.teague@pepperdine.edu. You may also contact Dr. Jack McManus, Dissertation faculty chairperson for this research at (redacted).

RIGHTS OF RESEARCH PARTICIPANT – IRB CONTACT INFORMATION: If you have questions, concerns or complaints about your rights as a research participant or research in general please contact Dr. Judy Ho, Chairperson of the Graduate & Professional Schools Institutional Review Board at Pepperdine University 6100 Center Drive Suite 500, Los Angeles, CA 90045.

Sincerely,

Helen Teague
Doctoral Student, Pepperdine Graduate School of Education and Psychology

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I understand that the investigator is willing to answer any inquiries I may have concerning the research herein described. I understand that I may contact Helen Teague at helen.teague@pepperdine.edu or [redacted] or if I have any other questions or concerns about this research. I acknowledge that I have read and understand what participation in the study entails. By selecting "Yes," I consent to participate in the survey and am ready to begin. If you decline participation within the survey, please feel free to close this email or select "No, I decline to participate".

- ❍ Yes, I consent to participate. Please take me to the survey.
- ❍ Yes, I consent to also participate in a follow-up interview.
- ❍ No, I decline participation.

QR Code Image Box –

QR Code deactivated following data collection

APPENDIX D

Authorization for the Use of Survey Instrument

Helen Teague, MEd.
Pepperdine University
Doctoral Student, Learning Technologies

2/22/2016 **PERMISSION: TO USE AN EXISTING SURVEY**

Dr. KOH Hwee Ling Joyce
Nanyang Technological University, Singapore
[redacted]

Dear Dr. Koh

From our previous emails, you may recall that I am a doctoral student from Pepperdine University and that I am writing my dissertation tentatively titled, "Implications of TPACK and Design Dispositions in online course content design and evaluation: An explanatory mixed methods study" under the direction of my dissertation committee chaired by Dr. Jack McManus.

This letter requests formal approval to reproduce and use your survey instrument "A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK)" in my research study and eventual dissertation. I would like to use and print your survey under the following conditions:

- I will use this survey only for my research study and will not sell or use it with any compensated or curriculum development activities.
- I will include the copyright statement on all copies of the instrument.
- I will send my research study and one copy of reports, articles, and the like that make use of these survey data to your attention.

If these are acceptable terms and conditions, please indicate so by signing one copy of this letter and returning it to me either through fax or email.

Sincerely,
Helen Teague
Doctoral Student
helen.teague@pepperdine.edu FAX [redacted]

Signature & Date: Joyce Koh 10 March 2016

Citation: Koh, J. H. L., Chai, C. S., Hong, H. Y., & Tsai, C. C. (2015). A survey to examine teachers' perceptions of design dispositions, lesson design practices, and their relationships with technological pedagogical content knowledge (TPACK). *Asia-Pacific Journal of Teacher Education*, 43(5), 378-391.

APPENDIX E

IRB Approval Letter

PEPPERDINE

Pepperdine University
24255 Pacific Coast Highway
Malibu, CA 90263
TEL: 310-506-4000

NOTICE OF APPROVAL FOR HUMAN RESEARCH

Date: August 15, 2016

Protocol Investigator Name: Helen Teague

Protocol #: 16-07-341

Project Title: A MIXED METHODS STUDY OF ONLINE FACILITATORS' PERCEPTIONS OF MOBILE TECHNOLOGY, DESIGN, AND TPaCK AFFORDANCES

School: Graduate School of Education and Psychology

Dear Helen Teague:

Thank you for submitting your application for exempt review to Pepperdine University's Institutional Review Board (IRB). We appreciate the work you have done on your proposal. The IRB has reviewed your submitted IRB application and all ancillary materials. Upon review, the IRB has determined that the above entitled project meets the requirements for exemption under the federal regulations 45 CFR 46.101 that govern the protections of human subjects.

Your research must be conducted according to the proposal that was submitted to the IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit an amendment to the IRB. Since your study falls under exemption, there is no requirement for continuing IRB review of your project. Please be aware that changes to your protocol may prevent the research from qualifying for exemption from 45 CFR 46.101 and require submission of a new IRB application or other materials to the IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite the best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the IRB as soon as possible. We will ask for a complete written explanation of the event and your written response. Other actions also may be required depending on the nature of the event. Details regarding the timeframe in which adverse events must be reported to the IRB and documenting the adverse event can be found in the *Pepperdine University Protection of Human Participants in Research: Policies and Procedures Manual* at community.pepperdine.edu/irb.

Please refer to the protocol number denoted above in all communication or correspondence related to your application and this approval. Should you have additional questions or require clarification of the contents of this letter, please contact the IRB Office. On behalf of the IRB, I wish you success in this scholarly pursuit.

Sincerely,

Judy Ho, Ph.D., IRB Chairperson

APPENDIX F

Koh et al. Survey Questions Post Pilot Study

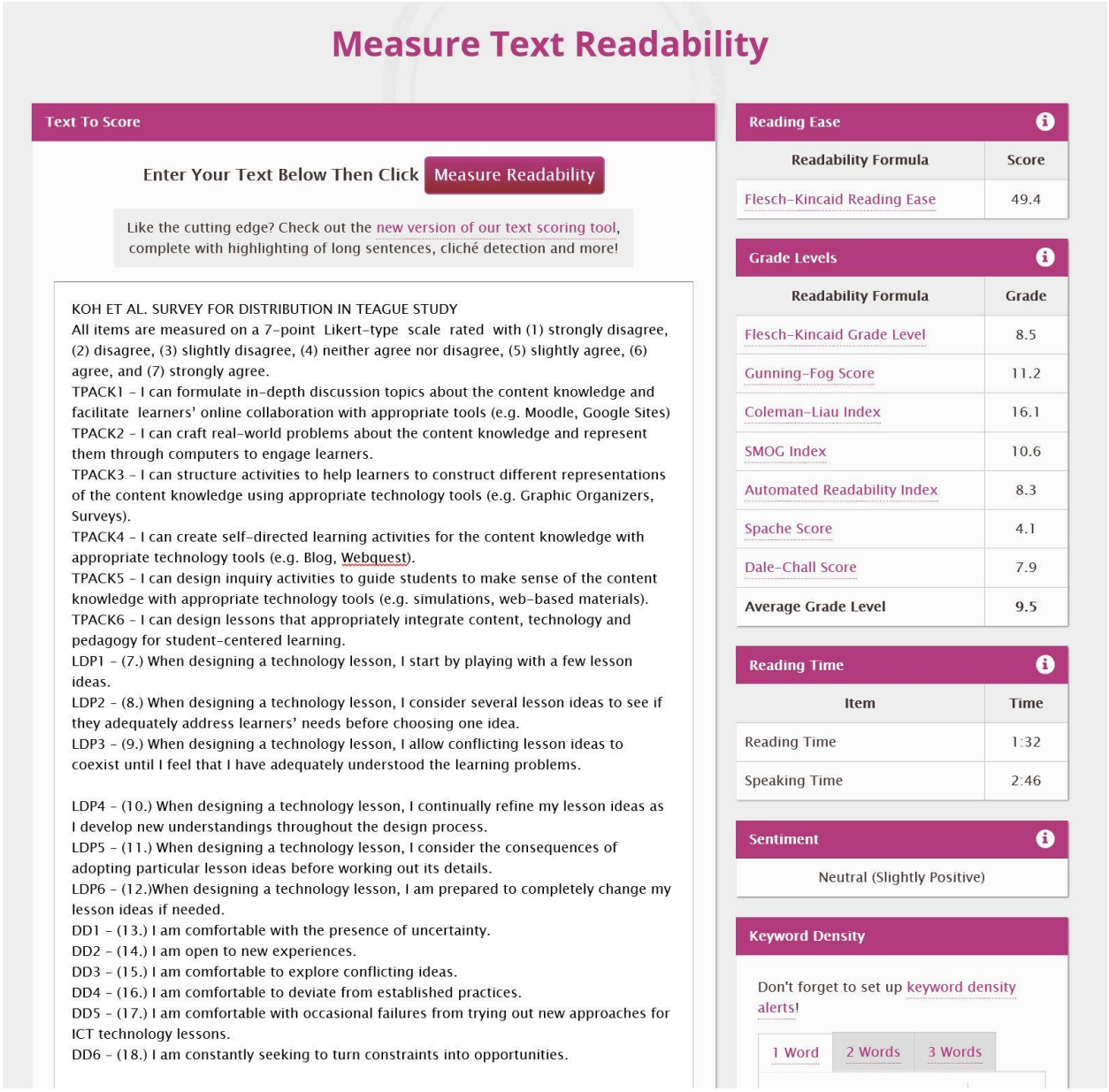
TPACK1 – I can formulate in-depth discussion topics about content and help learners' with appropriate tools (e.g. Moodle, Google Sites)
TPACK2 – I can craft and represent real-world problems that relate to course content in order to engage learners.
TPACK3 – I can structure activities to help learners construct different representations of content knowledge using appropriate technology tools (e.g. Graphic Organizers, Surveys).
TPACK4 – I can create self-directed learning activities for content knowledge with appropriate technology tools (e.g. Blog, Webquest).
TPACK5 – I can design inquiry activities to guide learners to make sense of content knowledge with appropriate technology tools (e.g. PBL, simulations).
TPACK6 – I can design lessons that appropriately integrate content, technology, and pedagogy for learner-centered learning.

LDP1-(7.) When designing a technology-enhanced lesson, I start by considering a few lesson ideas.
LDP2 – (8.) When designing a technology-enhanced lesson, I consider several lesson ideas to see if they adequately address learners' needs before choosing one idea.
LDP3 – (9.) When designing a technology-enhanced lesson, I allow conflicting lesson ideas to coexist until I feel that I have adequately understood the learning problems.
LDP4 – (10.) When designing a technology-enhanced lesson, I continually refine my lesson ideas as I develop new understandings throughout the design process.
LDP5 – (11.) When designing a technology-enhanced lesson, I consider the consequences of adopting particular lesson ideas before working out details.
LDP6 – (12.) When designing a technology-enhanced lesson, I am prepared to completely change my lesson ideas if needed.

DD1 – (13.) I am comfortable with the presence of uncertainty.
DD2 – (14.) I am open to new experiences.
DD3 – (15.) I am comfortable to explore conflicting ideas.
DD4 – (16.) I am comfortable to deviate from established practices.
DD5 – (17.) I am comfortable with occasional failures from trying out new approaches for technology-enhanced lessons.
DD6 – (18.) I am constantly seeking to turn constraints into opportunities.

APPENDIX G

Koh et al., 2014 Survey Readability Report



Measure Text Readability

Text To Score

Enter Your Text Below Then Click Measure Readability

Like the cutting edge? Check out the new version of our text scoring tool, complete with highlighting of long sentences, cliché detection and more!

KOH ET AL. SURVEY FOR DISTRIBUTION IN TEAGUE STUDY
All items are measured on a 7-point Likert-type scale rated with (1) strongly disagree, (2) disagree, (3) slightly disagree, (4) neither agree nor disagree, (5) slightly agree, (6) agree, and (7) strongly agree.
TPACK1 - I can formulate in-depth discussion topics about the content knowledge and facilitate learners' online collaboration with appropriate tools (e.g. Moodle, Google Sites)
TPACK2 - I can craft real-world problems about the content knowledge and represent them through computers to engage learners.
TPACK3 - I can structure activities to help learners to construct different representations of the content knowledge using appropriate technology tools (e.g. Graphic Organizers, Surveys).
TPACK4 - I can create self-directed learning activities for the content knowledge with appropriate technology tools (e.g. Blog, Webquest).
TPACK5 - I can design inquiry activities to guide students to make sense of the content knowledge with appropriate technology tools (e.g. simulations, web-based materials).
TPACK6 - I can design lessons that appropriately integrate content, technology and pedagogy for student-centered learning.
LDP1 - (7.) When designing a technology lesson, I start by playing with a few lesson ideas.
LDP2 - (8.) When designing a technology lesson, I consider several lesson ideas to see if they adequately address learners' needs before choosing one idea.
LDP3 - (9.) When designing a technology lesson, I allow conflicting lesson ideas to coexist until I feel that I have adequately understood the learning problems.

LDP4 - (10.) When designing a technology lesson, I continually refine my lesson ideas as I develop new understandings throughout the design process.
LDP5 - (11.) When designing a technology lesson, I consider the consequences of adopting particular lesson ideas before working out its details.
LDP6 - (12.)When designing a technology lesson, I am prepared to completely change my lesson ideas if needed.
DD1 - (13.) I am comfortable with the presence of uncertainty.
DD2 - (14.) I am open to new experiences.
DD3 - (15.) I am comfortable to explore conflicting ideas.
DD4 - (16.) I am comfortable to deviate from established practices.
DD5 - (17.) I am comfortable with occasional failures from trying out new approaches for ICT technology lessons.
DD6 - (18.) I am constantly seeking to turn constraints into opportunities.

Reading Ease

Readability Formula	Score
Flesch-Kincaid Reading Ease	49.4

Grade Levels

Readability Formula	Grade
Flesch-Kincaid Grade Level	8.5
Gunning-Fog Score	11.2
Coleman-Liau Index	16.1
SMOG Index	10.6
Automated Readability Index	8.3
Spache Score	4.1
Dale-Chall Score	7.9
Average Grade Level	**9.5**

Reading Time

Item	Time
Reading Time	1:32
Speaking Time	2:46

Sentiment

Neutral (Slightly Positive)

Keyword Density

Don't forget to set up keyword density alerts!

1 Word | 2 Words | 3 Words