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Transforming Traditional Practices Of Teacher Preparation To Meet Changing Needs Of Digital Learners: A First Step Intervention By Assessing And Addressing Needs Of Pre-Service Teachers In A Dual Learning Environment

Susan Poyo

TRANSFORMING TRADITIONAL PRACTICES OF TEACHER PREPARATION TO MEET CHANGING NEEDS OF DIGITAL LEARNERS: A FIRST STEP INTERVENTION BY ASSESSING AND ADDRESSING NEEDS OF PRE-SERVICE TEACHERS IN A DUAL LEARNING ENVIRONMENT

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ABSTRACT

TRANSFORMING TRADITIONAL PRACTICES OF TEACHER PREPARATION TO MEET CHANGING NEEDS OF DIGITAL LEARNERS: A FIRST STEP INTERVENTION BY ASSESSING AND ADDRESSING NEEDS OF PRE-SERVICE TEACHERS IN A DUAL LEARNING ENVIRONMENT

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Changes in the field of education require teachers' acquisition of specific knowledge of technology and the skills of its effective use in the classroom. With the expansion of the traditional classroom to include virtual learning environments, concern still exists regarding characteristics necessary for quality teaching and learning.

This research is an examination of pre-service teachers' needs relevant to integrating technology in an online learning environment. It is a first step toward acknowledging the responsibility teacher preparation programs have in the formation of educators equipped to instruct in dual learning environments, thus providing pre-service teachers with opportunities and experiences to become fluent in the technological pedagogical content knowledge (TPACK) required for online learning environments as well as the traditional face-to-face instruction.

The purpose of this study was to determine if active engagement with content of an online instruction module would affect the attitudes, knowledge and skills, and instructional centeredness of pre-service teachers' towards technology integration in an online learning environment. A mixed-methods concurrent triangulation design procedure was utilized to measure characteristics of pre-service teachers in a teacher preparation program. A two-way within-subjects analysis of variance was conducted to evaluate the effect of engagement with the content of the online instruction module for all three domains. Participants began the intervention with limited knowledge and skills of technology integration and online learning environments; however, they made statistically significant gains upon completion of the intervention. The implementation of an intervention such as this online instruction module may support other teacher preparation programs in identifying strengths and weaknesses of their pre-service teachers and provide valuable information necessary to guide program goals.

DEDICATION

"My soul proclaims the greatness of the Lord

and my spirit rejoices in God my savior". Luke 1:46, 47

This is dedicated to my family, the Rickes, Poyos, Gallos, Hoyts, Scofields, and Smyths, for their unwavering support and to the Lord who is my strength and my salvation. For the many times you recognized the need to listen, pray, support, and be "second"…I love you all and thank you! You will always be THE greatest accomplishment. All glory be to the Father, to the Son and to the Holy Spirit.

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To Vicky Perry and Kathy McVey for seeing something in me worth investing in! My journey completely changed (for the better) because of your forward thinking, vision, and mentoring.

Finally, I am most grateful for my students…THIS is for you!

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LIST OF ABBREVIATIONS

APA	American Psychological Association
CAEP	Council for the Accreditation of Educator Preparation
CCR	College and Career Readiness
CCSS	Common Core State Standards
EPP	Educator Preparation Program
ICT	Information and Communication Technologies
iNACOL	International Association for K-12 Online Learning
INTASC	Interstate Teacher Assessment and Support Consortium
ISTE	International Society for Technology in Education
LMS	Learning Management System
PK-12	Pre-kindergarten through 12th grade
NCATE	National Council for Accreditation of Teacher Education
NEA	National Education Association
R2T	Race To The Top
SAMR	Substitution Augmentation Modification Redefinition
SREB	Southern Regional Education Board
TAM	Technology Acceptance Model
TIM	Technology Integration Matrix
TPACK	Technological Pedagogical and Content Knowledge

Chapter I

Introduction

Technology affords us the opportunity to present education and promote learning in a variety of contexts and classroom environments. Integration of technology within the PK-12 classrooms, both face-to-face and online, has been a focus for studies considering the positive impact technology leverage may have on student learning (Knezek and Christensen, 2008). Technology integration may be defined as the situated use of technology as "…an integral part of a course or program of study and not an add-on…when the use of technology is not separate from the content to be learned but embedded in it" (Abrami, p. 29). National attention to the presence of technology in all classrooms, regardless of the venue, and the immediate need for communication skills development in education is evidenced by structural and systematic reforms such as Race To The Top (R2T), Common Core State Standards (CCSS), and College and Career Readiness (CCR). These initiatives have been proposed and are currently being implemented to address the changing needs of the global society. Race To The Top is a series of contests with the intention of encouraging development and reform among K-12 schools throughout the country by awarding grants to advance state and district initiatives in education (US Department of Education, 2013). The Common Core State Standards is an initiative that highlights educational reform through the implementation of national standards designed to provide rigorous expectations of student achievement. Included in these standards is an emphasis on critical analysis and production of media and technology (NGA Center & CCSSO, 2012). Coupled with College and Career Readiness standards, students achieving these criterion will be prepared with the skills and knowledge needed to meet the needs of the 21st century workforce for our global society (NGA Center & CCSSO, 2012).

Current Perspective

Educators are asked to prepare students with the knowledge and skills needed to become contributing citizens to the global society of the time. The current perspective in education resulting from the national initiatives of R2T, CCSS and CCR includes concentrated efforts to equip students with skills in communication, creative problem solving, critical thinking, creativity and collaboration (NEA, n.d.; NGA Center & CCSSO, 2012; P21, 2015). Information and communication technology (ICT) use in education is foundational to effective teaching and learning in both higher education and K-12 environments (AACTE, 2010; AACTE, 2013). While educational technology has gained global acceptance and adoption is increasing steadily (AACTE, 2013), the degree to which these technologies are being used effectively has been questioned (Gronseth, Brush, et al., 2010; Koenig, 2011).

A decade ago, research indicated that neither pre-service teachers nor in-service teachers were being adequately prepared with resources and instruction to integrate technology in their teaching (Laffey, 2004; Plair, 2008). This issue persists as researchers continue to report hesitancy and uncertainty regarding technology integration (Archambault, 2011; Gronseth et al., 2010; Kovalik, Kuo and Karpinski, 2013) and a deficiency in the ability to create student-centered lessons (O'Connor, 2010). Although most teacher preparation programs (Anderson, 2006; Gronseth et al., 2010; Kleiner, Thomas and Lewis, 2007; Lambert and Gong, 2010) address educational technology integration with a required course in technology, pre-service teachers indicate a need for additional support (Stryker, 2012). Similarly, preparation for teaching in an online learning environment and the integration of technology required for this classroom space is a relatively new area of research. Although little is known about teacher preparation for this environment (Archambault, 2011;

Archambault and Larson, 2015) there are limited studies providing information of certificate programs at the postgraduate level and professional development by online education providers (Archambault, DeBruler and Freidhoff, 2014; Archambault and Larson, 2015; Barbour et al., 2013; Glass 2009) but is rarely present at the undergraduate level (Barbour et al., 2013). Teacher preparation programs must address classroom settings that include alternatives to the traditional learning environment (Archambault and Crippen, 2009b; Barbour et al., 2013; Rice and Dawley, 2009).

In addition to a deficit in preparation, barriers exist which prohibit or restrict use of technology in instruction (Ausband, 2006; Ertmer, 2005; Kovalik, Kuo and Karpinski, 2013) including lack of resources and professional development. In particular, there has been a proliferation of resistive attitudes toward the use of educational software, hardware, and Internet resources for instructional purposes (Cleveland-Innes & Sangra, 2010). Similarly, there exists a misconception within the education community about the authenticity of the educational experience an online classroom may provide (Kennedy and Archambault, 2012).

In response to the need for appropriate preparation of pre-service teachers with the knowledge and skills necessary to integrate technology, recommendations have been made to integrate technology throughout the teacher preparation program (Balgalmis, et al., 2012; Koh and Divaharan, 2011; Foulger et al., 2013: Laffey, 2004; Lambert, Gong, and Cuper, 2008) to strengthen the relationship between technology and pedagogy within the content area, or technological pedagogical content knowledge, (Brush and Saye, 2009; Poyo, S., Wilson, B., & Carbonara, D.D., 2013). This is a call for more emphasis on technology integration within courses other than the required techno centric technology course. These courses tend to include intentionally designed, technology-rich experiences embedded within the teacher preparation

program to provide pedagogical connections with the content knowledge and technology knowledge. Additionally, researchers (Koh and Divaharan, 2011) suggest an emphasis on application of technology proficiencies with subject-focused pedagogical modeling.

Pre-service teachers enrolled in teacher education programs benefit from a variety of recommended technology integration models, including explicit instruction of technology use in the context of discipline specific content, research based pedagogy, and an awareness of the learner's individual needs (Niess, 2008; Baran, Coreia, and Thompson, 2013). Learning environments can be created to include strategic, intentional and authentic use of technology to enhance the content for the learner. Because teachers tend to teach the way they were taught (Lee, 2008), it is conceivable that attention to curriculum design in teacher preparation programs focused on providing rich learning experiences promoting 21st century learning skills of creativity, collaboration, communication, and critical thinking (NEA; P21) and the modeling and observation of technology-rich learning environments (Kovalik, Kuo and Karpinski, 2013) would result in a positive step towards achieving our national educational goals while capitalizing on the affordances technology provides for non traditional pedagogy.

Changing Landscape

As researchers continue to investigate the potential for utilizing technology to increase learning, exciting and dynamic possibilities for learning environments are surfacing. The use of digital technologies is emerging in a variety of activities (Watson, Murin, Vashaw, Gemin & Ryan, 2014). Educators in brick-and-mortar schools are incorporating online resources to deliver part of the education content through instructional materials, online instruction modules, and supplemental content. This environment, blended learning, may be defined as any time a student learns at least in part at a supervised location and at least in part through

online delivery with some student control over factors such as time and place of learning (Staker and Horn, 2012).

Moreover, digital technologies are utilized as a means for delivering instruction in a completely online learning environment. Recent research indicates K-12 students want and need to participate in online and virtual courses (Allen and Seaman, 2014; Watson, Murin, Vashaw, Gemin, & Rapp, 2013). In the academic year 2013-2014, an estimated 315,000 K-12 students attended school completely online in the 30 states that offer fully online education (Watson, Murin, Vashaw, Gemin & Ryan, 2014). In that same year, 740,000 K-12 students enrolled in online supplementary courses in 26 states operating virtual schools. Recent policy changes in six states now require their students to complete an online educational experience before high school graduation (Watson, Murin, Vashaw, Gemin, & Rapp, 2013) and a recent Phi Delta Kappa Gallup poll indicates over 60% of the general public agree or strongly agree that high school students should have more opportunities to receive credit from online courses (Bushaw and Calderon, 2014).

Assessing and Addressing Needs

The movement toward improving student learning includes an intentional focus on the learning environment and creating the optimal setting for each student. Technology is being used for both the delivery and management of learning as well as the tool for achieving the learning necessary for the 21st Century. Changes in the field of education require teachers' acquisition of specific knowledge of technology and the skills of its effective use in the classroom (Koehler & Mishra, 2008) particularly as technology is utilized in both blended and online learning (Watson, Murin, Vashaw, Gemin, and Rapp, 2013). Teacher preparation programs provide a starting point for educating technologically proficient teachers (Petri, S.,

Poyo, S., McVey, K., Smith, M.L. & Pratt, K. 2015). Understanding the complexity of change in our culture and the dynamics of effective instruction, teacher preparation reflects an integration of knowledge about the learner, the context, the discipline and emerging technologies (Niess, 2008). Keeping curricular goals in mind, teachers need the knowledge of how technology may be integrated to enhance the content of a particular discipline, and the skill of using the technology purposefully rather than for the novelty. Pre-service teachers must be fluent in technology as a delivery of instruction as well as a tool for learning.

Statement of The Problem

The need for online courses in K-12 requires the addition of pre-service and licensed teachers who are equipped to instruct in this environment. Serving the rapidly increasing number of students in the online learning environment requires an addition of teachers with the knowledge and skills necessary to deliver instruction online. While much of the existing research concentrates on student learning in an online context and the quality of online learning (Means, Bakia, and Murphy, 2014) there is little awareness, discussion or research on the preparation of online teachers (Archambault and Larson, 2015; Barbour et al., 2013) particularly at the undergraduate level. To address the issue of preparing teachers for the online learning environment, graduate certification programs offering certificates in online learning, graduate certificates offered by Continuing Education, and in-service training provided by virtual schools are available. Archambault and Larson (2015) conducted a national survey of 252 K-12 online teachers, exploring how these participants were prepared to teach in an online learning environment. The percentage of teachers who received ongoing training typically by the virtual school or reported being self taught was nearly 70% and those who received training at the graduate level responded at 12.7%. "Existing pre-service teacher education initiatives

for future teachers that attempt to support K-12 online learning are faced with a variety of challenges such as a lack of research and few models to guide their development" (Barbour et al., p. 63, 2013). Additional barriers include the lack of a consistent certification process for educators across state lines. These challenges result in a professional field that is unprepared (Archambault and Larson, 2015; Barbour et al., 2013; Kennedy and Archambault, 2011) for the changing climate in learning spaces. In order to address the preparation, what do online teachers need to know about instructing in this learning environment? How can teacher preparation programs provide learning experiences to foster the characteristics necessary to effectively instruct in an online learning environment? National organizations such as iNACOL (2011) and SREB (2003) have appealed for particular preparation for delivering online instruction to include experience of the online classroom as a student. Researchers (Garrison, Anderson and Archer, 1999; Hanover, 2009; Moore, 1997; Samora, 2013; Savery, 2005; Vaughn, 2010) have identified the need for new forms of communication, engagement and assessment to exist in the online learning environment. Additionally, affective characteristics and intentional relationship building in an online learning environment (Cleveland-Innes and Garrison, 2010; Devine, Fahie and McGilicuddy, 2013) must be present to address the potential sense of personal and social isolation in the online environment (Martin and Noakes, 2012; Palloff and Pratt, 2011). For this reason, researchers have called for educators in K-12 environments to be prepared to facilitate learning online (Archambault, 2011; NEA, n.d.; Rice et al., 2008; Rice and Dawley, 2009; Kennedy and Archambault, 2012; Gunter and Gunter, 2014). In the publication *Guide To Teaching Online Courses,* the National Education Association implores all teacher education programs include instruction in online education and all accreditation organizations assess these programs in their competency to

equip future educators to teach in a virtual learning environment (NEA, n.d.). Research on preparing K-12 teachers to instruct in virtual contexts is limited even though online learning is rapidly becoming a central focus for instructional technology (Means, Toyama, Murphy, Bakia, and Jones, 2009).

A 2012 national survey of faculty and administrators in teacher preparation programs across the country performed by Kennedy and Archambault (2012) revealed a reluctance and absence of motivation toward pursuing online educational experiences for their pre-service teachers. In this study, it was found that a mere 1.3% of educator preparation programs were planning or addressing the need to prepare teachers for the next generation of online and blended learning environments by providing field experience within the virtual classroom. Preparation for the online learning environment has not become part of the mainstream, traditional teacher preparation program (Barbour et al., 2013; Petri, S., Poyo, S., McVey, K., Smith, M.L. & Pratt, K. 2015; Kennedy and Archambault, 2012; Norton and Hathaway, 2013).

Purpose of the Study

The purpose of this study was to determine if active engagement with content of an online instruction module would affect pre-service teachers' attitudes, knowledge and skills, and instructional centeredness towards technology integration in an online learning environment. Providing an opportunity to participate and develop within an online community of learners is important for developing the perspective and awareness of instruction in this learning environment. It was therefore the goal of this study to assess and address the needs of pre-service teachers situated in a paradigm of education that transcends the traditional face-to-face instruction to include the online component of learning and instruction.

Significance of the Study

This research addresses characteristics of pre-service teachers in a teacher preparation program. It is an examination of pre-service teachers' attitudes, knowledge and skills and teaching centeredness relevant to integrating technology in an online learning environment. It is a first step towards preparing pre-service teachers for transformational changes in education brought on in part by the continued development of technology and the changing needs of today's learner. The digital age of technology affords pedagogical practices that were not possible prior to its evolution. Traditional practices of teaching were designed for an industrial age that is no longer prevalent; therefore transformation in preparation is essential. This research is the beginning of a movement to acknowledge the responsibility teacher educators have for training pre-service teachers to be fluent in dual learning environments, to integrate technology effectively in both blended and online learning environments. Taking a programmatic approach to the integration of technology and attention to a variety of learning environments in teacher preparation may provide important gains in educating our nation.

Chapter II

Literature Review

Chapter two discusses and reviews the literature as it pertains to the three domains of characteristics evidenced in pre-service teachers, particularly as they relate to online learning environments. These three domains include attitude, knowledge and skills toward technology integration, and instructional centeredness. Attitude, knowledge and skills are situated in Blooms taxonomy and may be thought of as goals of the learning process. Attitude represents the affective domain of learning (Bloom, 1956) associated with emotional areas and feelings. Knowledge is situated in the cognitive and is evidenced by intellectual skills (Bloom, 1956) while skills may be considered the psychomotor or physical skills. The collective works of theorists such as Dewey, Piaget, Vygotsky, and Montessori direct us to an understanding of how students learn, thus how teachers may teach most effectively with the students in mind. These areas will be discussed further within each of the domains of this research.

The goal of this research is to determine the effects of an intervention on characteristics of pre-service teachers enrolled in a teacher preparation program relative to attitudes, knowledge and skills toward technology integration, and instructional centeredness in an online learning environment. This study is designed to answer the following research questions:

RQ1. In a teacher preparation program, what are the attitudes of pre-service teachers' towards technology integration in an online learning environment?

RQ2. In a teacher preparation program, what are the knowledge and skills in technology integration of pre-service teachers' in an online learning environment?

RQ3. In a teacher preparation program, what are the instructional centeredness behaviors of pre-service teachers' in an online learning environment?

RQ4. What are the effects of an intervention on the attitudes of pre-service teachers' towards technology integration in an online learning environment?

RQ5. What are the effects of an intervention on the knowledge and skills in technology integration of pre-service teachers' in an online learning environment?

RQ6. What are the effects of an intervention on the instructional centeredness behaviors of pre-service teachers' in an online learning environment?

As part of the essential knowledge and skills beginning teachers must have (NCATE, n.d.), these domains are examined relative to the teacher preparation program that is tasked with and designed to assist in their development as they contribute to the formation of an effective teacher. The education of pre-service teachers has a direct impact on PK-12 student learning (NCATE, n.d.). "Strong teacher preparation programs lead to better learning for students" (US Department of Education, n.d.)

In the past decade, a concentrated focus on problems confronting our national education system has led to systematic and structural propositions by the Obama administration. Reform-minded initiatives such as Race To The Top (R2T), Common Core State Standards (CCSS), and College and Career Readiness (CCR) have been proposed and are currently being implemented to address the changing needs of the global society. Race To The Top is a series of contests with the intention of encouraging development and reform among K-12 schools throughout the country by awarding grants to advance state and district initiatives in education (US Department of Education). The Common Core State Standards is an initiative that

highlights educational reform through the implementation of national standards designed to provide rigorous expectations of student achievement. Included in these standards is an emphasis on critical analysis and production of media and technology (NGA Center & CCSSO, 2012). Coupled with College and Career Readiness standards, students achieving these criterion will be prepared with the skills and knowledge needed to meet the needs of the 21st century workforce for our global society (NGA Center & CCSSO, 2012).

Discussion of education reform has included attention on the importance of good teaching particularly as it may impact the future of our economy. Teacher preparation programs are tasked with the preparation of students with the skills needed to become contributing citizens to the global society of this century. The current perspective in education resulting from the national initiatives of R2T, CCSS and CCR includes concentrated efforts to equip students with skills in communication, critical thinking, creativity and collaboration (NGA Center & CCSSO, 2012; NEA, n.d.; P21, 2011). Information and Communication Technologies (ICT) use in education is foundational to effective teaching in both higher education and K-12 environments (AACTE, 2010; AACTE, 2013).

Integration of technology within the PK-12 classrooms has been a focus for studies considering the positive impact technology leverage may have on student learning (Knezek and Christensen, 2008). A decade ago, research indicated that neither pre-service teachers nor in-service teachers were being adequately prepared with resources and instruction to integrate technology in their teaching (Laffey, 2004; Plair, 2008). Current research corroborates teacher preparation is still not acknowledging the rise in importance of digital literacies (Johnson et al., 2015). Barriers exist which prohibit or restrict use in instruction (Ertmer, 2005; Ausband, 2006) including lack of resources and professional development. In particular, there has been a

proliferation of resistive attitudes toward the use of educational software, hardware, and Internet resources for instructional purposes (Cleveland-Innes and Sangra, 2010; Koc and Bakir, 2010).

Many teacher preparation programs require their pre-service teachers to take a stand-alone technology course to address the technology knowledge and skills needed in the field. Other programs provide technology knowledge and the opportunity to gain skills by embedding technology integration into methods courses (Gronseth, et al., 2010). Pre-service teachers enrolled in teacher education programs benefit from a variety of recommended technology integration models, including explicit instruction of technology use in the context of discipline specific content, research based pedagogy, and an awareness of the learner's individual needs (Niess, 2008; Baran, Coreia and Thompson, 2013). Learning environments can be created to include strategic, intentional and authentic use of technology to enhance the content for the learner. Because teachers tend to teach the way they were taught (Lee, 2008), it is conceivable that attention to curriculum design in teacher preparation programs focused on providing rich learning experiences promoting 21st century learning skills of creativity, collaboration, communication, and critical thinking (NEA; P21) would result in a positive step towards achieving our national educational goals.

The advent of new technology brings with it new possibilities for engaging students in educational environments that reach beyond the traditional four walls of a brick and mortar school building. Synchronous, asynchronous and a variety of blended classrooms have become new additions to the transformation occurring in education across the country. Students in K-12 want and need to participate in the fast growing enrollments of online/virtual courses (Allen & Seaman, 2014; Watson, Murin, Vashaw, Gemin, & Rapp, 2013). In the

academic year 2012-2013, an estimated 310,000 K-12 students attended school completely online, and 29 states offered fully online education as a choice for students attending school during the 2013-2014 academic year (iNACOL, 2013; Watson, Murin, Vashaw, Gemin & Ryan, 2012; Watson et al., 2013). Policy changes in six states now require students to complete an online educational experience prior to high school graduation (Watson et al., 2013) and a recent Phi Delta Kappa Gallup poll indicates over 60% of the general public agree or strongly agree that high school students should have more opportunities to receive credit from online courses (Bushaw & Calderon, 2014). With the increase in demand for online education, teacher preparation programs must respond and participate in the training of teachers for the variety of learning environments students are choosing and the technological and pedagogical needs associated with them. The appeal has been made for teacher preparation programs to address this need through policy and practice (Barbour et al., 2013; Gunter and Gunter, 2014; Kennedy and Archambault, 2012; Rice et al., 2008; Rice and Dawley, 2009).

Researchers have made recommendations for both in-service teacher professional development and teacher preparation programs to address the integration of technology and the new digital literacies (Johnson et al., 2015). These recommendations include integrating technology in methods courses for pre-service teachers (Laffey, 2004; Polly et al., 2009; Wetzel et al., 2014) with technical support (Koc and Bakir, 2010) to strengthen the relationship between technology and pedagogy within the content area, or technological pedagogical content knowledge, (Brush and Saye, 2009; So and Kim, 2009). Including technology rich field experiences for teacher candidates (Polly et al., 2009) and mentoring for faculty are additional suggestions as they also provide a positive effect on pre-service teachers' attitudes towards technology integration.

Current research suggests moving away from a focus on technology, particularly as standards for teachers are transforming to include digital literacies, and highlighting the changes needed in thinking about how learning may be enhanced through intentional and strategic use of digital pedagogy (Johnson et al., 2015; Niess, 2008). When experiences with technology are grounded in the context of the discipline's content, there is evidence of value of technology use for learning and development of connections between the technology and the content (Harris and Hofer, 2011; Hughes, 2005; Niess, 2008). Utilization of effective technology frameworks has the potential for strategic and intentional selection and use of student-centered learning activities, more judicious use of technology, and an increase in standards for technology integration (Harris and Hoffer, 2011). "Teacher education programs need to create structures and experiences that support and reflect the integration and interdependence of technology, pedagogy, and content" (Thompson et al., 2008, p. 298).

Experiences with technology need to be numerous and authentically designed (Koehler and Mishra, 2005) as pre-service teachers then have the opportunity to practice with the digital tool's functionality and gain an awareness (Hechter and Phyfe, 2011) of effective implementation for student learning. Including collaborative experiences (Hughes, 2005) with technology integration may also provide increased awareness and development of content-centric technology use. Particularly, inquiry learning for pre-service teachers in effective technology integration may deepen knowledge and foster change in practice.

Examining and identifying characteristics relative to attitudes, knowledge and skills toward technology integration and instructional centeredness lays a foundation for intentional growth as a professional educator of the 21st century. There is great value in determining a

baseline regarding these three domains as they relate to integrating technology and online learning environments.

Attitudes of Pre-Service Teachers Toward Technology Integration in an Online Learning Environment

Defining Attitude

In attempting to define attitude, several characteristics surface. Firstly, attitude is not the same as behavior but rather a perception that is waiting, a readiness to respond as in Jung's definition. In *Psychological Types*, Jung (1921), defines attitude as "readiness of the psyche to act or react in a certain way," as cited by Main (2004). Secondly, attitude is a psychological tendency to express a valuation of a particular entity as positive, negative, or neutral (Eagly and Chaiken, 1998). A relationship exists between attitude and behavior (Eagly and Chaiken, 1993) and includes the component of habit and its effect on attitude toward the object and toward behavior. Thirdly, the motivation to respond or act in a certain way is an additional facet to the definition of attitude, which correlates with the degree of favor or disfavor one feels about performing a particular behavior (Venkatesh, 2008). Finally, in education, one must determine an appropriate action or behavior to distinguish the attitude. "Since attitudes are defined as latent, and not observable in themselves, the educator must identify some action that would seem to be representative of the attitude in question so that this behavior might be measured as an index of the attitude" (Simonson, 1979).

Factors Affecting Attitude: Barriers and Bridges

> "If a teacher today is not technologically literate - and is unwilling to make the effort to learn more - it's equivalent to a teacher 30 years ago who didn't know how to read and write." Fisch, K. (2007)

Steady growth in school access to technology, namely computers, the Internet, digital tools such as audiovisual cameras and projectors (National Center for Education Statistics, 2010) and an increase in attendance in professional development opportunities for teachers to learn about a technology related topic (Partnership for 21st Century Skills, 2009) would suggest that more teachers are utilizing technology, integrating it successfully in their planning for learning. However, assessment maintains that teachers are not well prepared to use technology in their practice (Plair, 2008; U.S. Department of Education, 2010). Barriers exist that prohibit effective technology integration. Ertmer (1999; 2005) suggests the existence of first and second order barriers to integration whose presence influence readiness, habit and motivation. First order barriers include extrinsic factors that are not reflective of the instructor and may be out of their control. Factors such as insufficient access to technology, inadequate administrative support, and scarce time for planning affect the instructor's attitude toward integrating technology as a first order barrier. Without sufficient access to educational technology, the habit of utilizing these tools in pedagogy is not developed. Instructors practice the profession of education as they create opportunities for learning with process and pedagogy familiar to them. Without the appropriate access, support and time, familiarity with innovative pedagogy and modern learning tools is non-existent creating instead the habit of re-using old pedagogy and industrial age transmission of knowledge. Ertmer (2005) adds that although the technology is more accessible than it was at the turn of the century and training for teachers to learn the affordances of the digital tools has increased, there are still barriers specifically related to teachers' pedagogical beliefs that are influencing appropriate integration. Second order barriers, as described by Ertmer (1999), include the more personal, intrinsic and deeply held beliefs about teaching, technology and change. Addressing intrinsic barriers requires a

challenge to ingrained belief systems about what teaching and learning should look like. It is often a fundamental challenge of the past, even a cultural challenge, particularly as the teaching profession transforms to meet the challenges and changes brought about by the Information age. Innovation requires change, which may or may not be viewed as necessary or constructive by pre-service teachers.

Awareness of these barriers and knowledge of strategies to overcome them leads to successful integration. Researchers have identified the following factors as affecting attitude towards technology integration: prior experience (Ertmer, 1999; Inman, 2010; Laffey, 2004; Lei, 2009; Lortie, 1975; Mewborn and Tyminsky, 2006; Prensky, 2001), field experience (Boury, McVey, Poyo, & Smith, 2014; Compton, 2009; Polly et al., 2009; Krueger et al., 2004), technology skill (Brush, Glazewski, and Hew, 2008; Wentworth et al., 2008), self-perception, perceived usefulness of technology (Bain and Weston, 2012; Ertmer and Ottenbreit-Leftwich, 2010; Gialamas, Nikoloulou, and Koutromanos, 2012; Gilakjani and Leong, 2012; Hughes, 2005; Pierson, 2001; Rice et al., 2008), perceived ease of use of technology (Al-Ruz and Khasawneh, 2011; Bain and Weston, 2012; Pressey, 2013; Shroff et al., 2011; Venkatesh, 2000), and reflection (Cullen and Green, 2011; Ertmer, 2005).

Prior Experience

Pre-service teachers enter teacher preparation programs with a wealth of experience in education. These students enter college with prior experiences as a student in the K-12 classroom, which could equate to more than twelve years of being the target for thousands of lesson plans. Traditional classroom experiences void of current technology infusion, however may negatively affect the readiness, habit, and motivation of pre-service teachers to teach with technology. Pre-service teachers typically have few experiences with the modeling of

appropriate use of technology and thus have a difficult time creating their own vision of how to integrate 21st century pedagogy in their future classrooms (Ertmer, 1999; Laffey, 2004). "Many of todays pre-service teachers are the product of technologically illiterate teachers" (Plair, 2008, p.73). The habit of using traditional, teacher centered strategies for learning breeds students, in this case pre-service teachers, who are comfortable with this method and routine of education. This group of students enrolled in teacher preparation programs may be straddling two different technology paradigms, their own and their teacher's. With the advent of technology, this generation has been surrounded by technology. "Computer games, email, the Internet, cell phones and instant messaging are integral parts of their lives" (Prensky, 2001, p. 1). Although these pre-service teachers may be what Prensky (2001) coins "digital natives", the experiences they do have with technology are not educative by nature but typically social. The pedagogy modeled for them in the classroom is the result of experiences their teachers were familiar with, prior to the ubiquitous digital environment. These pre-service teachers are not necessarily comfortable or confident with integrating the newer technologies into their own teaching even though they may be considered digital natives (Inman, 2010; Lei, 2009). These traditional practices experienced in a learning environment thus affect the pre-service teachers' readiness, habit, and motivation toward innovative instruction and new learning environments.

Pre-service teachers' experiences in classrooms practicing traditional instructional methods, both PK-12 and teacher preparation programs, may be a barrier to technology integration and readiness for new models of classroom environments. Particularly in higher education, reinforcement of traditional practices is not appropriate for modeling the capacities for discovery learning that educational technology affords. Dewey (1938) suggests the "transmission method" in education, the process of sharing content to be absorbed as presented

from expert to learner, is not appropriate for democratic and open societies. Critics of higher education's resistance to change site the changing economy, changing technology, changing demographics of students, and changing societal and religious values as motivation for reform in teaching practices (Keller, 2008). Yet, the importance lies not in change for the sake of change, but rather structural and pedagogical change because it is appropriate for the transformation in how individuals are learning. "Existing organizational realities must give way to new structures and new pedagogical models as current socioeconomic trends, technology, and the new roles for faculty and students become part of higher education" (Cleveland-Innes and Sangra, 2010, p.228).

Though once viewed as points on a continuum, appropriation and mastery of technology integration have been evidenced in pre-service teachers as both mastery without appropriation and appropriation without mastery (Laffey, 2004). Pre-service teachers struggle with the new vision of the classroom, particularly with anxiety about "having the computers come between them and the children they wanted to teach" (Laffey, p.376). This may be especially problematic for pre-service teachers entering an online teaching environment in which they have no experience or vision. In Laffey's (2004) research, the image pre-service teachers had of classrooms they would be teaching in, the technology that may be available to them and the support and resources they may access affected their attitude toward integrating technology. There is concern regarding what teacher preparation faculty, particularly their preconceptions and misconceptions about online learning and the online classroom, is modeling. In Kennedy and Archambault's (2012) national survey of teacher education programs, faculty and administrators conveyed reluctance and absence of motivation toward

pursuing online educational experiences for their pre-service teachers. The following represent a sample of participant responses (Kennedy and Archambault, 2012, p.12):

> "That [online learning] isn't the way I learn. I don't understand how people can learn something without human contact- or why they would want to."
>
> "Online learning isn't learning."
>
> "I don't particularly support 'virtual' school experiences for teachers in training."

The influence of prior experience of faculty in teacher preparation manifested through their own attitudes toward learning may also contribute to appropriation and mastery of technology in education. Ertmer (2005) stresses the potential power early episodes of personal experience may have on behavior, particularly when they are highly personal in nature and "unlikely to be affected by persuasion". This is particularly significant as the online learning environment is introduced to pre-service teachers. Without prior experience in the online classroom or if a negative experience with online education exists, it may be difficult for the novice teacher to embrace the virtual classroom or transform pedagogical behavior.

However, it is important to remember that pre-service teachers are also students, situated in the educational system as learners, and may well be influenced by a focused reflection and evaluation of past experiences in light of the current transformations occurring in the field (Ertmer, 2005). Structured reflections with intentional guidance towards examination of both existing attitudes as well as value gained in current learning experiences (Cullen and Green, 2011) aids in the process of behavioral change. Mewborn and Tyminski (2006) reference Lortie's (1975) apprenticeship of observation as a possible scapegoat mindset to explain the connection between pre-service teachers past experiences without technology and their attitudes towards integrating technology in their own practice. "Invoking Lortie's

apprenticeship of observation as an explanation for the failure of teacher education programs and practices, leads to a downward spiral in which teacher educators are either absolved of all responsibility for making change or are rendered powerless by the influence of prior experience" (p.32). The cultural transmission of teaching practices, Lortie asserts, includes the tradition of a generalization across individuals and suggests that students assimilate their own teachers' behavior as good or bad based upon their experiences with their teachers, how their teaching was impactful on a personal basis. However, teacher preparation may act as a filter for pre-service teachers' new learning, intentionally addressing prior experiences with technology, or the lack thereof. Pre-service teachers may need time to reexamine their "taken-for-granted, often deeply entrenched beliefs" (Mewborn and Tymindki, 2006) about good teaching using a critical approach in order to transform their experiences into positive teaching practices.

Field Experience

Teacher preparation programs include both field and clinical experiences in the classroom environment prior to matriculation and licensure. These experiences not only aid in the transition from coursework to professional practice, but also provide a learning environment for developing and refining necessary knowledge and skills for interacting with students. Field experiences provide a cycle of learning for pre-service teachers as they progress through what Knowles and Cole (1996) describe in four components of an upward spiral: 1) Personal experience and practice, 2) Information gathering and documentation, 3) Reflection and analysis, formulation of personal theories, and 4) Informed action. Experiential learning, particularly as pre-service teachers participate in several cycles of this framework, is foundational, facilitates the development of a reflexive teacher, and informs future practice. Given the vast number of programs across the country, there is considerable variety in the

structure of these experiences (DeMont, 2015; Retallick and Miller, 2010). Typically, pre-service teachers at the undergraduate level participate in fieldwork throughout their college experience gradually building up to a clinical experience in which the teacher candidate spends the entire day in their assigned classroom, gaining at least a 350-hour, semester-long teaching experience (Darling-Hammond and Cobb, 1996). Pre-service teachers may experience a variety of models of technology integration while completing their field experiences, building a habit, which affects behavior with technology integration in the practice of instruction. As cooperating teachers and mentor teachers model their pedagogy for the pre-service teacher, attitudes are acquired which may act as a barrier or a bridge, depending on the expertise and attitude of the mentor (Al-Awadi and Alghazo, 2012; Brush and Saye, 2009; Hutchinson and Reinking, 2011).

Learning as an apprentice is a natural approach to learning (Collins, Brown and Holum, 1991). As apprentices, pre-service teachers often practice their instruction by replicating the pedagogy of their mentor. Moving beyond the duplication of instruction towards an integration of personal teaching philosophy and pedagogy may or may not occur, depending upon the mentor's encouragement of authentic practice and willingness to entrust the class to the visiting teacher, in this case the teacher candidate. Learning in context, learning by doing is a leading principle of clinical and field experiences particularly as the learning is contextualized and framed within an authentic setting. "Situated cognition values practical, hands-on experience as a primary mechanism for learning" (Kennedy and Archambault, 2012). These experiences provide the avenue for practicing the pedagogical content knowledge (Shulman, 1986) obtained during the teacher preparation program. Recommendations for teacher preparation programs to work closely with cooperating teachers, offering workshops to

assist in developing expertise in technology integration and setting high expectations for pre-service teachers to integrate technology in their field and clinical experiences may alleviate negative attitudes and translate to increased use of technology in practice (Al-Awidi and Alghazo, 2012; Chen, 2010).

In regard to online contexts, providing pre-service teachers with field experiences in a virtual classroom affects their attitude towards virtual teaching skills, virtual teacher's role (Compton and Davis, 2010), and integrating technology in their own practice (Boury, McVey, Poyo, & Smith, 2014). The value a teacher sees in technology for supporting both instruction and learning may be instrumental in determining its utilization (Hughes, 2005). Negative beliefs about technology and pedagogical affordances can prevent teachers accepting the unfamiliar (Ertmer, 2005). Conversely, a student teacher in a virtual context practicing with the tools utilized in an online classroom brings familiarity and the opportunity to learn new technological pedagogical knowledge (Boury, McVey, Poyo, & Smith, 2014).

Technology Skill

The lack of technology knowledge as well as the lack of technological pedagogical knowledge is a barrier to technology integration for pre-service teachers (Brush, Glazewski, and Hew, 2008). Technology knowledge, understanding how to make a digital tool perform the function it is designed to perform, and technological pedagogical knowledge, an understanding of how to use technology in instruction and what technology to select for increased student learning in a particular lesson, affects the motivation, habit and readiness to use technology. A deciding factor of whether or not a teacher integrates technology in their practice is their perceived ability to use the technology effectively and obtain the desired results (Chen, 2010).

In order for technology skill to become a bridge, Brush and Saye (2009) recommend that teacher preparation programs provide opportunities for viewing and analyzing models of effective technology use, exploring innovative and emerging technologies and integrating them into learning activities, and using authentic learning situations to implement activities with effective technology integration. Exploring digital pedagogy such as digital storytelling early on in teacher preparation may make a positive impact on the pre-service teacher's attitude toward change as well as their technology competency (Heo, 2009), particularly if the exploration is prolonged. Modeling technology use in teacher preparation is also recommended and highly effective for increasing computer self-efficacy and the likelihood of technology integration (Al-Ruz and Khasawneh, 2011; Chen, 2010; Koh and Frick, 2009). Downing and Dyment (2013) discovered some change in attitudes specifically with teachers currently teaching online courses. Although they indicated hesitancy to teach online was caused by a lack of confidence with both technological knowledge and pedagogical knowledge for the online learning environment, over half of the participants were willing to continue teaching online. Confidence and competence appeared to increase over time quite considerably (Downing and Dyment, 2013). Recommendations include taking the time needed for technological and pedagogical skills to be developed prior to entering into the online learning environment.

Perceived Usefulness of Technology

Pre-service teachers responding to a survey regarding their use of the Internet indicate their frequency of use of technology positively correlates with their attitude of its usefulness as a learning tool as well as advancement for their career (Gialamas, Nikolpoulou, and Koutromanos, 2012). "Unless a teacher views technology as an integral part of the learning

process, it will remain a peripheral ancillary to his or her teaching" (Pierson, 2001, p. 427). Another survey of over 1400 literacy educators, in-service teachers who may be mentoring pre-service teachers in field experience, indicated a majority of those surveyed did not consider new genres of literacy, namely utilization of digital tools for blogs, wikis, and online chats to be important in meeting their curriculum goals. The perceived usefulness of technology in this case is a barrier to its integration, as teachers perceive digital tools to be supplements rather than integral components of learning activities. Consistent with this research, Rice et al., (2008) examined pre-service teachers' view of technology integration and found similar attitudes; Technology plays a peripheral role in what they do as teachers. Recommendations for changing perceptions include focusing awareness of technology integration in the planning stage by using a planning tool developed as a Needs Analysis chart, which allows for intentional thinking about the role technology plays in a lesson. This process assists in revealing the true drivers of education: curriculum and the needs of the learners and allows for metacognition particularly in selection of best-fit technology (Rice et al., 2008).

Simply providing the technology resources to teachers does not ensure that these tools will be used for educative purposes (Bain and Weston, 2012; Gilakjani and Leong, 2012). Unless the teachers see value in the utilization of the technology to support instruction and increase learning, the technologies remain nonessential and dispensable (Hughes, 2005). Certainly, the more positive a teachers' attitude is towards technology use, the more likely they are to use it (Ertmer and Ottenbreit-Leftwich, 2010). This serves to emphasize the reality that pre-service teachers may not experience effective technology integration in field experiences if the in-service teacher's attitude toward integration is not one of readiness, habit or motivation.

Perceived Ease of Use

The most significant influence on how useful an instructor perceives a technology tool may be is the instructor's perceived ease of use (Shroff et al., 2011). Technological knowledge, gaining an understanding of how to manipulate, maneuver, or work a particular technology tool or how easy it is to use, is positively related to attitudes towards usage. Reports from a comparative analysis of National Teacher Surveys by the Joan Ganz Cooney Center indicate the biggest barrier to technology integration is the personal comfort level teachers have with technology (Pressey, 2013). Recommendations for bridging the gap between perceived ease of use and actual integration include the presence of modeling by the University faculty and support from the school technicians, teachers and administration school during field experience (Al-Ruz and Khasawneh, 2011). Technology self-efficacy had the most direct effect on technology integration and use by the pre-service teachers.

Change in education, specifically in pedagogy, has partially evolved due to changes in the available technology and their application as tools for learning. Educational technology cannot assist in learning without being adopted; teachers must use them in instructional experiences. "The role of ICT in the lives of teachers must be reconceptualized from something they access to something they use regularly with sophistication and ease to meet the individual learning needs of their students" (Bain and Weston, 2012, p. 12). Technology integration, or "user adoption behavior" (Venkatesh, 2000) has been the subject of researchers committed to uncovering factors affecting user behavior. Two such factors are explained in Venkatesh's Technology Acceptance Model (TAM). This model indicates attitudes toward technology integration are affected by both perceived usefulness and perceived ease of use (Shroff, Deneen, and Ng, 2011).

Knowledge and Skills of Pre-Service Teachers Toward Technology Integration in an Online Environment

General Knowledge and Skills

In response to changes occurring in the field of education, organizations have created standards for the knowledge and skills teachers ought to have as professional educators. These standards include not only proficiency in content and learning theory, but also an awareness of and competence in technology knowledge and skills. Federal legislation and national technology plans address the relevance of dexterity in specific information and communication technologies. Accrediting organizations such as the Council for the Accreditation of Educator Preparation (CAEP), organizations for the advancement of education such as the Southern Regional Education Board (SREB), International Society for Technology in Education (ISTE), and the National Education Association (NEA) address the quality of teachers by creating criteria and best practices for educators. Publications and policy briefs produced by the NEA include 21st Century Learner, Preparing 21st Century Students For a Global Society, Technology in Schools: The Ongoing Challenge of Access, Adequacy, and Equity, and Guide to Teaching Online Courses to name just a few. Specific competencies needed by educators include modeling and applying technology standards to engage students and improve learning experiences (CAEP, n.d.). ISTE defines these competencies to include "the skills and knowledge educators need to teach, work, and learn in an increasingly connected global and digital society." Collaborating with the NEA, Partnership for 21st Century Skills (P21) developed a Framework for 21st Century Learning, which focuses on specific skills necessary for both teaching and learning prompting states to include 21st century outcomes in their own

standards and assessments (NEA, n.d.). Some of these skills include the effective application of technology as:

- A research tool to organize, evaluate and communicate information,
- A communication tool to network, access, manage, and create information,
- An ethical tool to apply an understanding of legal and ethical issues regarding the access and use of information technologies.

The International Reading Association (2009) also promotes the realization of proficiency in the new literacies and 21st century technologies, stating "literacy educators have a responsibility to effectively integrate these new technologies into the curriculum, preparing students for the literacy future they deserve" (IRA, 2009, n.d.). The development of the Common Core State Standards (CCSS) currently being negotiated throughout the country also includes specific learning outcomes that include effective application of technology and multimedia in communication, research, and creative processes (NGA Center, 2015).

Teacher preparation programs are charged with preparing teachers and recommending licensure based upon successful completion of coursework and competencies. Requirements for field experience include creating partnerships with K-12 schools to provide clinical experiences for pre-service teachers to engage in "technology-enhanced learning opportunities" (CAEP, n.d.). Multiple forms of evidence must be provided to accreditation organizations that indicate candidates' development of technological pedagogical content knowledge (TPACK) through technology integration (CAEP, n.d.).

With the expansion of the classroom to include virtual learning environments, concern still exists regarding characteristics necessary for quality teaching and learning. Guidance for standards and best practices for online teaching and learning have been instituted by

organizations such as ISTE, NEA, SREB, and the International Association for K-12 Online Learning (iNACOL). Four categories of interest emerge from an analysis of this criterion (Crozier, Rice and Homuth, 2008). These categories include online teacher qualifications, Teacher practice, Evaluation, and Special needs and diverse students.

Teacher qualifications for online instruction include skill sets, academic preparation and credentials, online experience, and professional development. Teachers responsible for delivering online instruction require skills in facilitating online communication. This facilitation requires the ability to promote and sustain appropriate interactions (Rice, 2012). Three types of interaction as described by Moore (1997) are communication between teacher and student, student and student and student and content.

Teacher to Student:

Personalized communication via email and Skype

Clearly defined goals and due dates

Interest in student as a person

Empathy and flexibility

Feedback includes praise as well as questions to deepen learning

Support, examples, and modeled behavior are provided (scaffolding)

Teacher communicates high expectations

Focus on synthesis and application

Student to Student:

Clear communication that student's ideas are valuable

Responses to student discussion board posts display genuine interest

Students have shared interest in learning, direction, and goal

Student to Content: Student centered-purposeful, authentic instructional tasks (Giguere and Minotti, 2003)

Applicable for student's current situation (authentic learning)

Inquiry based assignments allow for student choice/direction (purposeful)

Student choice in content focus and/or delivery approach (learner outcomes)

Student possesses high level of confidence with technology

Confident with content, able to relate prior experiences/knowledge

Each of these three types of interaction had a significantly positive effect on the achievement of participants in a study conducted by Bernard et al. (2009), who underscores the importance of intentionally designing interaction within the online learning experience. Abrami et al., (2011) further posits incorporating attention to effective knowledge tools whose inclusion in the design of an online learning experience is maximizes the effectiveness, efficiency and appeal of instruction. An additional type of communication interaction that exists particularly in an online learning environment is the communication between the Teacher to Parent/Guardian/Learning Coach. The addition of the learning coach expands the role and responsibility of the online instructor to include this relationship (Archambault, Debruler, and Freidhoff, 2014). Virtual schools across the country are utilizing the synchronous and asynchronous models of online learning and including the addition of the on-site mentor. Virtual schools such as K12, Connections, and Florida Virtual utilize a model of education that includes a "learning coach", a parent or guardian present with the student, who supports the teacher in facilitating progress. This important role varies depending on the age of the student but characteristically involves monitoring engagement, helping students remain on task by minimizing distractions, and assisting with organization and scheduling. These learning

coaches aid in the scaffolding (Vygotsky, 1978) of instruction as well as the logistics of process to product during learning activities. The primary feature of scaffolding is being able to harness the expertise of the more knowledgeable other in assisting the extension of the student's understanding and capabilities. As the student progresses to middle school and high school, the role of the learning coach diminishes. Communication between the teacher and the adult present with the student is essential for ensuring common goals and attention to individual learning needs.

Technology Integration Frameworks

Understanding the complexity of change in our culture and the dynamics of effective instruction, teacher preparation reflects an integration of knowledge about the learner, the context, the discipline and emerging technologies (Niess, 2008). In order to equip pre-service teachers with the knowledge required for the profession they are entering, knowledge may be obtained through a framework that considers the interconnectedness of three knowledge domains: technology knowledge, pedagogy knowledge and content knowledge (Baran et al., 2011; Bull and Cisse, 2011; Koh and Divaharan, 2011; Koehler and Mishra, 2005; Niess, 2008; Pierson, 2001). This framework, referred to as TPACK (Koehler and Mishra, 2005) is an extension of the construct of Pedagogical Content Knowledge (Shulman, 1987). TPACK explores the interconnectedness of seven subgroups of knowledge (Figure 1). These subgroups are 1) content knowledge (CK), knowledge that is specific to the discipline being taught, 2) pedagogical knowledge (PK), knowledge of the practice and process of teaching, including methods of instruction, understanding of the learner, and management of the classroom, 3) pedagogical content knowledge (PCK), pedagogical knowledge that is specific to the content, 4) technology knowledge (TK), knowledge of technology and its relevance in communication,

problem solving, and information processing, 5) technological content knowledge (TCK), knowledge of technologies that fit or enhance specific content, 6) technological pedagogical knowledge (TPK), knowledge of how teaching and learning changes with specific technology integration, and 7) technological pedagogical content knowledge (TPACK), knowledge of how specific technologies enhance content or teaching strategies (Graham et al., 2011; Harris, Mishra and Koehler, 2009; Koehler and Mishra, 2008).

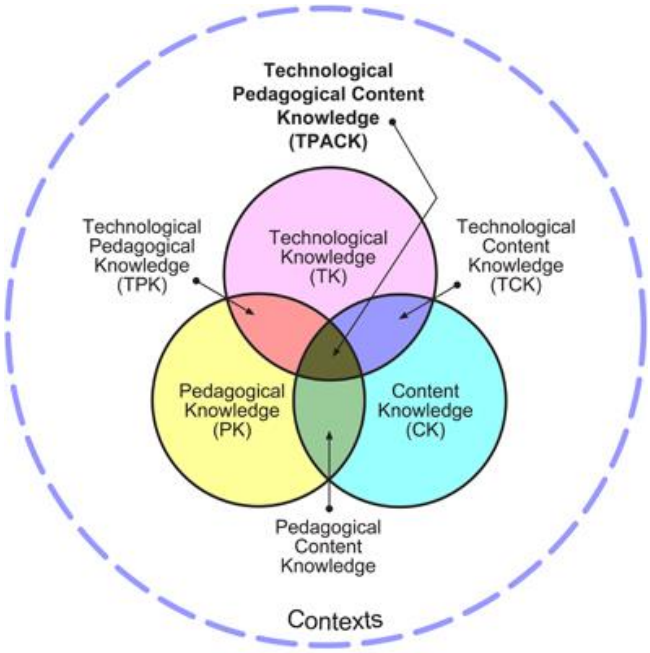


Figure 1. Technological Pedagogical Content Knowledge. Reproduced by permission of the publisher, © 2012 by tpack.org

When a teacher's focus is concentrated on the content of the discipline, pedagogical strategies and technology tools, the TPACK framework empowers that teacher to determine what "fits" (Hofer and Grandgenett, 2012). The development of TPACK Learning Activity Types (Harris, Mishra and Koehler, 2009) provides taxonomy of technologies appropriate for

specific content areas and particular curricular goals and objectives. Given a variety of educational technologies, effective teachers may make strategic and intentional decisions for deliberate inclusion of technology based upon appropriateness when using Activity Types. Keeping curricular goals in mind, teachers need the knowledge of how technology may be integrated to enhance the content of a particular discipline, using the technology purposefully rather than for the novelty.

One promising practice is the utilization of Activity Types in teacher preparation methods courses during lesson design. Providing opportunities for PSTs to practice matching content objectives with technology tools that aid pedagogy is possible through lesson design (Koehler and Mishra, 2005; Lu, et al., 2011). Education is a practice profession (CAEP, 2010). Instructional application of TPACK during the planning stage of a lesson permits flexibility in thinking for goals of content knowledge, pedagogy, and technology. Self-efficacy in personal technology skills and a good understanding of how to use technology pedagogically are significant predictors of how PSTs intend to integrate technology with their students (Teo, 2009). Technology-based courses and courses developed in the TPACK framework allow pre-service teachers to practice skills in technological pedagogical content knowledge with the possibility of transferring these skills as they integrate technology in the classroom (Koehler and Mishra, 2005; Niess and Gillow-Wiles, 2012). In addition to practicing knowledge and skills in technology integration, pre-service teachers engaged in courses using the TPACK framework with reflection are able to make their thinking, that which is typically covert, something that is visible. Pre-service teachers' rationales for technology selection provide evidence of growth in subcategories of the TPACK framework (Graham, Borup and Smith,

2012), which may be used to inform teacher preparation programs in regard to their students' needs.

When considering technology integration it is imperative that the learner outcome as well as the process is taken into account; an intentional selection of digital tools for pedagogical goals ensues (Ruday, 2011; Figg & Jaipal, 2010; Williams, Wetzel and Foulger, 2010; Baran, Coreia, and Thompson, 2013). Although teachers may report confidence with technology, the integration is often shallow with an emphasis on the technology rather than the curricular goals (Hutchinson and Reinking, 2011). Improving both the learner outcome and the learning process is central for effective technology integration. Development of the SAMR model (Puentedura, 2008) in the late 1980's and early 1990's was the result of questions such as "what types of technology use would have greater or lesser effects upon student learning" (Puentedura, 2008). Technology integration often begins at the lower level of Substitution as a technology is merely exchanged with an original tool to perform an identical task. Using a laptop and keyboard to compose a written task and then printing it is a substitution for the same task, which could be performed with paper and pen. The learning outcome may not be changed with the addition of the technology nor is the learning process improved; rather, the substitution of tools results in analogous consequences. The Augmentation level is used to describe the instructional situation when technology is used as an enhancement, when learning is improved due largely to the inclusion of a particular technology. The use of powerful functions within a word document such as charts, tables, links to online resources or images enhance the learning process and may be considered augmentation. The use of technology to encourage collaboration or significantly change individual compositions may be indicative of Puentedura's Modification level of integration. The use of document sharing and Web 2.0

tools such as word clouds afford teachers and students many transformations in learning as well as opportunities for sharing and exchanging new knowledge. Finally, the Redefinition level describes technology integration that creates the greatest improvement in both learning outcomes and the learning process by producing tasks and products that were inconceivable without the technology. Technologies such as Video conferencing, video production tools and web application hybrids such as Glogster allow learners new opportunities that are not otherwise available. Learners may synthesize their knowledge, create new knowledge and share their products with a wide audience (Figure 2).

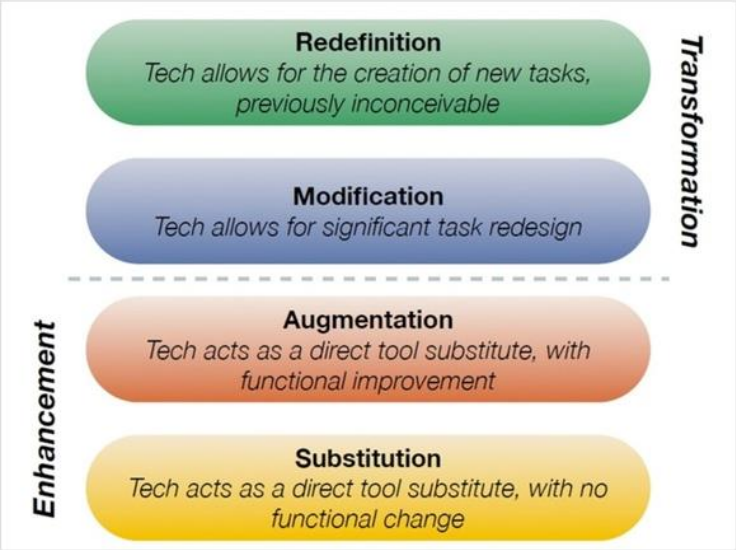


Figure 2. SAMR Image adapted from Puentedura, R. (Producer). (2008, December 22). TPCK and SAMR: Models for enhancing technology education [Video podcast]. Available from https://itunes.apple.com/

Both TPACK and SAMR provide a framework for educators to use when making decisions about their pedagogy, the technologies that may increase student learning, and the content necessary for the learning activity. The knowledge and skills these two models encompass are

necessary for effective instruction of the 21st century learner regardless of the avenue through which the instruction takes place (Hanover, 2009).

Models For Effective Technology Integration

Teacher preparation is the logical starting point for offering future educators opportunities to experience, evaluate, and apply effective technology integration for educative purposes. These experiences may be obtained through stand-alone technology courses, embedded technology projects or activities, modeling through classroom observation, or executing technology activities in field experiences (Gronseth et al., 2010).

Often teacher preparation programs have single, stand alone technology courses required for education majors to complete prior to their clinical experience in student teaching. Stand-alone technology courses typically include emphasis on effective operation of presentation tools, word processing, and personal productivity (Gronseth et al., 2010). These courses may address the need for technology knowledge, but often exist in a vacuum with little relevance to authentic classroom situations.

Teacher preparation programs may include the demonstration of available online resources such as curriculum-based lessons and projects that have been used successfully by in-service teachers (Harris, Mishra, and Koehler, 2009). These Open Educational Resources (OER) are widespread, as the ability to share resources worldwide across the Internet has increased. Free online open education resources such as Curiki, Edutopia, Teacher's First and Khan Academy and websites like Wikispaces and Edublogs are examples of specific technologies modeled in teacher preparation courses. The open online networks provide an educational social community and opportunities for collaboration (Waard, et al., 2011). These resources may be helpful in providing ideas for pre-service teachers, but they do not account

for differences in learners, contexts, and teacher disposition. Successes with these resources may not be transferable to other learning environments (Harris, Mishra, and Koehler, 2009; Judson, 2006).

While providing pre-service teachers with technology experiences may develop confidence, decrease technological frustration and promote technology integration (Balgalmis, 2012; Niess and Gillow-Wiles, 2012), findings suggest that sustainability of these results depends largely on the duration of the course with best results obtained from a variety of technology integration approaches experienced throughout the education program (Lambert, Gong, and Cuper 2008; Koc and Bakir, 2010). This may be attained through restructuring methods courses with the infusion of technology experiences for relevant practice and exploration of both pedagogical and contextual affordances. This methodology, when infused in teacher preparation courses, may result in dual modeling in which both live behavior modeling and cognitive modeling are present. Lu and Lei (2012) describe this practice and its valuable effects on developing technological pedagogical content knowledge in pre-service teachers. Live modeling of technology within the context of pedagogy and content establishes a standard for tackling complex instructional problems for pre-service teachers who are inexperienced at teaching with technology. Recent inclusion of technology integration models within teacher preparation methods courses has resulted in positive learning outcomes for teacher candidates (Poyo, Wilson, and Carbonara, 2013; Foulger et al., 2013).

Interaction Between Online Teaching Tasks and Teacher Preparation

Academic preparation and credentials are ubiquitous among educators regardless of the learning environment in which they teach. Professional teaching standards for licensure, aligned to state and program requirements, may be found within teacher preparation programs.

However, studies by Archambault and Crippen, (2009a) and Archambault and Larson (2015) revealed a profile of an online teacher with data suggesting the online instructors have more classroom experience, more education, and more part time employment than teachers in brick and mortar schools. Because the majority of online teachers have experience in traditional classroom settings these teachers may have an easier transition into the online learning environment with accumulated content knowledge and pedagogical experience in a traditional setting (Kennedy and Archambault, 2011). However the challenges and demands of technological pedagogical content knowledge required for the online learning environment still remain. In addition to specific communication skills and appropriate credentials, standards for online education emphasize the significance of obtaining online learning experience. In order for teachers to be effectively prepared to teach any form of online education, it is best practice for them to have experienced this learning environment from the student perspective. (Compton, Davis, & Mackey, 2009; iNACOL, 2011; ISTE, 2008; Paloff and Pratt, 2011; SREB, 2003). Researchers (Archambault, Debruler, and Freidhoff, 2014; Compton and Davis, 2010; Kennedy and Archambault, 2011) are appealing to teacher preparation programs to provide inclusion of online pedagogy and field experiences in virtual contexts for their pre-service teachers to practice in this authentic learning environment (Archambault and Crippen, 2009b). These practica are critical to teacher preparation programs as they allow their students to address their attitudes as well as their knowledge and skills of instruction in a variety of learning contexts. Kennedy and Archambault (2012) investigated the handful of teacher preparation programs offering virtual field experience. Some of the knowledge and skills taught in these settings include: hands-on experience with virtual classroom management, utilizing technology to interact with and motivate students, building relationships with students

in an online learning environment, and navigating the learning management systems utilized by online schools (Archambault, Debruler, and Freidhoff, 2014). "Teaching online utilizes a different pedagogical skill set, involves instructors who are arguably more conscious of their teaching strategies, and demands teachers who overtly consider a broader range of technologies" (Tomei, 2011, p.12). The knowledge and skills necessary for cultivating student learning in an online learning environment are discussed below.

Characteristics of Effective Online Instructors

One outcome of the rapid growth in online education evidenced across the country is the implementation of a variety of professional development programs for training online educators (Norton and Hathaway, 2013). Although multi-district fully online schools serve K-12 students from 30 states (Watson, Murin, Vashaw, Gemin, and Rapp, 2013), the number of teachers formally trained in their teacher preparation programs for instructing in an online learning environment is minimal (Archambault, 2011; Dawley, Rice and Hinck, 2010). Online teaching certificate programs are evident as national programs, state-level programs and professional development opportunities provided by a variety of organizations and professional programs (Archambault, DeBruler and Freidhoff, 2014). These training programs are generally developed at the local level and may contain diverse skill priorities (Glass, 2009; Watson, Murin, Vashaw, Gemin, and Rapp, 2013). Teacher preparation has traditionally occurred at the college level, however, virtual schools are training their own teachers for virtual contexts rather than request the Institution of Higher Education (IHE) to adapt standards and coursework to address the changes in learning environments (Glass, 2009). With such diversity in online teacher-training programs, it may be difficult to retain consistency and maintain a standard level of expertise among itinerant online educators.

Professional education organizations and current education policy and standards help to define both training and the knowledge and skills needed for effective teaching. In response to the growth in online education and the emphasis on teacher quality, organizations such as the International Association for K-12 Online Learning (iNACOL, 2011), the National Education Association (NEA, 2006), Quality Matters (Quality Matters, 2010), International Society for Technology in Education (ISTE, 2008) and the Southern Regional Education Board (SREB, 2003) have generated national standards for quality online teaching. These standards provide guidance for effective and quality teaching and focus on the knowledge, skills and dispositions required for quality online instruction.

Professional dispositions are prominent in national standards for educators in the United States provided by the Council for the Accreditation of Educator Preparation (CAEP) and the Interstate Teacher Assessment and Support Consortium (INTASC), and these standards are useful for examining and cultivating qualities in the educational context. Although the concept of dispositions, particularly in regard to the educator, has enjoyed a degree of debate, for the purpose of this research disposition refers to a form of character to include beliefs, habits, attitudes, sensitivities and inclinations. For example, characteristics listed in the critical dispositions for educators include dimensions of personality as well as patterns of behavior. InTASC (2011) standards include the following examples of critical dispositions: respect for learner differences, commitment to working with all stakeholders, responsibility for promoting learner growth, thoughtful and responsive listener and observer, values flexible learning environments, believes plans must always be open to adjustment and revision, embraces the challenge of continuous improvement and change. Although these are just a few examples, indicators of what is critical to the effective teacher's disposition, described by InTASC

(2011), center on respect, values, responsibility and commitment, none of which are contingent upon mode of delivering instruction. Due to the nature of teaching, the educator's dispositions, the characteristics and personal qualities unique to the individual educator, are a necessary component of effective teaching particularly as they assist in creating a positive impact on student learning (CAEP). Research by Devine, Fahie and McGillicuddy (2013) documented affective characteristics such as a passion for teaching and learning, and a love for children as representative of what teachers themselves believe to be good teaching. The manner in which a teacher relates to his or her students, colleagues, administrators, parents and community members inevitably contributes to the learning environment. Effective teaching includes these critical relationships (InTASC, 2011) and care and empathy between teacher and student are major components of these relationships (Devine, Fahie and McGilicuddy, 2013). Within the online environment, particular attention to relationship building may be required to diminish the learner's sense of personal and social isolation and disaffection (Croft, Dalton and Grant, 2010; Hanover, 2009; Martin and Noakes, 2012). Affective expressive behaviors among learners, such as sharing of experiences, beliefs, values, humor and self-revelation must be valued, encouraged, and modeled by the online instructor (Garrison and Cleveland-Innes, 2010). Characteristics such as emotional engagement, enthusiasm, and compassion as highlights of the human dimension in education contribute to an improved quality of learning, particularly in the online environment (Savery, 2005; Hanover, 2009; Martin and Noakes, 2012).

The knowledge and skills of teachers refers to the information possessed by the teacher, particularly theoretical or practical information related to educating the individual learner. There is an implication of knowing with familiarity, having gained this knowledge through

experience or association. “Knowledge applies to facts or ideas acquired by study, investigation, observation, or experience” (Merriam-Webster, n.d.).

It is the educator preparation program’s (EPP) responsibility to provide the necessary coursework and relationships for pre-service teachers to gain the knowledge, skills, and dispositions needed for effective teaching. “The ultimate goal of educator preparation is the impact of program completers on P-12 student learning and development” (CAEP, p.5). Generally speaking, the knowledge, skills, and dispositions of teachers affect student achievement. In the traditional classroom, teacher effectiveness has been correlated to student achievement (Darling-Hammond, 2000) and student learning is greatly affected by teachers, particularly when measuring value added (Sanders and Horn, 1998). Excellent teachers provide a positive affect on both the quantitative and qualitative measures of student achievement. Higher scores on standardized assessments, student satisfaction and desire to learn are important educational results produced by excellent teachers (Bain, 2004; Brinthaupt, et al, 2011). Excellent teachers provide sustained and significant impact on students, encouraging a love for learning (Brinthaupt, et al, 2011). Teaching standards are relevant to creating and developing exceptional educators who may be successful in any learning environment.

Characteristics of quality teaching are articulated in the work of Chickering and Gamson (1987) and their Seven Principles for Good Practice. These seven principles include: 1. Encourage contact between students and faculty, 2. Develop reciprocity and cooperation among students, 3. Encourage active learning, 4. Give prompt feedback, 5. Emphasize time on task, 6. Communicate high expectations, and 7. Respect diverse talents and ways of learning.

Originally developed for higher education, these principles in general may be applied specifically to online environments in the following manner.

1. Be present.

In an online learning context, it is imperative that instructors intentionally use the learning space to create opportunities to connect with their students (Cleveland-Innes and Garrison, 2010; Ragan, 2007; Rice, 2012). "The sense that the instructor is present online and interacting with students is even more important than interactions with peers" (Means, Bakia, and Murphy, 2014, p.157). It is the concept of being visible, both publicly and privately, as described by Savery (2005) that encourages participants of a learning community to develop relationships with one another, connecting as individuals for a common purpose of learning. Presence is particularly important in an online learning environment to intentionally diminish a sense of isolation among participants who are separated by time and space (Palloff and Pratt, 2011). In the K-12 online learning environment, it is critical for instructors to attend to relationships with parents, guardians or mentors as well since these individuals are responsible for overseeing the learner's attention to coursework and time on task (DiPietro et al., 2008). Three types of presence with students have been identified. These are Facilitation (Teaching) Presence, Social Presence, and Cognitive Presence (Hanover, 2009; Vaughn, 2010; Samora, 2013).

Online instructors meet the needs of their students with their facilitation presence as they manage the course with engagement and timeliness, providing quick responses and constructive feedback. The leadership of the instructor provides and sustains a productive collaboration among the learning community. The technology within an online learning environment affords not only group interaction, but also a personalization of one-to-one

communication between teacher and student. Feedback may be provided privately through personal e-mail, individual text messages, online journals shared between the student and the teacher, comment sections within the grading tool of an LMS, and synchronous audio and visual communication such as FaceTime, Skype, and Google Hangouts. Public communication is also necessary (Savery, 2005) and may be accomplished through shared discussion forums, broadcast messages in the form of e-mails or notifications to the whole class, information shared on a personal or class website, and recorded audio and visual messages.

Online instructors utilize these technology tools to develop relationships with their learners through their communication, interaction and social presence. Personal characteristics of both learner and instructor are projected through this communication, bringing a sense of belonging, community, and personhood to the online environment (Vaughn, 2010). Social presence describes the purposeful communication occurring in an environment based on trust. Participants are encouraged through this mode of presence to "be yourself" and convey individual personalities while developing interpersonal relationships. The use of personal avatars contributes to the sense of presence within an online learning community (Palloff and Pratt, 2011). Social networking technologies such as Twitter, Facebook, Google Doc and Instagram may be additional tools for establishing a social presence and improving teaching and learning through discussion, chats, and collaborative activities (Barr and Miller, 2013).

Cognitive presence refers to the characteristics pertaining to the online instructor's knowledge of the content and the capacity, by the group as a whole, to construct and confirm meaning (Hanover, 2009). Virtual communication, interaction and presence may be achieved through asynchronous means with the utilization of emails, discussion boards, e-journals, online chats, and recorded video. Particularly in an online environment, presence is a factor of

effective instruction, learner satisfaction (Rovai and Barnum, 2003) and greater depth of learning (Picciano, 2002; Richardson and Swan, 2003; Rovai and Barnum, 2003).

2. Create Supportive Learning Communities

Supportive learning communities may be created through the relationships developed and sustained within the community of learners. "Infusing personality" (Rice, 2012, p. 77) with tone, humor, frequency of communication, the language and levels of both social and conventional interaction, and assistance in generating a sense of security and trust are necessary characteristics of an online community (Palloff and Pratt, 2011). Once the stage is set with an appropriate atmosphere of confidence, participants may be uninhibited and able to candidly share their ideas and knowledge together as a community. Supportive learning communities foster natural conversation and interaction, "becoming the vehicle through which the course is effectively conducted" (Palloff and Pratt, 2011, p. 9).

The idea of building community in an online environment without face-to-face contact and a lack of visual and vocal cues remains to some an impossible and obscure suggestion. However, researchers in the area of online education have found evidence to support the perception of real community among learners (Rourke, et al., 2001; Swan, 2002). Personal perceptions were more important than the technology capability, particularly as some online learners expressed feeling less psychological distance between themselves and the other learners than if they were in a face-to-face class. Nonetheless, the development of community must be deliberately engineered and encouraged in an online learning environment (Swan, 2010).

Reciprocity, cooperation, and the use of technology tools for higher order thinking in an online learning environment may provide for deeper understanding of content for learners and

support critical thinking (Hanover, 2009). The effective online instructor intentionally designs opportunities for community building, particularly as it pertains to knowledge building. Sharing ideas, thoughts, and understanding of content affords learners with opportunities to perform both student and teacher roles in exploring and explaining in a collaborative setting. Discussion boards, chats, sharing of group documents, group emails, and collaborative projects and presentations encourage community in an online learning environment and promote constructivist thinking (Hanover, 2009). Constructivism theory relates the learning that takes place in a supportive environment with the participation of the learners, particularly as they collaborate and negotiate meaning among multiple perspectives in an online environment. Utilizing multiple strategies to establish and nurture relationships positively impacts the quality of interaction within the online classroom (DiPietro et al., 2008). Additionally, these are all excellent strategies for engaging learners in making their thinking visible through "clarifying and enlarging their mental models or concepts and building links and identifying relationships" (Boettcher, 2011).

3. Encourage Active Learning

The online classroom, whether it is synchronous, asynchronous or a variety of blended learning can be a place for engaging learners in participatory activities regardless of time and space. Active learning includes participation in the learning community as well as engagement with the content. As a community of learners, the feeling of connectedness to one another is developed and sustained through active participation in and among the group (Martin and Noakes, 2012). Providing activities and experiences for talking about learning, making connections between schemas and new knowledge, creating and composing written artifacts demonstrating evidence of learning promotes active learning. Fostering a nurturing

environment and a sense of connectedness promotes healthy, educational risk taking (Rice, 2012).

Particularly in an online environment not bound by strict time schedules, the absence of a requirement for immediate response allows for time to reflect on learning. Active learning may be supported through thoughtful and relevant discussion forums as well as student collaboration (Hanover, 2009; Niess and Gillow-Wiles, 2012; Ragan, 2007). Within this active learning, "dialogue is purposeful, constructive and valued by each party" (Moore, 1997). The encouragement of dialogue, its structure, content and frequency, is a component of the design of the instruction. Regardless of whether the instructor is the designer or if the materials have been developed independently of the instructor, the instructor's role is still very active in achieving the purpose of the course organization (Dick, Carey, and Carey, 2009). This may be done through a variety of technology tools, including text based devices and telecommunication devices with audio and video capacity. Dialogue is reflective of the educational philosophy of the designer, personalities of the instructor and learners, content of the course, and mode of communication (Moore, 1997). The ability of the online instructor to integrate technology to cultivate active participation through dialogue is emphasized.

Activities requiring learners to perform jobs of service for the learning community such as "Tech Helper", jobs of facilitator and moderator of class discussion forums or jobs of collaborative knowledge building within a group research project foster the sense of community through active participation. Utilizing a variety of collaborative configurations in which to perform these activities fosters the sense of a learning community within an online environment. Activities designed to engage students in active learning promotes deeper learning and cognitive gains (Hastie, Chen and Kuo, 2007). "The ultimate goal is for students

to learn how to be active learners and assess their own understanding so they realize when they need to do further studying or seek help" (Means, Bakia, and Murphy, 2014, p.156).

4. Give Prompt Feedback

As an instructor, making oneself visible in the online classroom requires a shift in communication to an increase in text-based messages (Hanover, 2009; Savery, 2005). "The immediacy of the teacher's verbal and nonverbal behaviors in face-to-face situations has been linked both directly and indirectly to enhanced cognitive and affective learning" (Hastie, Chen, and Kuo, 2007, p. 282). The lack of face-to-face contact and regular class meetings makes the need for timely, beneficial feedback all the more urgent as online learning communities establish social presence through their communication (Hastie, Chen, and Kuo, 2007; Palloff and Pratt, 2011; Swan, 2010). This communication may take the form of electronic text messages, voice messages, or video response. Excellent online instructors will encourage learners to communicate misconceptions, confusion or difficulty with content, organization and technology in order to maintain coherent understanding (Hanover, 2009; Ragan, 2007). This provides the instructor with the information necessary to support learning and respond appropriately. Learners portray an increase in their motivation and engagement following the delivery of intentional and specific feedback (DiPietro, et al., 2008; Ragan, 2007).

Not only does the feedback provide the emotional support needed for sustaining the community of learners, but it also adds positive effects in instructional outcomes. In the online classroom setting, responding to learners with this robust communication may provide the necessary guidance for achieving increased learning outcomes and sustaining motivation and interest (DiPietro, et al., 2008). With the continual development of new educational technology, communication of information pertaining to the learner's performance may be

provided immediately through assessments with automatic correction as well as through emails, chats, and other online video and audio communication tools.

5. Emphasize Time on Task

Time on task requires clear organization of course content, explicit instruction for participation and targeted motivation of learners. The manner in which content is organized and structured within the online classroom has the potential to foster development of learners and provide a construct of productivity. The goal is to design instruction and select strategies that are appropriate for meeting the diverse needs of the students as well as provide the motivation necessary for learners to succeed in the online environment (DiPietro, et al., 2008; Rice, 2012). This attention to both the design and the learners then focuses attention away from traditional delivery and materials to development of a learning environment that fosters active learning in a collaborative community (Swan, 2010). Time on task is emphasized as navigation becomes intuitive and an understanding of what is necessary for completing tasks is apparent.

Awareness of the learners as distinct individuals within the community requires monitoring their participation and progress to determine gaps in learning and communicating expectations (DiPietro, et al., 2008; Hanover, 2009; Ragan, 2007). Progress monitoring tools within an LMS provide statistics and data useful for assisting the instructor with assessment of student success. Attention to learners experiencing technical difficulties and provision of technical support resources are conducive to maintaining time on task (Ragan, 2007). Communication of specific details, descriptions, and deadlines for assignments will also present learners with a framework that encourages time on task (DiPietro, et al., 2008).

The effective instructor in an online learning environment may utilize both asynchronous and synchronous activities to obtain maximum performance. Providing specific

links to resources and supplementary materials necessary for completing tasks assists the learner in optimizing time spent in instructional activities. Including a variety of resources such as pdf, doc, ppt and delivering content in multiple mediums allows the learner the flexibility of using technologies appropriate for their learning style and displays a skill of organization necessary for online learning (DiPietro et al., 2008; Hanover, 2009; Savery, 2005). Attending to the interests of the learners, personalizing learning by allowing choice in project products helps maintain motivation, learner autonomy and time on task.

6. Communicate High Expectations

Anticipating excellent student performance and setting high expectations are important in any learning environment (InTASC, 2011). As Moore (1993) explained in his research of transactional distance, there exists a certain amount of cognitive space between learners and teachers. Although this physical separation may be found in any classroom, it is more pronounced in the online classroom, leading to psychological and communication interruption that must be addressed (Moore, 1993). "There is a space of potential misunderstanding between the inputs of the instructor and those of the learner" (Moore, 1993). Misunderstandings in an online classroom must be addressed as quickly as possible to eliminate confusion, anxiety and feelings of being lost in cyber space. It is necessary therefore that clear and unambiguous communication of expectations is a priority for the excellent online instructor.

High expectations for performance behavior may be communicated as specific information surrounding the assessment of assignments and learning activities. Providing examples and models of quality work, and communicating detailed descriptors and rubrics (Niess and Gillow-Wiles, 2012) for exemplary performance in an online learning environment

may motivate exceptional effort from the learner. To foster learner autonomy, online instructors may provide opportunities for students to choose a path in their learning, perhaps by selecting a topic for research or deciding the manner in which their new knowledge is presented. Explicit communication of expectations that learners seek out new information to control the direction of project outcomes fosters autonomy while providing clear expectations in an online learning environment (Rice, 2012).

7. Respects Diverse Talents and Ways of Learning

Understanding and respecting the uniqueness of each learner as well as encouraging multiple means of discovering new knowledge are key characteristics of good teaching. Online teaching and learning occur not only in a fulltime virtual school setting but also may occur in traditional education settings as a means of enhancing or supplementing classroom instruction (Rice, 2012). Therefore, there may be numerous reasons for learners to be enrolled in an online classroom. Determining the learner's unique situation and getting to know their prior knowledge and experience is a priority for the excellent online instructor. Electronic communication via surveys, emails, chats, discussion boards as well as video and telecommunication tools assist the instructor in gaining knowledge of the learners. Diversity in and among learners may emerge in the form of culture, learning styles, and physical and cognitive abilities and processing.

Cultural diversity may include an assortment of student interests and a wide range of prior experience in social situations, educational backgrounds and technical familiarity requiring awareness and sensitivity. Due to the emphasis on communication in an online environment, the inclusion of culturally sensitive dialogue and modeling of appropriate communication is neccesary (DiPietro, et al., 2008).

In addition to differences in culture, there may also be differences in learning style. Online instruction may be designed to include learner-centered principles such as student choice, particularly as it pertains to performance-based projects where learners may choose the technology they find most appropriate for conveying their knowledge and content. Designing multiple forms of participation with a variety of mediums controlled by the learners addresses the variety of learning styles that may be present among students in an online classroom.

Learning disabilities presented either cognitively or physically must also be respected in the classroom. Recognition of guidelines such as Universal Design for Learning (UDL) have helped bring access to instructional materials for learners with special needs (Rice, 2012). Numerous technology tools, hardware and software, are continually being developed and when utilized assist in equalizing imbalances created by diversity. Assistive technology such as electronic readers and voice activated software provide universal access for all learners. In an online learning environment, the use of adaptive release of resources may also provide the assistance needed by individual learners at particular times throughout their learning experience and personalizes their education. Personalized approaches to learning are an innovation in education that may be realized in online learning environments and clearly focus on student learning. "Personalized approaches also address the conceptual knowledge students bring to their online experiences, as well as diagnosis and remediation of any misconceptions they might acquire, and are particularly supportive of the acquisition of foundational disciplinary knowledge" (Swan, 2010, p. 116).

In addition to the principles suggested in the work of Chickering and Gamson (1987), effective teachers' efforts result in "important educational results" (Bain, p.5), which may include appropriate achievement on standardized tests and assessments, and the development

of lifelong learners, students who love to learn. Good teaching produces sustainable effects on students resulting in "changes in the way students think, act, or feel" (Bain, p. 7). Good teachers stimulate their students' intellectual development, inspire students to learn more, and develop rapport that encourages trust.

Good teachers are aware of the environment in which they are teaching and their students are learning. They understand the effects that change within this environment may provoke, particularly in regard to diverse needs and student achievement. Intentional planning and design of classroom space to provide optimal learning, interaction and collaboration is characteristic of effective instruction, particularly when considering the integration of technology (Niess, 2008; Niess and Gillow-Wiles, 2012). "Space affords and demands different pedagogies. Just as in face–to-face teaching you change the layout of the classroom and the organization of the desks you need to teach in different ways and students will react in different ways. The same occurs in an online space" (Redmond, 2011– student reflection). The Florida Center for Instructional Technology at the University of South Florida College of Education identified specific characteristics found in classrooms that describe the integration of technology within the classroom space. The instructional setting may include flexible and varied arrangement, robust access to different technology tools and online resources, as well as identifiable supports for all participants in the classroom. These characteristics promote an active, collaborative, constructive, authentic, and goal directed learning environment (Technology Integration Matrix).

Ultimately, good teaching is good teaching. Effective teachers know their content knowledge and pedagogy knowledge. They know their learners and learning theory and are able to engage students in active participation in learning activities designed to motivate and

inform. They understand the affordances and constraints of the learning environment and achieve a synergy of the technology tools and the learning space in order to increase student achievement. They move beyond the science of best practices to the art of identifying means by which students are inspired to continue their learning, deepening their understanding and world view. Devine, Fahie, and McGillicuddy (2013) identified several characteristics within the constructs of teaching style and personal traits that differentiate the excellent instructor and are anchored in the emotive realm. An emphasis on personal relationships, a passion for teaching and learning, and love for children are foundational characteristics of good teaching. The art of good teaching compliments the science of good teaching (Brinthaupt, et al., 2011). Quality online teaching is no different and it reflects the characteristics of a good teacher regardless of the mode of delivery (SREB, 2006).

Changing Roles of Effective Online Instructors

The evolution of education spaces and learning environments presents new experiences for all members of the learning community and a "change in the role of the instructor and the nature of teaching" (Redmond, 2011). Consequently, the nature of learning itself is changing as access to a wealth of information has become universal (iNACOL, 2015). Learning in the 21st century is largely impacted by technology access. Development and expansion of technology affords the means of retrieving and managing this information in classrooms worldwide. Internet access allows an individual to search for the answer to any question they may have. Due to the sheer size of the Internet, effective navigation of the World Wide Web requires knowledge of how the system works and what criteria are needed for determining legitimate resources. This will be increasingly relevant in the near future. In describing the paradigm shift away from the inadequate model of education inherited from the Industrial Era, Waks (2014)

predicts the Internet, not the school, will be the new centerpiece of education with schools playing a smaller role. Web 2.0 technologies and the Internet usher in a model of social learning in which the development of knowledge and skills in new online literacies is necessary.

This evolution requires a re-examination and adjustment to the roles of the instructor as well as that of the learners. Particular attention to the instructor presence and shift in pedagogy for the online classroom will be examined. One of the misconceptions of an increased use of technology in education is the idea that automation within the learning environment will create a space where "there is little room for the instructor" (Ice, 2010, p. 155). Although this thinking suggests that the instructor presence is not as necessary in an online learning environment, research presented above maintains that presence is critical. Transformation of the learning space affirms the necessity of the instructor as the role of providing motivation, being both learning coach and co-learner, becomes less obscure. The online instructor promotes skills required for today's global culture and may be integrating technology more familiar to the learners than to the instructor. The online teacher is a risk taker, actively and intentionally blurring the roles of student and teacher in order to create co-participation in the learning process. As with any learning space, the instructor remains central to learning.

Changes in how learning occurs, particularly in response to the integration of technology, affects the instructor's role in an online learning environment. Online learning is student centered and based in social constructivist learning theory (Rice, 2012; Swan, 2010). There is a philosophical paradigm shift in how one teaches. Students do not merely receive information from the computer in an online learning environment, nor does the instructor impart knowledge upon the student. Rather, learning occurs through thinking and inquiry-

oriented approaches (Swan, 2010) orchestrated by the presence of the instructor. Garrison, Anderson and Archer (2000) suggest the Community of Inquiry (CoI) framework in an online environment as a purposeful inclusion of the "core elements of social, cognitive and teaching presence for the purpose of critical reflection and discourse" (Garrison, Cleveland-Innes, 2010, p.20).

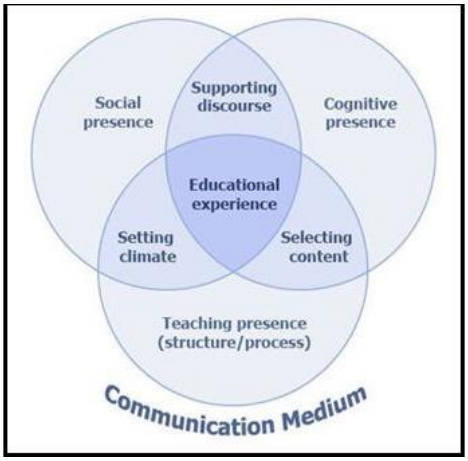


Figure 3. Community of Inquiry Framework. Adapted from Garrison, Anderson, and Archer, 1999.

This framework highlights the process of constructing and confirming deep understanding in relation to the three types of presence: social, cognitive, and teaching. Social presence refers to the affective connection felt by members of the learning community. This association may be developed by affective expression, open communication, and group cohesion (Garrison and Anderson, 2003). Teaching presence refers to the design, organization, facilitation, and direction of both cognitive and social processes in order to establish meaningful learning outcomes. Cognitive presence refers to the construction of meaning while engaged in course activities, reflection and dialogue. The online instructor facilitates the relationship between

these three presences as they assist in the learner's acquisition and construction of knowledge. In an online environment, the value of Web services and applications known as Web 2.0 is intensified as these tools enhance and enable rich relationship development in the CoI (Ice, 2010; McKerlich, Riis, Anderson, and Eastman, 2011; Vaughan, 2010). "Web 2.0 presents users with a more organic experience of a network environment, in which their contributions have the opportunity to be responded to in turn by others, and thus grow into a dialogical conversation with participants in an increasingly globalized world" (Guth and Thomas, 2010, p. 41).

The introduction of online technologies into the classroom changes what is pedagogically possible including greater access to information, larger scale of collaborative possibilities, and the development of new digital literacies, including the knowledge, skills and behaviors associated with their practice. Unfortunately, misconceptions arise in the prevailing tendency to transfer old pedagogy to new technology (Swan, 2010). Particularly when moving form a face-to-face classroom to a blended or online classroom, it is not uncommon for instructors to try to replicate existing course design and pedagogical practices (Bonk and Dennen, 2003). In the online learning space, the new technologies require a change in pedagogy from knowledge transmission to knowledge generation. Thus the role of the instructor transforms from content provider to facilitator (iNACOL, 2007; Redmond, 2011).

The online instructor plays a role of moderator as he or she facilitates learning and teaches students how to learn, a term that Mostrum and Blumberg (2012) refer to as "learning-to-learn" skills. With the shift from what the instructor does to what the learners are doing, the emphasis is on creating opportunities for students to take responsibility for their learning and developing autonomy as self-regulated learners. Facilitation of learning includes providing

student choice, allowing learners to make decisions within the process, and offering guidance and support. Online instructors use learning centered strategies to engage students in the content. The purpose of the engagement is to promote the student's understanding and knowledge building in order for them to apply this new knowledge in other contexts, thus learning to learn. Positive impacts on metacognition and critical thinking strategies have been associated with these self-regulated learning strategies (Rice, 2012).

Facilitating learners' achievement of the knowledge, skills, and behaviors appropriate for the new literacies may be supported by the inclusion of Web 2.0. The identification of three dimensions of these new literacies is reflected in the work of Lankshear and Knobel (2006). In their research, the operational, cultural and critical dimensions are recognized. The operational dimension refers to skills such as the ability to use the tools available online to operate desired functions, search for information, multitask online, and share resources and information effectively. The cultural dimension involves an understanding of what is appropriate in communication given particular online contexts. This dimension includes meaningful knowledge regarding whatever content the online community is concerned with, basic knowledge of netiquette and ethical behavior, and knowledge of copyright and intellectual property rights. Finally, the critical dimension includes an awareness of the technologies' potential and utility in relation to serving the community both locally and globally (Lankshear and Knobel, 2006). These three domains are developed simultaneously in telecollaboration (Guth and Thomas, 2010). With the addition of videoconferencing and desktop sharing devices, telecollaboration in the online classroom focuses on developing new online literacies (Guth and Helm, 2010) and promoting active and engaging dialogue as well as shared knowledge building. Telecollaboration has the potential to create authentic learning

situations when the instructor purposefully and intentionally creates these opportunities. The role of the instructor is less Sage on the Stage and more "Sage on the Side" (Martin and Noakes, 2012) as the e-learning space is transformed by a freedom from the linear paradigm and enhanced by relational pedagogy involving instructor, learners, and the technology.

Instructional Centeredness of Pre-Service Teachers in an Online Learning Environment

Instructional centeredness is often referenced by the behavioral actions depicted by the teacher and the students. Examination of pedagogical practices and student expectations lead to the distinction of practices an instructor employs in the classroom as they relate to function, power, control, and management of learning processes. For instance, Weimer (2002) characterizes learner-centered instruction by the role of the instructor, the responsibility for learning, the balance of control, the function of content, and the process and purpose of assessment. For the purpose of this study, these characteristics are examined within the planning stage, as pre-service teachers demonstrate their instructional centeredness in a lesson plan.

Background- Shift From Teacher-Centered to Learner-Centered

Traditional education has been described as a broad orientation of "teacher centered/content oriented" teaching (O'Neil and McMahon, 2005). Using the five areas identified by Weimer (2002), consideration of the following components of instruction will assist in identifying characteristics of traditional instruction.

1. The function of content
2. The role of the instructor
3. The responsibility for learning
4. The process and purpose of assessment

5. The balance of control

The focus of action within the traditional classroom is on the teacher and what the teacher does with the content. In teacher-centered classrooms the teacher possesses the power to control and manage all aspects of learning, provides the students with little to no choice in their learning, and promotes an environment of passive student demeanor. A low-level of learning is evident as teachers tell students what to learn by narrating conclusions and summaries, covering content to build a predetermined knowledge base and "force learning on reluctant participants" (Weimer, 2002). The unilateral transmission of knowledge by the teacher followed by recitation of the given content as assessment is evidence of low-level thinking and remembering for a brief period of time. The example of students copying lecture notes as described by Harry Wong, further identifies the characteristics that mark traditional pedagogical practices. "Students transfer words from the teacher's notebook to their notebook, bypassing the brains of both".

These traditional teacher-centered practices persist among PK-12 and higher education, demonstrating both the resistance to change and the barriers that inhibit learning, particularly with the adjustments necessary for embracing the affordances of technology and their innovative use in learning environments. Making the shift from teacher centered to student centered teaching practices must include an examination of the inclusion of technology and the transformation of distance education.

The Evolution of Online Education

Beginning with the first century AD, St. Paul's letters to the early Christians in Corinth may be considered an early form of distance education. His correspondence to the Corinthians was instructional in nature, written from Ephesus to "students" in the city of Corinth,

demonstrating the utilization of the technology of the time to teach from a distance. The invention of the printing press in the mid 1400's is an example of how technology made education available to a much wider audience moving literature beyond the grasp of the rich to the general public. This technology made textbooks accessible much like the Penny Post, affordable postage, allowed the general public to send and receive written correspondence. The mid 1800's are marked by the innovation employed by the University of London and their launch of the first distance learning degrees, affordable programs available to less affluent learners around the world. In the United States, the University of Chicago led the way in distance education implementing their degree program in the late 19th century. The development of additional technologies such as the radio and television furthered this concept of educating from a distance, assisting in neutralizing distance and increasing access. The success of correspondence courses was due to these factors in particular, independence in terms of time and space and the increased access for learners (Garrison and Cleveland-Innes, 2010).

As the needs of learners evolved, reformers in education responded to reflect a purpose of meeting the needs of the learner. The introduction of technical colleges and community colleges occurred in response to new workforce needs and changes in the culture, particularly during the Industrial Revolution (Miller, 2010). Focusing on the learner's needs rather than the method of instruction created a shift in pedagogical practice and instructional philosophy. Distance education achieved an innovative model, Britain's Open University, established in 1969 and provided adults who had been disregarded by Britain's elite higher education system the opportunity for continued learning. This spawned a democratization of access to open education across many other countries. The Open University had been designed to provide

services to nontraditional students and was organized as a learner-centered institution to meet the instructional needs of the individual student (Miller, 2010). Learner-centered distance education reflects a marked difference in teaching philosophy from what Garrison and Cleveland-Innes (2010) refer to as the Industrial age distance education. In the post-industrial era, not only were the needs of learners changing, but the new technologies being developed, namely the Internet and the World Wide Web, also encouraged change in the focus of education, as the opportunity for learning in community was now available. Post-industrial distance education was reconstructed with changes in pedagogy as well as technology as distance education transformed into online learning. Industrial models of distance education promoted autonomy of learning while post-industrial distance education promotes collaboration (Garrison and Cleveland-Innes, 2010).

> "Where distance education was materials and teacher-centered, online learning is student centered; where distance education focused on independent study, online learning focuses on collaboration; where distance education was grounded in behaviorist and cognitive psychology, online learning is grounded in social constructivist learning theory" (Swan, 2010, p. 109).

The new era of distance education, online education, capitalizes on the emerging technologies and focuses on quality of education. Post-industrial online learning goes beyond accessing information to include connectivity, blending interactive learning with collaboration in a different learning environment. "Online learning represents a range of practices based on the Internet that provides synchronous and asynchronous communication in a personal and group environment" (Garrison and Cleveland-Innes, p.19, 2010). As highlighted in the knowledge and skills domain, effective online educators are concerned with matters such as dialogue, interaction, and collaboration and online instruction can offer a more student-centered environment (Barker, 2003; Pederson & Liu, 2003; Salmon, 2003). Great emphasis on

learner-centered instruction has emerged in current educational reform (Walberg, 2015) along with the necessary integration of technology.

In online and blended education, the International Association for K-12 Online Learning (iNACOL) calls for a new vision for teaching and learning which includes a change in mindset. This is a shift from teacher-centered to student-centered learning by promoting models of education that underscore and develop student choice, student discovery, student initiated use of technology, student-generated content, student learning by doing, and culture that promotes learning (Powell, Rabbitt, and Kennedy, 2014). The Alliance for Excellent Education and the U.S. Department of Education (2014) developed the Future Ready District Pledge, which is an appeal for district superintendents to promise several specific activities in their commitment of transition to "personalized, digital learning". Among the activities is the provision of "universal access to personalized learning opportunities and instructional experts that give teachers and leaders the individual support they need, when they need it" (Future Ready District Pledge, 2014).

What is Student-Centered or Learner-Centered Teaching and Learning?

For the purpose of this study, student-centered or learner-centered teaching and learning is defined as instruction that is focused on the learner. Learner-centered teaching is designed to increase learner outcomes and promote student learning as it focuses on a number of factors affecting student achievement.

> "Student-Centered Teaching and Learning focuses on the needs, abilities, interests, and learning styles of the students and has many implications for the design of curriculum, course content, and interactivity of courses. Accordingly, a prominent pedagogy will be teacher-as-coach, to provoke students to learn how to learn and thus to teach themselves, rather than the more traditional teacher-centered learning with teacher-as-deliverer-of-instructional-services, which places the teacher at its center in an active role and students in a passive, receptive role.

> This pedagogy acknowledges student voice as central to the learning experience for every learner and requires students to be active, responsible participants in their own learning. To capitalize on this, teaching and learning should be personalized to the maximum feasible extent." (Coalition of Essential Schools, 2014)

Student centered teaching and learning has its roots and is underpinned in psychological research and cognitive constructivist learning theory and is in contrast to teacher-centered or traditional classroom instruction. In teacher-centered learning, the instructor asserts control over the content, the learning experiences and the learning environment by making decisions about how the learning will occur and what learning may occur.

Traditional instruction maintains the role of the teacher as the provider of information while the student plays a passive role as the receiver. The teacher is viewed as the expert in teacher-centered instruction and transmits knowledge, while the student flaccidly collects content. The focus in a teacher-centered classroom is on what the teacher is doing. In contrast, learner-centered teaching directs its attention to what the students are doing in order to acquire changes in their learning (Harden and Crosby, 2000; O'Neil and McMahon, 2005).

Cognitive constructivist learning theory explains the interaction of new information with prior experience and the connection and reorganization that occurs in the brain. There is an active process that transpires according to Piaget, with intentional retrieval of past experiences or schema to connect new information. The student is an active processor as he or she makes decisions about what is logical. Bruner augments this theory by including both context and readiness of the learner as it applies to education and instruction. Using logic and the human experience to interpret information, students construct new knowledge, transcending rote memorization and gaining meaningful and active learning through the process. Instruction therefore should be designed to facilitate extrapolation and allow the

learner to fill in the gaps of their learning. Dewey enhances this theory with the addition of an awareness of this process and the philosophy of experience, interaction, and reflection in education.

Key Characteristics of Learner-Centered Teaching

Years of research produced by the American Psychological Association (APA) on learners and how they learn has contributed to the creation of fourteen learner-centered principles, written through the joint efforts of the APA's Presidential Task Force on Psychology in Education and Mid-continent Regional Educational Laboratory (1993). These principles are categorized into four domains of factors impacting an individual's learning. These domains include the following: Metacognitive and Cognitive such as strategic thinking and context of learning, Motivational and Affective including intrinsic motivation and emotional influences, Developmental and Social including influences on learning encountered through personal developmental and social interactions, and Individual Differences such as factors resulting from diversity (Macombs and Vakili, 2005). Key principles or characteristics of learner-centered teaching and learning include a balance of power allowing students to make choices within the curriculum, the function of content to include the development of student metacognition and awareness, the role of the teacher as facilitator and guide, the responsibility of learning being shifted more towards the learner, and intentional construction of assessment as a process of utilizing personal feedback and guidance from the instructor (Weimer, 2002). The following are the five dimensions of education which Weimer (2002) indicated requiring change.

Function of content- although the goal of developing a knowledge foundation is the same in both teacher centered and student centered learning, a distinction may be made in a student-

centered classroom where content is used rather than covered. When content is used, students may develop learning skills and self awareness in addition to the knowledge gained while engaging in the messiness of learning. Students gain skills in cognitive processing when the strategies for learning are not separated from the content to be learned (Weimer, 2002). This includes learning through problem solving, evaluating content, developing hypotheses, analyzing arguments, and developing conceptual and critical thinking (Polly et al., 2014).

Role of the instructor- instruction is focused on student learning rather than on teacher action. This role may appear as a facilitator, guide or expert who is available but not directing. In a student centered learning environment instructors design learning experiences but are no longer the primary actor. Instructors design learning experiences, but students are the primary actors. They interact with the content, while the instructor is there to offer guidance, explanation, counsel, encouragement and praise. As students encounter content, the instructor teaches learning-to-learn skills (Mostrum and Blumberg, 2012) such as the strategies for problem solving and critical thinking while providing opportunities for practice of these skills. All of the focus is on student learning.

Responsibility for learning- learner centered teaching includes the intentional design of a learning community where learning is no longer forced on students, but rather students participate in the building of this environment and are motivated to take responsibility for their learning as they grow more autonomous. Learner centered instruction promotes questioning, exploration and construction of new knowledge.

Assessment- process and purpose- evaluation processes change as the role is shared in the learner-centered classroom between the learners and the instructor. Students develop the skills of self-evaluation and peer evaluation while they practice opportunities to assess activities as

part of the learning process. Formative feedback allows students to learn from their mistakes as they interact with content and receive feedback prior to submitting an assignment to be graded (Mostrum and Blumberg, 2012).

Control- balance of power- the learner-centered classroom provides an ethical balance of power with instructors sharing decision making about learning with the students. Allowing student choice in assignments, communicating and collaborating, as a learning community to create classroom procedures, assessment criteria, and guiding principles for learning are examples of the shared control in this environment. "Applying learner-centeredness to teaching and learning models will allow students to participate more fully in the arrangement of their own learning experiences" (Cleveland-Innes and Sangra, 2010, p. 233).

Noting the trendy nature of education jargon, Weimer (2013) offers the following five dominant characteristics of learner centered teaching included in a revision to her book, *Learner-Centered Teaching: Five Key Changes to Practice, 2nd edition*.

1. Learner-centered teaching engages students in the hard, messy work of learning.
2. Learner-centered teaching includes explicit skill instruction.
3. Learner-centered teaching encourages students to reflect on what they are learning and how they are learning it.
4. Learner-centered teaching motivates students by giving them some control over the learning process.
5. Learner-centered teaching encourages collaboration.

Additional characteristics of learner-centered teaching include activities in the classroom, which promote collaboration such as cooperative learning. Teams of students work together to solve problems or complete projects with attention given to positive

interdependence as well as individual accountability. Active learning during class time in a learner-centered classroom may include answering and generating questions, discussion, debate, brainstorming and problem solving. Inductive teaching and learning methods such as inquiry-based learning, case-based instruction, problem and project based learning, discovery learning and just-in-time learning are also evidence of learner-centered instruction.

Building a Case for Integrating Technology

In the traditional classroom, it is not uncommon to see shallow technology integration with an emphasis on the technology rather than the learning goals (Hutchinson and Reinking, 2011). However, the role of technology must be reimagined as that which is used recurrently and with ease to address differentiation of learning, increase learner access to concepts, communicate and collaborate with a wide audience, and provide meaningful and frequent feedback that promotes learning. This requires a transformed mindset as teachers begin to use technology with regularity and sophistication for meeting the needs of their students (Bain and Weston, 2012). With the focus on student learning, a shift in perception or understanding of technology integration is achieved. Learner-centered instruction does not focus on the digital tool but rather on what is acceptable and relevant for the learner in achieving his or her learning goals.

Researchers indicate an increase in student performance in courses and classrooms where student centered learning is a priority (Armbruster, Patel, Johnson and Weiss, 2009; Mostrum and Blumberg, 2012; Polly, 2008; Polly, Margierison, and Piel, 2014; Sawada et al., 2002; Weimer, 2002). There is also evidence that technology integration is most useful in student centered classrooms, particularly when technology is used for problem solving, developing concepts, and critical thinking (Krueger et al., 2004). Student-centered classrooms

demand higher order thinking and is reflected in the higher levels of Bloom's taxonomy: applying, analyzing, evaluating, and creating. Characteristics of learner-centered teaching such as student choice and the balance of power through student controlled work rate are two factors which proved to be positive influences on student outcomes in a technology infused learning experience (Lopez-Perez et al., 2013).

Although learner centered instruction has the potential for great improvement in student construction of new knowledge and understanding of the process of learning, Polly, Margierison, and Piel (2014) report several constraints identified by teachers practicing learner-centered instruction in mathematics. These constraints include difficulties with enforcing classroom management, time constraints, production of activities that are too permissive, and the potential for distraction when activities encourage high energy. Addressing these issues through awareness and intentional thinking and planning to eliminate them as possible pitfalls may be executed through professional development and pre-service training.

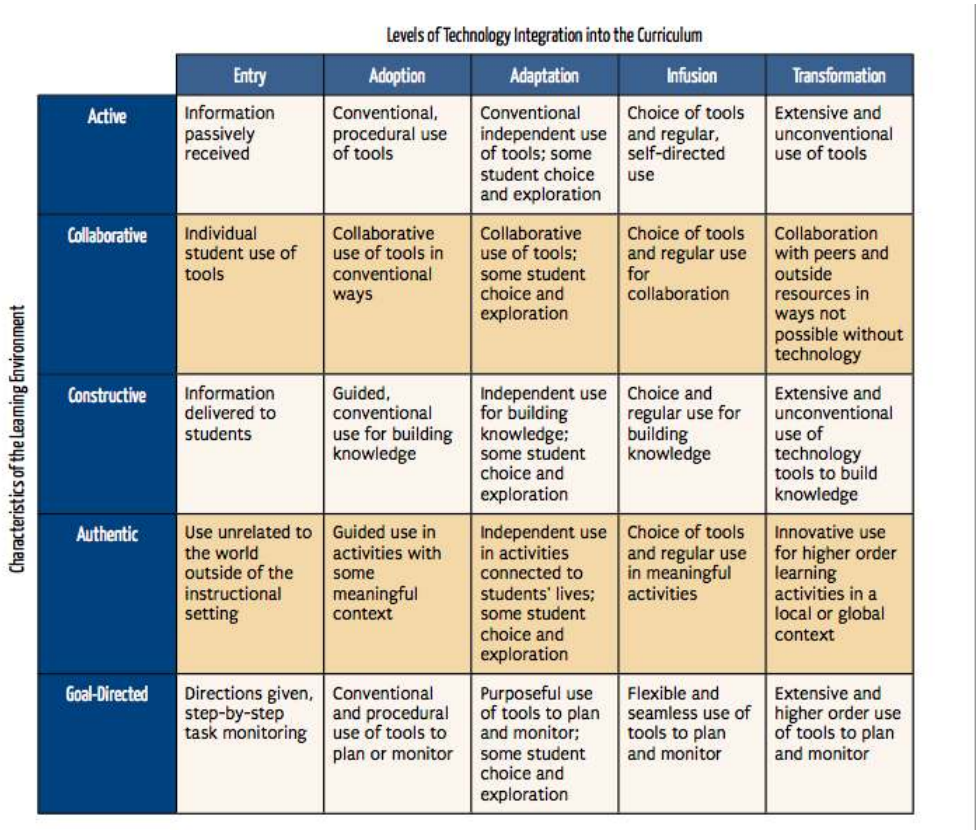
As mentioned in both the first and second domains, pre-service teachers struggle with a vision of instructional space and instructional pedagogy that is unfamiliar to them. Learning as an apprentice is a natural approach (Collins, Brown and Holum, 1991); therefore as apprentices, pre-service teachers often replicate the instruction they have experienced and what has been modeled for them. If pre-service teachers are to enter the profession with appropriation and mastery (Laffey, 2004) of technology integration and equipped to practice learner-centered instruction, it is important for them to experience these while they are still in a student role. Laffey (2004) found pre-service teachers were able to see the value of integrating technology in their instruction (appropriation) but lacked the accomplished use of technology

in their teaching (mastery). He also found the opposite, pre-service teachers who had mastery but without appropriation. A connection may be made between the earlier work of Laffey (2004) and the later research of Mishra and Koehler's (2005) TPACK and Puentedura's (2008) SAMR. Understanding and recognizing the significance of technology integration without possessing the technology skill, particularly within a content area, is much like Mishra and Koehler's (2005) pedagogical content knowledge (PCK), while the ability to use the technology in a specific content area without the understanding of its pedagogical significance is like Mishra and Koehler's technological content knowledge (TCK). Approaching instruction with the understanding of how technology may be used within the educational context to increase learner outcomes is the generalized purpose of TPACK as technological pedagogical content knowledge and SAMR's ability to answer the question: Does my technology integration act as a substitute (S), an augmentation (A), a modification (M) or a redefinition (R) of the learning task? Frameworks such as TPACK and SAMR encourage the characteristics of effective technology integration within a particular context and learner-centered pedagogical practices. Infusing these frameworks in teacher preparation programs and integrating coursework with faculty who possess TPACK and SAMR may impact pre-service teachers' learning and consequently PK-12 student learning. When teacher preparation programs are TPACK and SAMR oriented, the pre-service teacher becomes aware of TPACK and SAMR characteristics.

Measurement Tool for Instructional Centeredness

The Technology Integration Matrix, created by the Florida Center for Instructional Technology, is a tool, which describes levels of technology integration within the learning environment, including indicators of Teacher behavior, Student behavior and the Learning

Environment. The matrix contains 25 cells within the confines of a 5 by 5 square bound by characteristics of the learning environment and levels of technology integration. Use of this matrix allows teachers to gain a better understanding of their use of technology towards student learning.



Levels of Technology Integration into the Curriculum

Characteristics of the Learning Environment

	Entry	Adoption	Adaptation	Infusion	Transformation
Active	Information passively received	Conventional, procedural use of tools	Conventional independent use of tools; some student choice and exploration	Choice of tools and regular, self-directed use	Extensive and unconventional use of tools
Collaborative	Individual student use of tools	Collaborative use of tools in conventional ways	Collaborative use of tools; some student choice and exploration	Choice of tools and regular use for collaboration	Collaboration with peers and outside resources in ways not possible without technology
Constructive	Information delivered to students	Guided, conventional use for building knowledge	Independent use for building knowledge; some student choice and exploration	Choice and regular use for building knowledge	Extensive and unconventional use of technology tools to build knowledge
Authentic	Use unrelated to the world outside of the instructional setting	Guided use in activities with some meaningful context	Independent use in activities connected to students' lives; some student choice and exploration	Choice of tools and regular use in meaningful activities	Innovative use for higher order learning activities in a local or global context
Goal-Directed	Directions given, step-by-step task monitoring	Conventional and procedural use of tools to plan or monitor	Purposeful use of tools to plan and monitor; some student choice and exploration	Flexible and seamless use of tools to plan and monitor	Extensive and higher order use of tools to plan and monitor

Figure 4. The Technology Integration Matrix, developed by the Florida Center for Instructional Technology at the University of South Florida. This table contains summary descriptors, but their website contains supplementary matrices detailing student and teacher behavior and instructional setting descriptors. Additionally, a rich resource of video exemplars for K-12 in four different content areas may also be found on their website.

Technology integration is viewed along a continuum that generally reflects instructional centeredness in regard to who makes decisions about which technology to use, how to use the technology and when to use it. This matrix describes five levels of technology integration: Entry, Adoption, Adaptation, Infusion and Transformation. The Entry level suggests passive reception of information by the learners as the instructor makes all decisions regarding technology integration. Instructors continue to make instructional decisions regarding technology at the Adoption level although learners are exposed to the technology. Learners are guided in independent use of technology in the Adaptation level as the teacher maintains control over which technology is used. At the Infusion level, teachers allow learners choice in their decision of how and when to use technology for learning. Finally, the teacher encourages learners to use technology in unconventional ways in the Transformation level of the matrix.

Student-Centered Learning Environments

In the student centered learning environment the emphasis is on the learning. Rather than focusing on what is being taught, or how it is being taught, the concentration is on what and how students are learning. Grounded in the constructivist framework, all individuals bring unique understandings and structures of organizing information that affect their learning. The prior knowledge and distinct schema each learner possesses are the ingredients that student centered learning environments use for the creation of new knowledge. "Learner-centered teaching moreover builds on students' conceptual and cultural knowledge by linking learning to their knowledge and experiences, while exploring and valuing the multiple perspectives and divergent understandings unique individuals necessarily maintain" (Swan, 2010, p. 115). However, rarely is a learning environment entirely teacher-centered or entirely student-

centered, therefore it is beneficial to view this as a continuum such as O'Neil and McMahon (2005) suggest in figure 5.

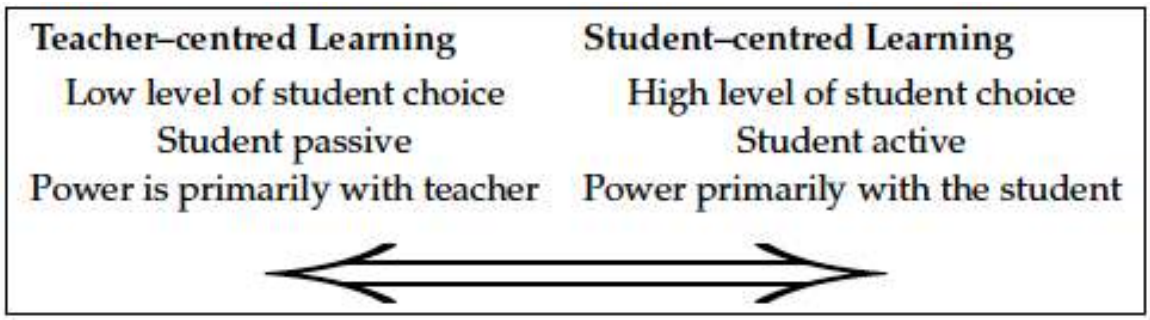


Figure 5 Teacher centered and student centered continuum. Adapted from O'Neil, G. & McMahon, T. (2005). Student-centered learning: What does it mean for students and lecturers? In O'Neil, G., Moore, S., & McMullin, B. (Eds.) *Emerging Issues in the Practice of University Learning and Teaching*. Dublin: AISHE.

Designing the online learning environment to promote student-centered learning includes applications for personalized instruction such as assessing prior knowledge, gathering baseline data, and managing individual learning trajectories. In addition to assessing students' conceptual knowledge, diagnosis and remediation of misconceptions must also be addressed. Student centered learning environments promote increased participation, increased motivation and interest and most importantly increased learning outcomes (Armbruster, et. al., 2009; Polly, Margierison, and Piel, 2014).

The learning environment may be examined using the Technology Integration Matrix through careful observation of characteristics to determine attributes of the instructional setting relative to student centered learning. The five characteristics of the Learning Environment include: Active, Collaborative, Constructive, Authentic, and Goal-Directed. The characteristic

Active refers to the degree of student engagement within the instruction. The environment may also reveal an intentional attempt to promote or disregard collaborative learning in the arrangement of desks, the design of the tasks, and the availability of technology tools. Constructive characteristics of the learning environment portray decisions made within the learning environment that may inhibit or promote connections learners make to prior knowledge. These decisions may include availability of technology tools and resources as well as opportunities for learners to construct and share new knowledge. Authentic characteristics of the learning environment include an assessment of learner motivation and relevancy of the task. Finally, the learning environment may support learner reflection and meta-cognition by including tasks requiring higher order thinking and robust access to a variety of technology tools and online resources as learners are able to plan and monitor their thinking as well as the task at hand.

Because learning is situated in the sociocultural context, learner-centered instruction is influenced by the social constructivist (Vygotsky) perspective. Designing opportunities for students to collaborate and learn from each other is characteristic of the learner-centered environment. This is not simply the utilization of group projects, but rather taking the classroom environment and course components to create a synergy of ideas, motivation, engagement and the social nature of learning.

In the virtual classroom, the student undergoes a series of relationship formations, which affect the student's sense of belonging to the learning community. These relationships involve the rapport with the teacher, the bond with the other students as well as the connection with the content. The interconnection of these associations augments the student's sense of "who they are as a person" (Falloon, 2011), specifically as it pertains to the virtual classroom.

These relationships affect the level of engagement experienced by the student and may contribute to increased motivation and learner outcomes.

The relationship and connection between student and instructor is highly desirable, essential, and serves as a source of engagement (Moore, 1993; Cleveland-Innes and Garrison, 2010; Ragan, 2007; Rice, 2012). In the virtual classroom, the instructor has the opportunity to be supportive and encouraging through feedback and pedagogical decisions. Conversely, communication from the learner to the instructor is also important if the student desires assistance. A lack of interaction between student and instructor results in a great deal of autonomy for the student (Moore, 1993; Palloff and Pratt, 2011).

Engagement in a virtual classroom is also affected by the student's perception and ability to gain knowledge in this environment. The connection a student makes with the course content directly affects the level of engagement a student feels within an online course. Intentional design of student choice in direction, focus, and specific topic within a content area affords the learner the opportunity to make the learning purposeful and authentic.

Chapter III

Methodology

Development of new technologies has provided a transformation in the field of education and identifiable possibilities for expanding beyond the four walls of the traditional classroom. These advances include innovative pedagogical strategies to meet the needs of individual learners, including those appropriate and effective for the addition of online and blended classroom spaces. The increase in both need and desire for online education results in a need for educators who are willing and able to practice effective instruction in this learning environment. Accordingly, teacher preparation programs must address classroom settings that include alternatives to the traditional learning environment (Archambault and Crippen, 2009b; Laffey, 2004; Rice and Dawley, 2009) while preparing their pre-service teachers. As teacher preparation programs plan and develop solutions to address this need, a thorough learner analysis of the characteristics their pre-service teachers possess in regard to online learning environments may provide information critical to effective and efficient course design within the preparation program. This study is designed to answer the following research questions:

RQ1. In a teacher preparation program, what are the attitudes of pre-service teachers towards technology integration in an online learning environment?

RQ2. In a teacher preparation program, what are the knowledge and skills in technology integration of pre-service teachers in an online learning environment?

RQ3. In a teacher preparation program, what are the instructional centeredness behaviors of pre-service teachers in an online learning environment?

RQ4. What are the effects of an intervention on the attitudes of pre-service teachers towards technology integration in an online learning environment?

RQ5. What are the effects of an intervention on the knowledge and skills in technology integration of pre-service teachers in an online learning environment?

RQ6. What are the effects of an intervention on the instructional centeredness behaviors of pre-service teachers' in an online learning environment?

This study examines pre-service teachers in a teacher preparation program. Specifically, the study considers the attitudes of pre-service teachers toward technology integration in regard to the online learning environment, the pre-service teachers' knowledge and skills of technology integration in regard to the online learning environment, and the pre-service teachers' instructional centeredness in regard to the online learning environment. The purpose of the study is to determine if pre-service teachers' understanding of technology integration, particularly as it pertains to the pre-service teacher's attitudes, knowledge and skills, and instructional centeredness could be changed as a result of participation in an online instruction module. The intervention is designed as a two-week curriculum for pre-service teachers. The content will introduce the concept of lesson planning with an emphasis on knowledge building of technology integration and the online learning environment. The content area for lesson design and age of learner is nondescript. If utilizing this module within a specific content area methods course, the faculty may specify the content area. Artifacts produced by the pre-service teacher will provide information relevant to the participant's attitudes, knowledge and skills toward technology integration in an online learning environment and instructional centeredness in an online environment. Additionally, an adaptation of the Survey of Teachers' Knowledge and Skills of Teaching and Technology (Schmidt et al., 2009) will be given to participants prior to beginning the intervention and upon completion of the intervention. This repeated measures assessment will provide data regarding the effect of the intervention on pre-

service teachers' attitudes, knowledge and skills toward technology integration in an online learning environment and instructional centeredness in an online environment. Institutions may use this to inform their teacher education programs as they plan to support teacher candidates in their acquisition of knowledge, skills and dispositions necessary for instructing in dual learning environments. The institution that implements this curriculum will meet standards for CAEP, INTASC and NETS-T.

This chapter addresses the method that was used in the study and includes the following: (a) the research design, (b) participant recruitment and description, (c) the variables for this study, (d) the research instruments used, (e) the procedure, (f) the data analysis plan, and (g) limitations of the design.

Research Design

In order to gain a rich description of the participants in this study, the researcher selected a mixed-method approach to collect both quantitative and qualitative data during this online instruction module intervention. The use of concurrent triangulation design allows the researcher to simultaneously collect quantitative and qualitative data, merge the data using both quantitative and qualitative analysis methods, and interpret the results together to provide a more complete picture of the phenomenon being studied (McMillan and Schumacher, 2010). A nonrandom purposeful sampling of students enrolled in a nationally accredited teacher preparation program at a small, private midwestern liberal arts Catholic university was used for this study. McMillan and Schumacher (2010) describe this technique as the process by which the researcher selects particular criterion that will be informative, allowing the researcher to gain significant information central to the research. In this study, criterion sampling was used to select participants based on predetermined characteristics, specifically novice students in the

institution's teacher preparation program and developing students in the institution's teacher preparation program. In order to recruit participants, the researcher selected three sections of two different courses as potential groups for participation. Two sections (A and B) of the course EDU 218 Foundations of Education and one section (C) of EDU 300 Active Learning for the Young Child: Science and Social Studies. Thus a selection of three groups of students was made. These three groups consist of Group A-students enrolled in a basic, foundations of education course, Group B- a second section of students enrolled in the basic, foundations of education course, and Group C- students enrolled in a 300 level education methods course (see Table 1). It should be noted that because students register for courses themselves, they decide on times and sections for each of their courses. The selection of these three groups will allow the researcher to compare effects using a three way model: A to B, A to C and B to C. Comparing the novice groups to each other and each novice group to the developing group may provide important information for the development of transformational changes to a teacher preparation program.

Table 1

Matrix of participants

Group	**Course**	**Instructor**	**Students' Experience as a pre-service teacher**	**Number of Students Enrolled**
A	EDU 218 A Foundations of Education	A	Novice	25
B	EDU 218 B Foundations of Education	B	Novice	23
C	EDU 300 Active Learning for the Young Child: Science and Social Studies	C	Developing	19

Students entering this institution as Education majors typically enroll in EDU 218 Foundations of Education during their first year. The selection of all students registered in the two sections of EDU 218 Foundations of Education in the fall semester 2015 to participate in this study would provide baseline data regarding characteristics of pre-service teachers who have had little or no coursework at this university specific to Education. A second criterion was employed to provide comparison data. Students at this university enrolled in the one section of EDU 300 Active Learning for the Young Child: Science and Social Studies in the fall semester 2015 were asked to participate. These participants have had the Foundations course, the single technology course, as well as at least one methods course. Preparation for use of the online instruction module as part of the regular coursework began prior to the beginning of the fall semester as the researcher met with the three faculty members for these courses and offered the module as curriculum. Recruitment of participants, however, began after IRB permission had been granted to the researcher. At that time, the researcher requested permission to use students enrolled in those three courses as participants for this research with the addition of the pre- and post-survey. Although the researcher is a fulltime faculty member at this Institute of Higher Education (IHE) none of the courses utilized for participant recruitment were courses the researcher teaches. Students were notified that the researcher was collecting data in regard to their attitudes toward technology integration, their knowledge and skills of technology integration, and their instructional centeredness in an online learning environment. Of the (67) students registered for these three course sections, all students agreed to participate. All of the participants were asked to complete a survey prior to and upon the completion of the intervention, which is an online instruction module. The online instruction module is a required component of the normal course work for all courses involved in this research. The

online instruction module was designed to provide necessary information to pre-service teachers. The content includes an introduction to models of online learning, design elements for lesson planning, central concepts for effective technology integration, curriculum approaches such as Technological Pedagogical Content Knowledge (TPACK) and Substitution Augmentation Modification Redefinition (SAMR), and tools and resources for engaging active learning in an online learning environment. Additionally, the online instruction module intervention includes learning experiences and tasks to be completed, which culminate in the creation of an artifact. Students are given a choice of the modality and tool they utilize to demonstrate learning in their artifact.

Participants and Setting

This research took place at a small, midwestern liberal arts Catholic university. The data collection occurred between November 2015 and December 2015. Of the 2103 students enrolled fulltime in the undergraduate program, 79% live outside of the state, including residents from all 50 states and 14 other countries, 52% are female, 9% labeled themselves as Hispanic while an additional 4% indicated themselves as other minorities. Undergraduate fulltime tuition for the 2015-2016 academic year was just under $24,320 and 86% utilizes financial aid. The college entrance scores for entering freshman have consistently been above the National average. In 2015, entering freshman received on average, a 25.7 ACT score while the National average ACT score was 21.0. Freshman entering with SAT scores averaged 1167, while the National average freshman SAT score was 1006. Education majors make up 10% of the undergraduate student population at this university. These demographics indicate a diverse population within the setting. Data was collected from 3 sections of teacher preparation courses delivered on campus during the fall semester of 2015. Most of the students in the 3

courses agreed to participate in this research. Of the 56 students 50 were female and 6 were male. The majority of the participants were in the 18 – 22 age range, however one group included three non-traditional students aged 25 or older. The majority of the participants were working on obtaining licensure in Dual (Early Childhood and Intervention Specialist) N = 24, and Early Childhood, N = 19 areas. The participants in this study were at various places in their program, with 31 freshman, 13 sophomores, 8 juniors, and 4 seniors. The majority of the participants (93%) were traditional students entering college directly after high school. Of the 56 participants, 31 have been students in an online course, which is about 55 % of the total participants.

A colleague of the researcher contacted a purposeful sample of undergraduate Education majors at this small, midwestern liberal arts Catholic university during a regular classroom session to invite them to participate in this research study. The colleague handed each participant a consent form describing the research study (Appendix A). The consent form was read aloud and the participants were given time to read the form themselves for a second time and sign the agreement. The participants then received a form with directions on how to create their personal identification number (Appendix B). Each pre-service teacher that volunteered for this study was asked to create his or her own six-digit personal identification number. The participants were allowed time to create their personal identification numbers on the index cards provided. These pin numbers were written by the participants on an index card and given to a colleague of the researcher. The colleague kept the identification numbers in a locked drawer in his locked office. Personal information of participants was not connected in any way in direct conjunction with the actual survey instrument or any artifacts collected from the online instruction module intervention. These pin numbers were completely anonymous

and were only used to match surveys and artifacts completed during the online instruction module intervention for data purposes. Participants could choose to withdraw during the survey by simply discontinuing participation and not submitting the survey. Additionally, participants could choose to withdraw submitted data by contacting the colleague of the researcher who would then remove the data and provide a new data set to the researcher. Participant agreements were returned to the colleague of the researcher who collected them in a manila envelope. This envelope was then returned to the researcher who stored the agreements in a locked cabinet within the researcher's locked office.

Sample

In order to determine the appropriate sample size the statistical software G*power 3.1.9.2 was used to determine the sample size necessary for achieving a statistical power of 0.80 and a medium effect size of 0.35, according to Cohen's (1988) guidelines for interpreting effect sizes. G*power yielded a minimum number of (63) participants required to achieve the requisite statistical power (see Appendix C).

The researcher is interested in determining any effect the intervention has on the participants and therefore wants to avoid a Type II error or failing to reject the null hypothesis when in fact an effect existed but was not detected by the study due to a low power. Therefore, this research will address the null hypothesis that there is no difference in knowledge and skills in technology integration in an online learning environment between pre-service teachers who do or do not participate in the intervention.

Variables

This study examines three separate groups and two distinct time periods when a quantitative score was obtained for each participant. Therefore, there are two qualitative variables or within subjects variables. The within subjects variables are group identification, which consists of three levels (group A, B and C), and time which consists of two levels (pre and post intervention). The dependent variables in this study included quantitative scores, collected at two distinct times, on the Survey of Preservice Teachers' Knowledge of Teaching and Technology. Thus a 3x2 ANOVA was conducted to investigate simultaneously the effects of two time periods and three groups of pre-service teachers on the survey scores of the participants. An additional quantitative score was obtained on artifacts completed during the online instruction module intervention.

The researcher created an adaptation of the Survey of Preservice Teachers' Knowledge of Teaching and Technology (Apendix D) in order to measure the effect of the intervention on the three domains of this study. Cronbach alpha scores of the original survey were found to be reliable by Schmidt et al. (2009) and scores for the adaptation are reported on page ___. To determine content validity of this adapted version of the Schmidt et al. survey, the researcher contacted four experts in the field of technology integration and online instruction. It was determined that this instrument may measure all three domains, attitude toward technology integration, knowledge and skills of technology integration, and instructional centeredness in an online environment. The survey consists of 23 self report questions, and of these 23 questions experts in the field determined that questions #1-9, and #20-23 effectively measure attitude, #9-23 effectively measure knowledge and skills, and #9-16 and #21-23 effectively measure instructional centeredness. Due to feedback obtained from the experts in the field, the

researcher clarified a few questions by changing the original verbiage. Additionally, the instrument used to measure the effects of the online instruction module intervention on pre-service teachers' instructional centeredness was the Technology Integration Matrix (TIM) (Apendix E). A crosswalk (Apendix F) was created to demonstrate the relationships between the survey questions, the conceptual framework and the research questions. All results from the pre and post survey and the Technology Integration Matrix were compared to determine the effect the treatment had on these participants.

Data Collection

To ensure protection of human subjects, all ethical considerations of the American Psychological Association (2002) regarding human participants were used. All participants were at minimal risk, and the researcher provided the instructors with results of this research and the instructors then provided the results to the participants. The researcher obtained permission from the Internal Review Board (IRB) of the participating institution as well as Duquesne University where the researcher is a doctoral candidate.

The researcher selected two instruments for measuring the effects of the intervention. The first instrument is a self-reporting survey, which provides quantitative measure. The second instrument is a performance-based measure of student work. These two instruments are complementary and when used together serve to reveal the relationship between a self-reporting instrument and a performance-based rubric (Abbitt, 2011). The instrument, A Survey of Preservice Teachers' Knowledge of Teaching and Technology, was an adaptation of a survey developed by Schmidt, et al. (2009). The intention of the instrument developed by Schmidt, et al. (2009) was to measure the development of teacher's TPACK knowledge domains through self-assessment rather than measure their use of technology. The instrument

is available for use under a noncommercial, attribution, no derivatives Creative Common License. The original survey included 47 items and was tested for reliability and validity. Schmidt, et al. (2009) assessed each of the knowledge domains using Cronbach's alpha reliability technique. Results include the following scores for each of the knowledge domains within the TPACK framework: Technology Knowledge (TK) 0.82, Pedagogical Knowledge (PK) 0.84, Pedagogical Content Knowledge (PCK) 0.85, Technological Pedagogical Knowledge (TPK) 0.86, Technological Content Knowledge (TCK) 0.80, and finally Technological Pedagogical Content Knowledge (TPACK) 0.92. The range of these scores for internal consistency reliability (coefficient alpha) was reported as to be acceptable to excellent. Schmidt, et al. (2009) also examined the construct validity for each knowledge domain using principal components factor analysis with varimax rotation and Kaiser normalization resulting in the discovery of a sample size that needed to be extended.

For this study, the researcher adapted the survey by removing some of the questions that were not relevant to this study. The original survey was developed to measure knowledge development of pre-service teachers preparing for licensure in early childhood and elementary education. Therefore it included questions about content knowledge of a variety of subject area domains that were not relevant to this research. Due to the various licensure areas the participants in this study were seeking, the researcher adapted the content knowledge domain questions to contain non-specific language, allowing for all participants to insert their own content area domain depending on the licensure they were seeking. For example, the original question "I have various ways and strategies of developing my understanding of mathematics" was changed to "I have various ways and strategies of developing my understanding of the content area in which I am seeking licensure". Additionally, the researcher has included

language that identifies the learning environment, online classroom, for several of the questions. For example, the original question "I know how to assess student performance in a classroom" was changed to "I know how to assess student performance in an online learning environment". The adapted survey consisted of 8 demographic questions, and 23-scaled questions utilizing a 4-point Likert scale with a range of strongly disagree to strongly agree. The researcher investigated the instrument's validity and reliability by giving the initial pool of 23 questions to experts in the field of TPACK and online instruction to evaluate for content validity (Appendix G). The experts were asked to individually rate each question based upon the extent to which the question measured the three domains of this research: attitude, knowledge and skills, and instructional centeredness. Experts first individually rated each of the questions on the extent to which the question measured attitudes toward technology integration. Second, experts rated each question on the extent to which the question measured knowledge and skills. Third, experts were asked to individually rate each question based upon the extent to which the question measured instructional centeredness. The addition of questions specific to an online learning environment deviated from the original seven TPACK domains. Experts were asked to rate the extent to which these questions measured the domains in an online environment. Experts were asked to rate the questions using a 10-point scale with 1 being to the least extent and 10 being to the greatest extent. An area for suggestions and comments was also included for the experts to offer possible modifications or alternate questions.

The researcher created the online instruction module intervention. Some form of education or intervention may be necessary to alter belief system and lead to behavioral change (Jung, 2008; Katz and Raths 1985, 1986). Providing intentional opportunities for pre-service

teachers to reflect critically upon their beliefs and attitudes relative to the modeling of good teaching may assist in amending these same beliefs (Mewborn and Tyminski, 2006). This online instruction module intervention reflects the cognitive constructivist theoretical framework, Backward Design (Wiggins and McTighe, 2006), Bloom's Taxonomy (Bloom et al., 1956), TPACK (Mishra and Koehler, 2005) and SAMR (Puentedura, 2009) to address the needs of the pre-service teachers in order to learn how to instruct in a dual learning environment.

All participants using the same Learning Management System (LMS) implemented the online instruction module intervention. Participants were familiar with the Blackboard Learning Management system (LMS) and received a tutorial in navigating the online instruction module. To recruit the appropriate number of participants, the researcher enlisted pre-service teachers enrolled in the following courses during the Fall semester of the 2015-2016 academic year: two sections of EDU 218 Foundations of Education (A & B), and EDU 300 Active Learning for the Young Child: Science and Social Studies (C). Blackboard LMS houses all data relevant to tasks completed within the online instruction module. All pre-service teachers enrolled in the courses above received scores from their course instructor for the artifacts they produced within each Task because the instruction module was part of the normal course material. The course instructor then de-identified the artifacts of those students participating in this research study. The course instructor completed the de-identification by removing the names of the participants and adding their personal identification number to each artifact. The artifacts were then scored by the researcher and were determined based upon the Technology Integration Matrix (TIMS). The TIMS matrix was used to determine where each pre-service teacher lies in his or her instructional centeredness. The use of the TIMS matrix for

score values was for research purposes only and had no effect on the pre-service teacher's final grade for the course. Data collection techniques and their relationship to the research questions are shown in Table 2.

Table 2

Data Collection Techniques

Phase	Data Collection Technique	Research Question(s)
Quantitative	TPACK survey Pretest	1, 2, 3
Quantitative	TPACK survey Posttest	4, 5, 6
Quantitative	Task 4 Lesson Plan	4, 5, 6
Qualitative	Task 5 Discussion Boards	1,2,3,4,5,6

Procedure

Data was collected using the researcher-modified online survey whose link was given to participants on the first day of participation in the online instruction module and again at the conclusion of the online instruction module. These surveys were collected through the online survey tool Google Forms with only the anonymous six-digit pin as an identifier to match data. Data was kept secure in Google Forms per the site's security and privacy policy, and data remains the property of the researcher according to Google's Data Processing Amendment and Customer Agreement. Participant created artifacts were collected throughout the online module utilizing Blackboard Learning Management System as the repository. Data was stored and the analysis performed on the researcher's personal computer, which was locked at all times and only accessible with a personal security password known only to the researcher. Only the researcher utilized this computer and logged on with a unique username and password. Any

data that was downloaded to this computer was placed in a password-protected folder that only she had access to. After completing a session, the computer was powered down.

A pre-test online survey was administered to all willing participants as the initial activity for the online instructional module intervention in the targeted courses, EDU 218 Foundations of Education (A), EDU 218 Foundations of Education (B) and EDU 300 Active Learning for the Young Child: Science and Social Studies (C). The survey measured pre-service teachers initial attitudes toward technology integration and understanding of technological pedagogical content knowledge and skills in an online learning environment. An identical survey was administered online to all participants at the conclusion of the online instructional module intervention. The survey is an augmented instrument; therefore Cronbach alpha values will be reported in Chapter 4.

In addition to utilizing self-report data, this study includes an online instruction module intervention. This module provides five tasks or opportunities for the participants to create artifacts utilizing the integration of technology with a high degree of pre-service teacher choice built into each task.

Pre-Test	Participants will complete the 31-question survey (Appendix D) adapted from the Survey of Preservice Teachers' Knowledge of Teaching and Technology, developed by Schmidt, et al. (2009). This survey measures the pre-service teachers' attitudes, knowledge and skills toward technology, and instructional centeredness in an online learning environment.
Task 1	This Task will introduce the participant to the goal for the module: the creation of a lesson plan to be taught in an online learning environment. The faculty assigned to the course in which this module is being used may decide to specify the content area and/or the age of the learner this lesson is designed for. The product for this Task will be a Context For Learning matrix (Appendix H), which serves as the beginning of a lesson plan for an online learning experience.

Task 2	This Task will introduce the participant to Backwards Design and the importance of aligning assessments to the particular objectives stated in a lesson plan. The faculty assigned to the course in which this module is being used may decide to specify the content area and/or the age of the learner this lesson is designed for, which in turn will limit participants in selection of objectives and standards. The product for this Task will be a Backwards Design Template (Appendix I) for a lesson plan.
Task 3	This Task will introduce the participant to the tools of a synchronous online learning environment. A colleague of the researcher who is an expert in the field of online education will moderate participant engagement in a synchronous class session. The goal for this class session is to provide the opportunity for participants to actively engage with the online classroom tools and practice using breakout rooms.
Task 4	This Task allows the participants to learn by completing their lesson design. The product for this Task will be the completion of a full lesson plan utilizing the Lesson Plan Template (Appendix J) for an online learning environment. This artifact will provide evidence of the pre-service teacher's characteristics relative to their instructional centeredness as it pertains to an online learning environment and characteristics of their attitudes, knowledge and skills toward technology integration in an online learning environment.
Task 5:	This Task allows participants to experience online learning though discussion boards and synchronous tools. Utilizing the discussion board promotes the social cognitive constructivist theory as participants are able to co-construct knowledge within the online learning community.
Post-Test	Participants will complete the 31-question survey (Appendix D) adapted from the Survey of Preservice Teachers' Knowledge of Teaching and Technology, developed by Schmidt, et al. (2009). This survey measures the effects of an intervention on pre-service teachers' attitudes, knowledge and skills toward technology, and instructional centeredness in an online learning environment.

These artifacts were then scored with the Technology Integration Matrix (TIM) to determine the level of technology integration employed by the pre-service teacher participating in this study within each of the five attributes of the learning environment (Appendix E). The

five levels of technology integration from the TIM instrument were assigned a point value based by the researcher on the degree of integration the participant demonstrated with their artifact. These levels lie on a continuum and include Entry (1), Adoption (2), Adaptation (3), Infusion (4), and Transformation (5). Each of the five attributes of the learning environment was scored in regard to where the attribute fit along the technology continuum. The five attributes of the learning environment include Active (1), Collaborative (2), Constructive (3), Authentic (4), and Goal-Directed (5). The maximum number of points a participant could receive was 25 while the lowest would be 0. A score of 0 was assigned to any tasks that were not completed. If a task was completed and scored at the Entry level of technology integration in any of the five attributes, the task was assigned a score of 1 for that attribute. A score of 2 was assigned to any task completed at the Adoption level. A score of 3 was assigned to any task completed at the Adaptation level. A score of 4 was assigned to any task completed at the Infusion level and finally; a score of 5 was assigned to any task completed at the Transformation level. The sum of the scores for each attribute was determined and assigned to the artifact.

Data Analysis Plan

In order to develop a clear plan for analyzing the data, it is important to understand the research model. In this mixed-methods concurrent triangulation design, the quantitative data provide a general understanding of characteristics of pre-service teachers relative to their attitudes, knowledge and skills toward technology integration and instructional centeredness in an online learning environment prior to and upon completion of the online instruction module intervention. The qualitative data provide results that aid in explaining the context of these characteristics and the effects the intervention had on the participants. The researcher adopted

this design because neither the quantitative nor the qualitative approach would have been sufficient to answer the research questions; rather the convergence of evidence from both methods support each other. Table 3 provides a visual model to explain both the quantitative and qualitative phases of this research.

Table 3

Mixed-Methods Concurrent Triangulation Design Procedure: Research model (adapted from McMillan and Schumaker, 2010)

Phase	Procedure	Product
Quantitative Data Collection	TPACK Survey Pre Test TPACK Survey Post Test	Numerical data
Pre-Analysis Data Screening	Frequencies Test for Normality Test for Homogeneity of Variance Test for Independence	Missing Data and Outliers Box Plots Levine's Test Description of Design
Quantitative Data Analysis	Two way Repeated Measures ANOVA Reliability analysis SPSS Software	Descriptive statistics for groups Descriptive statistics for questions Descriptive statistics for subscales Mean differences between groups and within
Quantitative Data Collection	Lesson Plan Template and Rubric	Numerical data Mean differences between groups
Connecting Quantitative and Qualitative Phases	Purposefully selecting 15 participants based on Pre Test/Post Test comparison scores, 5 each (high, mid and low)	Participants (n=15) Discussion board response selection
Qualitative Data Collection	Task 5: Discussion Boards	Text data
Qualitative Data Analysis	Coding and Thematic Analysis	Codes and Themes
Integration of Quantitative and Qualitative Results	Interpretation and explanation of the quantitative and qualitative results	Assertions Implications Future Research

Collection of quantitative data consisted of the repeated self-report survey administered to participants prior to and preceding the administration of an online instructional module intervention. Descriptive statistics were reported as measures of central tendency such as mean, median, and mode. Measures of variability were also obtained by calculating the range and the standard deviation. The two qualitative variables or within subjects variables were group identification, which consists of three levels (group A, B and C), and time which consists of two levels (pre and post intervention). The dependent variable in this study was quantitative scores, collected at two distinct times, on the Survey of Preservice Teachers' Knowledge of Teaching and Technology.

After determining descriptive statistics for each of the three groups, data was screened to ensure fulfillment of test assumptions- independence of observations, normal distributions of subgroups, and equal variances among groups. Next, a two way repeated measures analysis of variance (ANOVA) was conducted to determine if there were any significant mean differences among the cells in the experimental matrix. A main effect was determined for each of the two factors, time and group. The goal was to evaluate the mean differences that were produced by either of these factors acting independently or by two factors acting together. Post hoc tests were also conducted in conjunction with the ANOVA to determine which groups were significantly different. Particularly if the sample means look different, the researcher will determine if the difference is by chance or is there a real difference in population parameters.

The collection of qualitative data was conducted by coding and analyzing discussion board posts to determine themes that suggest effects of the intervention on pre-service teachers' attitudes toward technology integration, knowledge and skills of technology and instructional focus. Triangulation of both quantitative and qualitative data was used to support

any observed alignment between pre-service teachers attitudes toward technology integration, their knowledge and skills of technology integration, and the inclusion of student centered pedagogy in their artifacts.

Limitations of the Design

Specific limitations exist in this study, which must be considered when examining the impact of this design. The sample of participants used in this research represents a purposive sample to determine characteristics and needs of those students in a particular teacher preparation program. The research is designed to inform on an individual and unique level, with results describing the charism of the population of students at a given institution. For example, while some programs may recruit pre-service teachers from the immediate and surrounding geographical area, others have students with more diverse geographical roots. This factor affects the program, and an understanding of the characteristics of the pre-service teachers in any teacher preparation program helps to inform curriculum development and decisions targeted for the needs of that particular teacher preparation program. Although it is typical to perform comparisons between groups based on gender, one of the qualities unique to this university is its high percentage of female students enrolled in the teacher preparation program. Due to the low number of male participants, gender differences were not considered.

Chapter IV

Results

Introduction

The integration of technology in K-12 classrooms requires instructors trained in the technological pedagogical content knowledge necessary for designing learning experiences that serve to increase learning outcomes. In conjunction with the integration of technology, the K-12 classroom has evolved beyond the traditional brick and mortar classroom to include both blended and online learning environments. Teacher education programs must therefore undertake a transformation to include the preparation of pre-service teachers for dual learning environments, face-to-face as well as online. This research is an examination of pre-service teachers' attitudes, knowledge and skills, and teaching centeredness relevant to integrating technology in an online learning environment. As a first step towards acknowledging the responsibility teacher educators have for training pre-service teachers to be fluent in both environments, this research takes a programmatic approach to the integration of technology through an introduction to online instruction. In this chapter, the research design, research questions, response rate, demographics, and findings will be presented.

Research Design

In order to gain a rich description of the participants in this study, the researcher selected a mixed-method approach to collect both quantitative and qualitative data during this online instruction module intervention. The use of concurrent triangulation design allows the researcher to simultaneously collect quantitative and qualitative data, merge the data using both quantitative and qualitative analysis methods, and interpret the results together to provide a more complete picture of the phenomenon being studied (McMillan & Schumacher, 2010).

The researcher created an online instruction module intervention designed to provide content relevant to the planning of a lesson for an online learning experience. Specific curriculum approaches such as Technological Pedagogical Content Knowledge or TPACK (Koehler & Mishra, 2005) and Substitution Augmentation Modification Redefinition or SAMR (Puentedura, 2009) along with tools and resources for engaging active learning were also presented in this online instruction module. Participants engaged with the content of the online instruction module, both synchronously and asynchronously, for four days as an alternative to attending their regular face-to-face class. This engagement with the online instruction module was a requirement for all students enrolled in the targeted courses and had been built into the syllabus by the instructors. Quantitative data was collected using a pre- and post- survey as well as using a lesson plan rubric.

The pre- and post- surveys were adaptations of *The Survey of Preservice Teachers' Knowledge of Teaching and Learning* March 3, 2009 version (Schmidt, Baran, Thompson, Mishra, Koehler, & Shin, 2009) to measure attitudes, knowledge and skills and instructional centeredness in pre-service teachers. Due to the various licensure areas the participants in this study were seeking, the researcher adapted the content knowledge domain questions to contain non-specific language, allowing for all participants to insert their own content area domain depending on the licensure they were seeking. For example, the original question "I have various ways and strategies of developing my understanding of mathematics" was changed to "I have various ways and strategies of developing my understanding of the content area in which I am seeking licensure". Additionally, the researcher has included language that identifies the learning environment, online classroom, for several of the questions. For example, the original question "I know how to assess student performance in a classroom" was

changed to “I know how to assess student performance in an online learning environment”. The adapted survey consisted of 8 demographic questions, and 23-scaled questions utilizing a 4-point Likert scale with a range of strongly disagree (1) to strongly agree (4). Schmidt, et al. (2009) assessed each of the knowledge domains using Cronbach’s alpha reliability technique. Results include the following scores for each of the knowledge domains within the TPACK framework: Technology Knowledge (TK) (= 0.82), Pedagogical Knowledge (PK) (= 0.84), Pedagogical Content Knowledge (PCK) (= 0.85), Technological Pedagogical Knowledge (TPK) (= 0.86), Technological Content Knowledge (TCK) (= 0.80), and finally Technological Pedagogical Content Knowledge (TPACK) (= 0.92). Construct validity was also examined for each knowledge domain using principal components factor analysis with varimax rotation and Kaiser normalization. The researcher investigated the instrument’s validity and reliability and has been proven it to be robust (Table 4). The instrument is available for use under a noncommercial, attribution, no derivatives Creative Common License.

Table 4

Reliability Statistics: Adapted Survey Instrument

Cronbach’s Alpha	Cronbach’s Alpha Based on Standardized Items	N of Items
.919	.918	23

At the time of assessing lesson plans, the *Technology Integration Matrix (*Florida Center for Instructional Technology, University of South Florida College of Education) was used for triangulation. See Appendix E for this instrument. This matrix has been widely used

by researchers, administrators and teaching professionals to gain both quantitative and qualitative data regarding pedagogy and technology integration. The *Technology Integration Matrix,* originally developed in 2006 and revised and expanded in 2011, is part of a suite of tools developed by the Florida Center for Instructional Technology. Qualitative data was collected through the discussion board posts within the online instruction module. A purposeful selection of 15 participants based upon their pre- and post-survey scores was used in order to describe common trends. Five participants with high scores, five participants with midrange scores, and five participants with low scores were selected. Responses were coded and themes and trends reported.

Criterion sampling was used to select participants based on predetermined characteristics, specifically novice students in the institution's teacher preparation program and developing students in the institution's teacher preparation program. In order to recruit participants, the researcher selected three sections of two different courses as potential groups for participation. Two sections (A and B) of the course EDU 218 Foundations of Education and one section (C) of EDU 300 Active Learning for the Young Child: Science and Social Studies. These three groups consisted of Group A-students enrolled in a basic, foundations of education course, Group B- a second section of students enrolled in the basic, foundations of education course, and Group C- students enrolled in a 300 level education methods course.

Research Questions

The focus of this study is determining the effect of an online instruction module intervention on pre-service teachers' attitudes towards technology integration, knowledge and skills of technology integration, and instructional centeredness in an online learning environment.

RQ1. In a teacher preparation program, what are the attitudes of pre-service teachers towards technology integration in an online learning environment?

RQ2. In a teacher preparation program, what are the knowledge and skills in technology integration of pre-service teachers in an online learning environment?

RQ3. In a teacher preparation program, what is the instructional focus of pre-service teachers in an online learning environment?

RQ4. What are the effects of an intervention on the attitudes of pre-service teachers towards technology integration in an online learning environment?

RQ5. What are the effects of an intervention on the knowledge and skills in technology integration of pre-service teachers in an online learning environment?

RQ6. What are the effects of an intervention on the instructional focus of pre-service teachers in an online learning environment?

Response Rate

Students registered for EDU 218 A and B were recruited to participate in this research. The selection of these two sections of the Foundations of Education course enabled the researcher to determine characteristics of novice education majors. This course is typically enrolled by first or second semester freshman as an introduction to the major of Education. Students registered and enrolled themselves in either section of the course. Two adjunct professors who did not have a history teaching undergraduate students at this institution taught the Foundations of Education course. Therefore participants had no prior knowledge that may have persuaded them to enroll in one instructor's section over another. During the informed consent process, participants received information regarding the withdrawal procedure. While 48 participants completed the pre-survey, 8 of these participants chose to withdraw and did not

complete the post-survey. Additionally, one participant did not select a PIN number and was eliminated from the study. The third group of participants recruited for this research included all students enrolled in EDU 300 Active Learning for the Young Child: Science and Social Studies. This is a required course for all Early Childhood and Dual licensure students at this institution. There is only one instructor who teaches this course. The instructor is a full time professor in the Education department and teaches three other courses. Students registered and enrolled themselves in this course and typically take this course their sophomore or junior year. There were 19 students who participated in the pre-survey and 16 who completed the post-survey for a total of 55 participants between all three groups.

Demographics

Although both Group A and Group B typically contain a more homogenous group of students enrolled in a lower level, foundational course for Education majors, some differences existed in their composition, particularly in regard to age (Table 5).

Table 5

Age Frequencies

Age of Participant	Group A (N = 19)	Group B (N = 20)	Group C (N = 16)
18	11	11	
19	5	6	4
20	3	1	2
21			6
22			3
25		1	1
34		1	
38		1	

Group B includes three non-traditional students 25 years of age or older. Group C represents students enrolled in a 300 level course, which is typically comprised of sophomore

and junior level students. Mean age for Group A was 18.5, Group B was 21.5, and Group C was 20.8. All participants in this study were Education majors, and they were pursuing licenses to teach in Early Childhood, Dual Licensure (Early Childhood and Intervention Specialist), Middle Childhood, and Secondary Education. Table 6 represents the distribution of licensure areas for each group.

Table 6

Licensure Area of Participants by Group

Licensure Area	Group A (N = 19)	Group B (N = 20)	Group C (N = 16)
Early Childhood	7	6	5
Dual	4	9	11
Middle Childhood	2	3	
Secondary	6	2	

Group A included 2 male and 17 female participants, Group B included 3 male and 17 female participants, while Group C included 1 male and 15 female participants. Due to the low number of male participants, which is typical of the Education majors at this institution, the researcher did not perform any data analysis by gender. Of the 2103 students enrolled fulltime in the undergraduate program at this institution, 79% had permanent residency outside of the state, including residents from all 50 states and 14 other countries. Demographics for this research study indicate 40 participants had permanent residency outside of the state, which is 71.4%, slightly lower than the institutional average. This research focuses on the preparation of pre-service teachers to instruct in dual learning environments; therefore, participation in an online course as a student provides valuable experience to draw upon as an online instructor. Slightly more than 55% of the participants in this research study have been a student in an online course (Table 7).

Table 7

Experience as a student in an online course

	Group A	Group B	Group C
Yes	7	9	15
No	12	11	1

Findings

Data was screened first for missing data. There were 6 participants from Group A and 2 participants form Group B who did not complete the post-survey; therefore the data for these 8 participants was eliminated from the pre-survey data leaving a total of 40 participants in the AB group. Additionally one participant from group A did not select a PIN and was therefore eliminated for missing data. Three of the participants from Group C did not complete the post-survey and the data from those three participants was eliminated. Tables 8 -13 include descriptive statistics for each group in regard to the participants' pre-survey results and the post-survey results.

Table 8

Pre Survey Statistics for Participants in Group A (N=19)

Question	Mean	Std. Deviation	S.E.M.
1. I know how to solve my own technical problems.	2.95	0.524	0.120
2. I can learn technology easily.	3.11	0.738	0.169
3. I keep up with important new technologies.	3.11	0.567	0.130
4. I frequently play around with technology.	2.84	0.834	0.191
5. I know about a lot of different technologies.	2.68	0.820	0.188
6. I have the technical skills I need to use technology appropriately in my teaching.	3.32	0.582	0.134
7. I have had sufficient opportunities to work with different technologies.	2.90	0.738	0.169

Question	Mean	Std. Deviation	S.E.M.
8. I have various ways and strategies of developing my understanding of the content area in which I am seeking licensure.	3.21	0.713	0.164
9. I know how to assess student performance in an online learning environment.	2.37	0.684	0.157
10. I can adapt my teaching based-upon what students currently understand or do not understand.	3.26	0.653	0.150
11. I can adapt my teaching style to different learners in an online environment.	2.74	0.734	0.168
12. I can assess student learning in multiple ways in an online environment.	2.58	0.769	0.176
13. I can use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)	2.74	0.653	0.150
14. I am familiar with common student understandings and misconceptions.	3.00	0.667	0.153
15. I know how to organize and maintain classroom management in an online learning environment.	2.21	0.855	0.196
16. I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.	3.00	0.817	0.187
17. I know about technologies I can use in an online environment for understanding and doing the content area in which I am seeking licensure.	2.53	0.612	0.140
18. I can choose technologies that enhance the teaching approaches for a lesson in an online learning environment.	2.68	0.749	0.172
19. I can choose technologies that enhance students' learning for an online lesson.	2.74	0.734	0.168
20. I am thinking critically about how to use technology in an online learning environment.	2.90	0.738	0.169
21. I can adapt the use of technologies that I am learning about to different teaching activities.	3.16	0.688	0.158

Question	Mean	Std. Deviation	S.E.M.
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	2.74	0.734	0.168
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	2.74	0.734	0.168

Table 9

Pre Survey Statistics for Participants in Group B (N=20)

Question	Mean	Std. Deviation	S.E.M.
1. I know how to solve my own technical problems.	2.65	.489	.109
2. I can learn technology easily.	3.00	.459	.103
3. I keep up with important new technologies.	2.75	.851	.190
4. I frequently play around with technology.	2.35	.745	.167
5. I know about a lot of different technologies.	2.10	.788	.176
6. I have the technical skills I need to use technology appropriately in my teaching.	2.85	.813	.182
7. I have had sufficient opportunities to work with different technologies.	2.50	.827	.185
8. I have various ways and strategies of developing my understanding of the content area in which I am seeking licensure.	3.00	.324	.073
9. I know how to assess student performance in an online learning environment.	2.30	.571	.128
10. I can adapt my teaching based-upon what students currently understand or do not understand.	3.15	.489	.109
11. I can adapt my teaching style to different learners in an online environment.	2.70	.733	.164
12. I can assess student learning in multiple ways in an online environment.	2.50	.688	.154
13. I can use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)	2.80	.696	.154

Question	Mean	Std. Deviation	S.E.M.
14. I am familiar with common student understandings and misconceptions.	2.85	.587	.131
15. I know how to organize and maintain classroom management in an online learning environment.	2.35	.813	.182
16. I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.	2.50	.607	.136
17. I know about technologies I can use in an online environment for understanding and doing the content area in which I am seeking licensure.	2.55	.686	.154
18. I can choose technologies that enhance the teaching approaches for a lesson in an online learning environment.	2.80	.696	.156
19. I can choose technologies that enhance students' learning for an online lesson.	2.95	.686	.154
20. I am thinking critically about how to use technology in an online learning environment.	2.75	.716	.160
21. I can adapt the use of technologies that I am learning about to different teaching activities.	3.20	.696	.156
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	3.00	.726	.162
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	2.90	.641	.143

Table 10

Pre Survey Statistics for Participants in Group C (N=16)

Question	Mean	Std. Deviation	S.E.M.
1. I know how to solve my own technical problems.	2.69	.602	.151
2. I can learn technology easily.	3.25	.577	.144

Question	Mean	Std. Deviation	S.E.M.
3. I keep up with important new technologies.	2.63	.719	.180
4. I frequently play around with technology.	2.69	.793	.198
5. I know about a lot of different technologies.	2.25	.683	.171
6. I have the technical skills I need to use technology appropriately in my teaching.	3.06	.680	.170
7. I have had sufficient opportunities to work with different technologies.	2.88	.619	.155
8. I have various ways and strategies of developing my understanding of the content area in which I am seeking licensure.	3.19	.655	.164
9. I know how to assess student performance in an online learning environment.	2.63	.619	.155
10. I can adapt my teaching based-upon what students currently understand or do not understand.	3.19	.655	.164
11. I can adapt my teaching style to different learners in an online environment.	2.63	.806	.202
12. I can assess student learning in multiple ways in an online environment.	2.63	.619	.155
13. I can use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)	2.81	.544	.136
14. I am familiar with common student understandings and misconceptions.	2.88	.619	.155
15. I know how to organize and maintain classroom management in an online learning environment.	2.25	.856	.214
16. I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.	3.19	.544	.136
17. I know about technologies I can use in an online environment for understanding and doing the content area in which I am seeking licensure.	2.75	.775	.194
18. I can choose technologies that enhance the teaching approaches for a lesson in an online learning environment.	2.94	.854	.214

Question	Mean	Std. Deviation	S.E.M.
19. I can choose technologies that enhance students' learning for an online lesson.	2.81	.834	.209
20. I am thinking critically about how to use technology in an online learning environment.	2.50	1.096	.274
21. I can adapt the use of technologies that I am learning about to different teaching activities.	2.88	.718	.180
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	2.63	.806	.202
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	2.75	.683	.171

Table 11

Post Survey Statistics for Participants in Group A (N=19)

Question	Mean	Std. Deviation	S.E.M.
1. I know how to solve my own technical problems.	3.11	.658	.151
2. I can learn technology easily.	3.16	.602	.138
3. I keep up with important new technologies.	2.68	.749	.172
4. I frequently play around with technology.	2.74	.734	.168
5. I know about a lot of different technologies.	2.68	.749	.172
6. I have the technical skills I need to use technology appropriately in my teaching.	3.05	.621	.143
7. I have had sufficient opportunities to work with different technologies.	2.90	.658	.151
8. I have various ways and strategies of developing my understanding of the content area in which I am seeking licensure.	3.05	.705	.162
9. I know how to assess student performance in an online learning environment.	2.79	.713	.164
10. I can adapt my teaching based-upon what students currently understand or do not understand.	3.21	.631	.145

Question	Mean	Std. Deviation	S.E.M.
11. I can adapt my teaching style to different learners in an online environment.	2.95	.780	.179
12. I can assess student learning in multiple ways in an online environment.	2.79	.713	.164
13. I can use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)	2.90	.738	.169
14. I am familiar with common student understandings and misconceptions.	2.90	.738	.169
15. I know how to organize and maintain classroom management in an online learning environment.	2.74	.734	.168
16. I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.	3.00	.667	.153
17. I know about technologies I can use in an online environment for understanding and doing the content area in which I am seeking licensure.	3.11	.567	.130
18. I can choose technologies that enhance the teaching approaches for a lesson in an online learning environment.	3.05	.621	.143
19. I can choose technologies that enhance students' learning for an online lesson.	3.05	.621	.143
20. I am thinking critically about how to use technology in an online learning environment.	3.16	.602	.138
21. I can adapt the use of technologies that I am learning about to different teaching activities.	3.16	.602	.138
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	3.05	.524	.120
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	3.11	.567	.130

Table 12

Post Survey Statistics for Participants in Group B (N=20)

Question	Mean	Std. Deviation	S.E.M.
1. I know how to solve my own technical problems.	2.85	.489	.109
2. I can learn technology easily.	3.25	.639	.143
3. I keep up with important new technologies.	2.95	.686	.154
4. I frequently play around with technology.	2.85	.671	.150
5. I know about a lot of different technologies.	2.75	.851	.190
6. I have the technical skills I need to use technology appropriately in my teaching.	3.10	.447	.100
7. I have had sufficient opportunities to work with different technologies.	3.20	.616	.137
8. I have various ways and strategies of developing my understanding of the content area in which I am seeking licensure.	3.15	.587	.131
9. I know how to assess student performance in an online learning environment.	3.00	.562	.126
10. I can adapt my teaching based-upon what students currently understand or do not understand.	3.35	.587	.131
11. I can adapt my teaching style to different learners in an online environment.	3.30	.657	.147
12. I can assess student learning in multiple ways in an online environment.	3.30	.571	.128
13. I can use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)	3.40	.503	.112
14. I am familiar with common student understandings and misconceptions.	2.90	.447	.100
15. I know how to organize and maintain classroom management in an online learning environment.	3.00	.858	.192
16. I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.	3.15	.489	.109

Question	Mean	Std. Deviation	S.E.M.
17. I know about technologies I can use in an online environment for understanding and doing the content area in which I am seeking licensure.	3.20	.616	.138
18. I can choose technologies that enhance the teaching approaches for a lesson in an online learning environment.	3.35	.587	.131
19. I can choose technologies that enhance students' learning for an online lesson.	3.40	.503	.112
20. I am thinking critically about how to use technology in an online learning environment.	3.45	.605	.135
21. I can adapt the use of technologies that I am learning about to different teaching activities.	3.55	.605	.135
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	3.40	.503	.112
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	3.45	.510	.114

Table 13

Post Survey Statistics for Participants in Group C (N=16)

Question	Mean	Std. Deviation	S.E.M.
1. I know how to solve my own technical problems.	3.06	.680	.170
2. I can learn technology easily.	3.06	.680	.170
3. I keep up with important new technologies.	2.88	.719	.180
4. I frequently play around with technology.	2.75	.775	.194
5. I know about a lot of different technologies.	2.50	.895	.224
6. I have the technical skills I need to use technology appropriately in my teaching.	3.00	.365	.091
7. I have had sufficient opportunities to work with different technologies.	2.94	.574	.143

Question	Mean	Std. Deviation	S.E.M.
8. I have various ways and strategies of developing my understanding of the content area in which I am seeking licensure.	3.00	.516	.129
9. I know how to assess student performance in an online learning environment.	2.88	.719	.180
10. I can adapt my teaching based-upon what students currently understand or do not understand.	3.25	.447	.112
11. I can adapt my teaching style to different learners in an online environment.	2.75	.856	.214
12. I can assess student learning in multiple ways in an online environment.	2.88	.719	.180
13. I can use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)	3.00	.516	.129
14. I am familiar with common student understandings and misconceptions.	2.88	.885	.221
15. I know how to organize and maintain classroom management in an online learning environment.	2.63	1.025	.256
16. I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.	3.00	.365	.091
17. I know about technologies I can use in an online environment for understanding and doing the content area in which I am seeking licensure.	3.00	.516	.129
18. I can choose technologies that enhance the teaching approaches for a lesson in an online learning environment.	3.13	.500	.125
19. I can choose technologies that enhance students' learning for an online lesson.	3.13	.619	.155
20. I am thinking critically about how to use technology in an online learning environment.	2.94	.574	.143
21. I can adapt the use of technologies that I am learning about to different teaching activities.	3.06	.574	.143
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	3.00	.516	.129

Question	Mean	Std. Deviation	S.E.M.
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	3.13	.619	.155

In a study of 55 undergraduates enrolled in a teacher preparation program, participants' attitudes, knowledge and skills and instructional centeredness were measured using an adapted version of *The Survey of Preservice Teachers' Knowledge of Teaching and Learning* March 3, 2009 version (Schmidt, Baran, Thompson, Mishra, Koehler, & Shin, 2009). Scores ranged from 1 to 4, with higher scores representing a higher degree of agreement with the survey statement. These undergraduate students were enrolled in EDU 218 Foundations of Education, section A (N= 19), EDU 218 Foundations of Education, section B (N= 20), or EDU 300 Active Learning for the Young Child: Science and Social Studies (N= 16). Mean scores for the Pre Survey for the groups ranged from 2.10 – 3.32 and standard deviations ranged from 0.324 – 1.096. An ANOVA showed significant differences between groups A, B, and C for question 16 "I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure" ($F = 5.182$, df = (2, 52), $p = 0.009$). Post hoc tests (Tukey) were performed ($\alpha = 0.05$) to identify pairs of means that were significantly different. Results indicate significance ($p = 0.01$) in mean knowledge and skills and instructional centeredness as seen in question 16 scores between Group B ($\mu = 2.50$) and Group C ($\mu = 3.19$).

After completing the online instruction module, participants completed the survey again as a post-survey. Mean scores for the groups ranged from 2.50 – 3.55 and standard deviations ranged from 0.365 – 1.025. An ANOVA showed significant differences between groups for

question 12 “I can assess student learning in multiple ways in an online environment” (F = 3.254, df = (2, 52), p = 0.047) and question 13, “I can use a wide range of teaching approaches in an online classroom setting” (F = 3.855, df = (2, 52), p = 0.027). Significant differences were also shown for question 20, “I am thinking critically about how to use technology in an online learning environment” (F = 3.369, df = (2, 52), p = 0.042), 21, “I can adapt the use of technologies that I am learning about to different teaching activities” (F = 3.523, df = (2, 52), p = 0.037) and question 22 “I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn” (F = 3.366, df = (2, 52), p = 0.042). Post hoc tests (Tukey) were performed (α= 0.05) to identify pairs of means that were significantly different. Results indicate significance (p = 0.029) in mean knowledge and skills and instructional centeredness as seen in question 13 scores between Group A (μ = 2.90) and Group B (μ = 3.40), question 20 scores between Group B (μ = 3.45) and Group C (μ = 2.94) and question 21 scores between Group B (μ = 3.55) and Group C (μ = 3.06).

Attitude Domain

RQ1. In a teacher preparation program, what are the attitudes of pre-service teachers towards technology integration in an online learning environment?

RQ4. What are the effects of an intervention on the attitudes of pre-service teachers towards technology integration in an online learning environment?

Survey questions #1-9 and #20-23 addressed research questions RQ1 and RQ4. Data was analyzed to determine means, standard deviations and significance between pre survey and post survey results for each group. These statistics aid in the description of pre-service teachers’ attitudes towards technology integration in an online learning environment. Descriptive statistics provided evidence of differences in the three groups. Tables 14, 15, and

16 indicate additional differences between groups and effects of the intervention on each group. Mean differences were determined by subtracting the pre- survey score from the post-survey score for each question associated with the Attitude domain.

Table 14

Post-survey vs. pre-survey results for Attitude, Group A (N=19; df=18)

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
1. I know how to solve my own technical problems.	.158	.502	.115	1.372	.187
2. I can learn technology easily.	.053	.405	.093	.567	.578
3. I keep up with important new technologies.	-.421	.693	.159	-2.650	.016*
4. I frequently play around with technology.	-.105	.809	.186	-.567	.578
5. I know about a lot of different technologies.	.000	.577	.133	.000	1.000
6. I have the technical skills I need to use technology appropriately in my teaching.	-.263	.562	.129	-2.041	.056
7. I have had sufficient opportunities to work with different technologies.	.000	.577	.133	.000	1.000
8. I have various ways and strategies of developing my understanding of the content area in which I am seeking licensure.	-.158	.688	.158	-1.000	.331
9. I know how to assess student performance in an online learning environment.	.421	.769	.176	2.388	.028*
20. I am thinking critically about how to use technology in an online learning environment.	.263	.806	.185	1.424	.172
21. I can adapt the use of technologies that I am learning	.000	.471	.108	.000	1.000

about to different teaching activities.					
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	.316	.749	.172	1.837	.083
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	.368	.761	.175	2.111	.049*

Note. *$p < .05$

Table 15

Post-survey vs. pre-survey results for Attitude, Group B (N=20; df=19)

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
1. I know how to solve my own technical problems.	.200	.523	.117	1.710	.104
2. I can learn technology easily.	.250	.550	.123	2.032	.056
3. I keep up with important new technologies.	.200	.616	.138	1.453	.163
4. I frequently play around with technology.	.500	.688	.154	3.249	.004*
5. I know about a lot of different technologies.	.650	.813	.182	3.577	.002*
6. I have the technical skills I need to use technology appropriately in my teaching.	.250	.786	.176	1.422	.171
7. I have had sufficient opportunities to work with different technologies.	.700	.801	.179	3.907	.001*
8. I have various ways and strategies of developing my understanding of the content area in which I am seeking licensure.	.150	.587	.131	1.143	.267

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
9. I know how to assess student performance in an online learning environment.	.700	.801	.179	3.907	.001*
20. I am thinking critically about how to use technology in an online learning environment.	.700	.801	.179	3.907	.001*
21. I can adapt the use of technologies that I am learning about to different teaching activities.	.350	.988	.221	1.584	.130
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	.400	.681	.152	2.629	.017*
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	.550	.686	.154	3.584	.002*

Note. *$p < .05$

Table 16

Post-survey vs. pre-survey results for Attitude, Group C (N=16; df=15)

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
1. I know how to solve my own technical problems.	.400	.507	.131	3.055	.009*
2. I can learn technology easily.	-.133	.352	.091	-1.468	.164
3. I keep up with important new technologies.	.267	.594	.153	1.740	.104
4. I frequently play around with technology.	.067	.704	.182	.367	.719

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
5. I know about a lot of different technologies.	.333	.488	.126	2.646	.019*
6. I have the technical skills I need to use technology appropriately in my teaching.	-.067	.594	.153	-.435	.670
7. I have had sufficient opportunities to work with different technologies.	.067	.704	.182	.367	.719
8. I have various ways and strategies of developing my understanding of the content area in which I am seeking licensure.	-.200	.561	.145	-1.382	.189
9. I know how to assess student performance in an online learning environment.	.200	.862	.223	.899	.384
20. I am thinking critically about how to use technology in an online learning environment.	.400	.986	.255	1.572	.138
21. I can adapt the use of technologies that I am learning about to different teaching activities.	.133	.743	.192	.695	.499
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	.333	.724	.187	1.784	.096
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	.333	.724	.187	1.784	.096

Note. *$p < .05$

A two-way within-subjects analysis of variance was conducted to evaluate the effect of the online instruction module on each of the three groups mean scores on the survey measuring

attitude toward technology integration in an online learning environment. The dependent variable was a mean score for each participant on the group of questions pertaining to attitude. The within-subjects factor was time with two levels (pre and post intervention) and the between-subjects factor was group with three levels (group A, group B, and group C). The Time, Group, and Time X Group Interaction effect were tested using the multivariate criterion of Wilk's Lambda (λ). The Time main effect was significant, $\lambda = .683$, $F\ (1, 52) = 24.144$, $p < .01$ as well as the Time X Group interaction effect, which was also significant, $\lambda = .786$, $F\ (2, 52) = 7.069$, $p < .01$. The univariate test associated with the Group main effect was not significant, $F\ (2,52) = 0.271$, $p = .763$.

Table 17

Repeated Measures ANOVA for Attitude Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	*ES*
Within subjects						
Time	1.262	1	1.262	24.144	< .001*	.317
Time X Group	.739	2	.370	7.069	.002*	.214
Between subjects						
Group	.181	2	.090	.271	.763	.010

Note. *$p < .05$

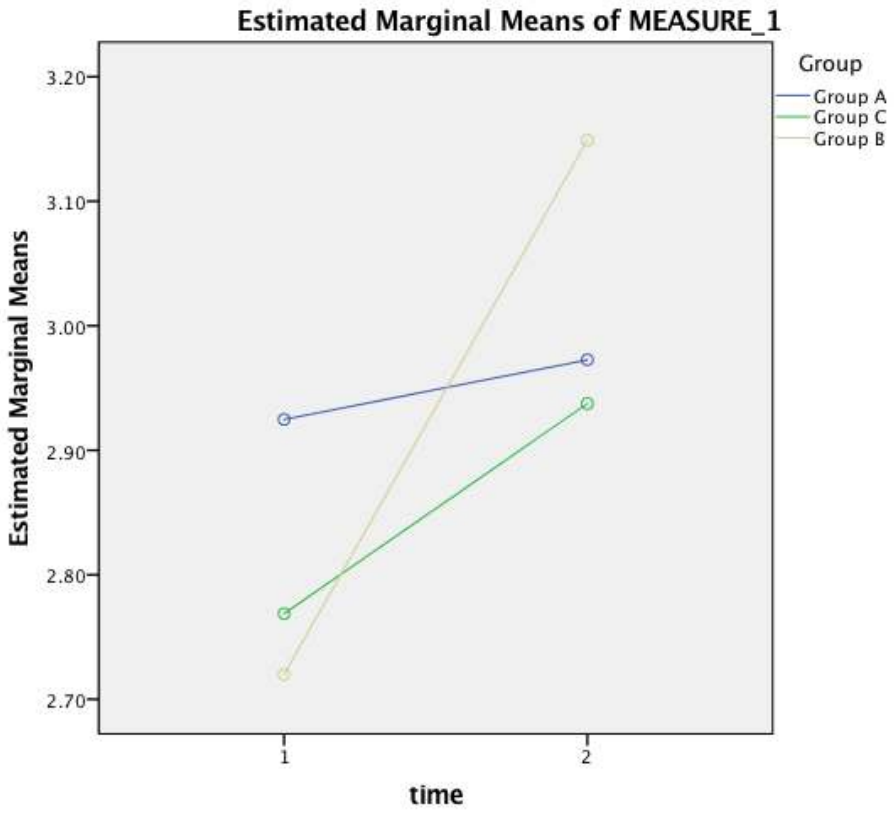


Figure 6. Line plot interaction between Time and Group within the Attitude domain

Knowledge and Skills Domain

RQ2. In a teacher preparation program, what are the knowledge and skills in technology integration of pre-service teachers in an online learning environment?

RQ5. What are the effects of an intervention on the knowledge and skills in technology integration of pre-service teachers in an online learning environment?

Survey questions #9-23 addressed research questions RQ2 and RQ5. Data was analyzed to determine means, standard deviation and significance between pre survey and post survey results for each group. These statistics aid in the description of pre-service teachers' knowledge and skills in technology integration in an online learning environment. Descriptive

statistics provided evidence of differences in the three groups. Tables 18, 19, and 20 indicate additional differences between groups and effects of the intervention on each group. Mean differences were determined by subtracting the pre- survey score from the post-survey score for each question associated with the Knowledge and Skills domain.

Table 18

Post-survey vs. pre-survey results for Knowledge and Skills, Group A (N=19; df=18)

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
9. I know how to assess student performance in an online learning environment.	.421	.769	.176	2.388	.028*
10. I can adapt my teaching based-upon what students currently understand or do not understand.	-.053	.524	.120	-.438	.667
11. I can adapt my teaching style to different learners in an online environment.	.211	.419	.096	2.191	.042*
12. I can assess student learning in multiple ways in an online environment.	.211	.976	.224	.940	.360
13. I can use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)	.158	.958	.220	.718	.482
14. I am familiar with common student understandings and misconceptions.	-.105	.567	.130	-.809	.429
15. I know how to organize and maintain classroom management in an online learning environment.	.526	.612	.140	3.750	.001*

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
16. I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.	.000	.577	.133	.000	1.000
17. I know about technologies I can use in an online environment for understanding and doing the content area in which I am seeking licensure.	.579	.607	.139	4.158	.001*
18. I can choose technologies that enhance the teaching approaches for a lesson in an online learning environment.	.368	.597	.137	2.689	.015*
19. I can choose technologies that enhance students' learning for an online lesson.	.316	.582	.134	2.364	.030*
20. I am thinking critically about how to use technology in an online learning environment.	.263	.806	.185	1.424	.172
21. I can adapt the use of technologies that I am learning about to different teaching activities.	.000	.471	.108	.000	1.000
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	.316	.749	.172	1.837	.083
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	.368	.761	.175	2.111	.049*

Note. *$p < .05$

Table 19

Post-survey vs. pre-survey results for Knowledge and Skills, Group B (N=20; df=19)

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
9. I know how to assess student performance in an online learning environment.	.700	.801	.179	3.907	.001*
10. I can adapt my teaching based-upon what students currently understand or do not understand.	.200	.696	.156	1.285	.214
11. I can adapt my teaching style to different learners in an online environment.	.600	.883	.197	3.040	.007*
12. I can assess student learning in multiple ways in an online environment.	.800	.894	.200	4.000	.001*
13. I can use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)	.600	.754	.169	3.559	.002*
14. I am familiar with common student understandings and misconceptions.	.050	.686	.154	.326	.748
15. I know how to organize and maintain classroom management in an online learning environment.	.650	.813	.182	3.577	.002*
16. I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.	.650	.745	.167	3.901	.001*
17. I know about technologies I can use in an online environment for understanding and doing the content area in which I am seeking licensure.	.650	.875	.196	3.322	.004*

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
18. I can choose technologies that enhance the teaching approaches for a lesson in an online learning environment.	.550	.686	.154	3.584	.002*
19. I can choose technologies that enhance students' learning for an online lesson.	.450	.686	.154	2.932	.009*
20. I am thinking critically about how to use technology in an online learning environment.	.700	.801	.179	3.907	.001*
21 I can adapt the use of technologies that I am learning about to different teaching activities.	.350	.988	.221	1.584	.130
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	.400	.681	.152	2.629	.017*
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	.550	.686	.154	3.584	.002*

Note. *$p < .05$

Table 20

Post-survey vs. pre-survey results for Knowledge and Skills, Group C (N=16; df=15)

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
9. I know how to assess student performance in an online learning environment.	.200	.862	.223	.899	.384

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
10. I can adapt my teaching based-upon what students currently understand or do not understand.	.067	.704	.182	.367	.719
11. I can adapt my teaching style to different learners in an online environment.	.067	.961	.248	.269	.792
12. I can assess student learning in multiple ways in an online environment.	.200	.941	.243	.823	.424
13. I can use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)	.133	.743	.192	.695	.499
14. I am familiar with common student understandings and misconceptions.	.000	.655	.169	.000	1.000
15. I know how to organize and maintain classroom management in an online learning environment.	.333	.724	.187	1.784	.096
16. I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.	-.200	.414	.107	-1.871	.082
17. I know about technologies I can use in an online environment for understanding and doing the content area in which I am seeking licensure.	.200	.775	.200	1.000	.334
18. I can choose technologies that enhance the teaching approaches for a lesson in an online learning environment.	.133	.743	.192	.695	.499
19. I can choose technologies that enhance students' learning for an online lesson.	.267	.704	.182	1.468	.164

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
20. I am thinking critically about how to use technology in an online learning environment.	.400	.986	.255	1.572	.138
21. I can adapt the use of technologies that I am learning about to different teaching activities.	.133	.743	.192	.695	.499
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	.333	.724	.187	1.784	.096
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	.333	.724	.187	1.784	.096

Note. *$p < .05$

A two-way within-subjects analysis of variance was conducted to evaluate the effect of the online instruction module on each of the three groups mean scores on the survey measuring knowledge and skills toward technology integration in an online learning environment. The dependent variable was a mean score for each participant on the group of questions pertaining to attitude. The within-subjects factor was time with two levels (pre and post intervention) and the between-subjects factor was group with three levels (group A, group B, and group C). The Time, Group, and Time X Group Interaction effect were tested using the multivariate criterion of Wilk's Lambda (λ). The Time main effect was significant, $\lambda = .576$, F (1, 52) = 38.236, $p < .01$ as well as the Time X Group interaction effect, which was also significant, $\lambda = .872$, F (2,

52) = 3.829, $p < .028$. The univariate test associated with the Group main effect was not significant, F (2,52) = .732 , p = .486.

Table 21

Repeated Measures ANOVA for Knowledge and Skills Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	*ES*
Within subjects						
Time	2.885	1	2.885	38.236	< .001*	.424
Time X Group	.578	2	.289	3.829	.028*	.128
Between subjects						
Group	.521	2	.261	.732	.486	.027

Note. *$p < .05$

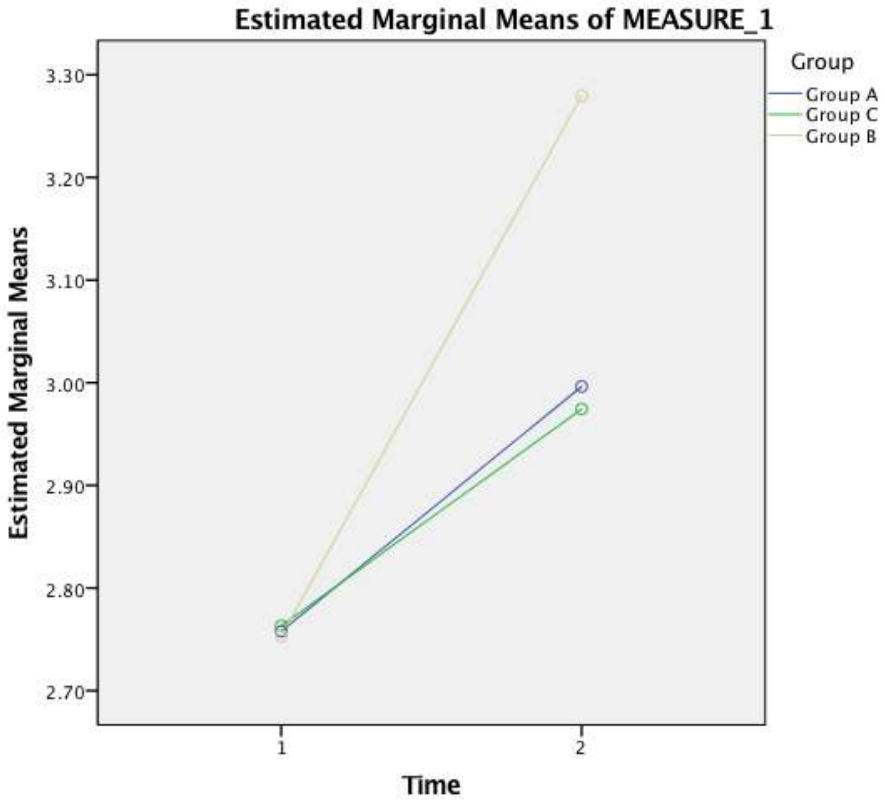


Figure 7. Line plot interaction between Time and Group within the Knowledge and Skills domain

Instructional Centeredness Domain

RQ3. In a teacher preparation program, what is the instructional focus of pre-service teachers in an online learning environment?

RQ6. What are the effects of an intervention on the instructional focus of pre-service teachers in an online learning environment?

Survey questions #9-16 and #21-23 addressed research questions RQ3 and RQ6. Data was analyzed to determine means, standard deviation and significance between pre survey and post survey results for each group. These statistics aid in the description of pre-service teachers' instructional centeredness in an online learning environment. Descriptive statistics provided evidence of differences in the three groups. Tables 22, 23, and 24 indicate additional differences between groups and effects of the intervention on each group. Mean differences were determined by subtracting the pre- survey score from the post-survey score for each question associated with the Instructional Centeredness domain.

Table 22

Post-survey vs. pre-survey results for Instructional Centeredness, Group A (N=19; df=18)

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
9. I know how to assess student performance in an online learning environment.	.421	.767	.176	2.388	.028*
10. I can adapt my teaching based-upon what students currently understand or do not understand.	-.053	.524	.123	-.438	.667
11. I can adapt my teaching style to different learners in an online environment.	.211	.419	.096	2.191	.042*

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
12. I can assess student learning in multiple ways in an online environment.	.211	.976	.224	.940	.360
13. I can use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)	.158	.958	.220	.718	.482
14. I am familiar with common student understandings and misconceptions.	-.105	.567	.130	-.809	.429
15. I know how to organize and maintain classroom management in an online learning environment.	.526	.612	.140	3.750	.001*
16. I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.	.000	.577	.133	.000	1.000
21. I can adapt the use of technologies that I am learning about to different teaching activities.	.000	.471	.108	.000	1.000
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	.316	.749	.172	1.837	.083
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	.368	.761	.175	2.111	.049*

Note. *$p < .05$

Table 23

Post-survey vs. pre-survey results for Instructional Centeredness, Group B (N=20; df=19)

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
9. I know how to assess student performance in an online learning environment.	.700	.801	.179	3.907	.001*
10. I can adapt my teaching based-upon what students currently understand or do not understand.	.200	.696	.156	1.285	.214
11. I can adapt my teaching style to different learners in an online environment.	.600	.883	.197	3.040	.007*
12. I can assess student learning in multiple ways in an online environment.	.800	.894	.200	4.000	.001*
13. I can use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)	.600	.754	.169	3.559	.002*
14. I am familiar with common student understandings and misconceptions.	.050	.686	.154	.326	.748
15. I know how to organize and maintain classroom management in an online learning environment.	.650	.813	.182	3.577	.002*
16. I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.	.650	.745	.167	3.901	.001*
21. I can adapt the use of technologies that I am learning about to different teaching activities.	.350	.988	.221	1.584	.130

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	.400	.681	.152	2.629	.017*
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	.550	.686	.154	3.584	.002*

Note. *$p < .05$

Table 24

Post-survey vs. pre-survey results for Instructional Centeredness, Group C (N=16; df=15)

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
9. I know how to assess student performance in an online learning environment.	.200	.862	.223	.899	.384
10. I can adapt my teaching based-upon what students currently understand or do not understand.	.067	.704	.182	.367	.719
11. I can adapt my teaching style to different learners in an online environment.	.067	.961	.248	.269	.792
12. I can assess student learning in multiple ways in an online environment.	.200	.941	.243	.823	.424
13. I can use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)	.133	.743	.192	.695	.499

Question	Mean Difference	SD	SEM	*t*	Sig. (2-tailed)
14. I am familiar with common student understandings and misconceptions.	.000	.655	.169	.000	1.000
15. I know how to organize and maintain classroom management in an online learning environment.	.333	.724	.187	1.784	.096
16. I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.	-.200	.414	.107	-1.871	.082
21. I can adapt the use of technologies that I am learning about to different teaching activities.	.133	.743	.192	.695	.499
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	.333	.724	.187	1.784	.096
23. I can use strategies in an online learning environment that combine content, technologies, and teaching approaches that I learned about.	.333	.724	.187	1.784	.096

A two-way within-subjects analysis of variance was conducted to evaluate the effect of the online instruction module on each of the three groups mean scores on the survey measuring instructional centeredness in an online learning environment. The dependent variable was a mean score for each participant on the group of questions pertaining to attitude. The within-subjects factor was time with two levels (pre and post intervention) and the between-subjects factor was group with three levels (group A, group B, and group C). The Time, Group, and Time X Group Interaction effect were tested using the multivariate criterion of Wilk's Lambda

(λ). The Time main effect was significant, λ = .630, F (1, 52) = 30.557, p < .01 as well as the Time X Group interaction effect, which was also significant, λ = .858, F (2, 52) = 4.296, p = .019. The univariate test associated with the Group main effect was not significant, F (2,52) = 0.718 , p = .492.

Table 25

Repeated Measures ANOVA for Instructional Centeredness Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	*ES*
Within subjects						
Time	2.313	1	2.313	30.557	< .001*	.370
Time X Group	.650	2	.325	4.296	.019*	.142
Between subjects						
Group	.497	2	.249	.718	.492	.027

Note. *p < .05

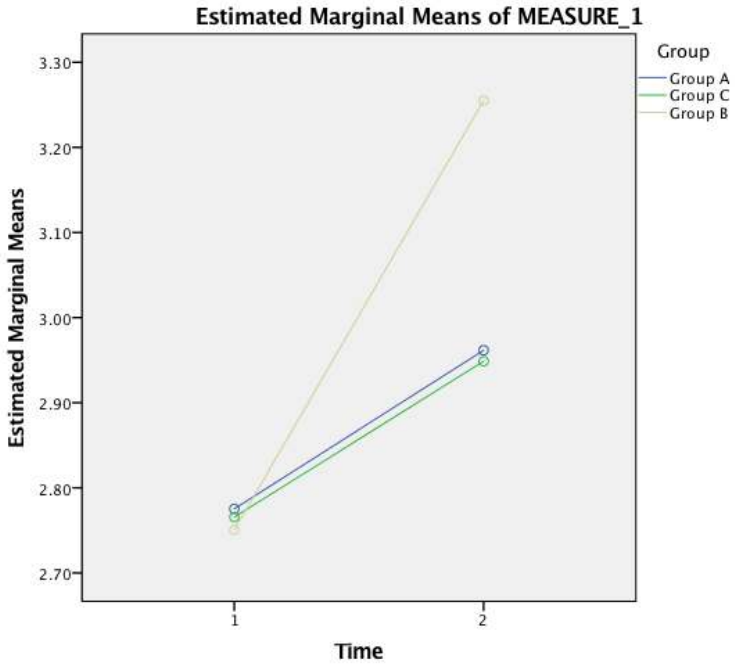


Figure 8. Line plot interaction between Time and Group within the Instructional Centeredness domain

Three paired-samples *t* tests were computed to assess differences between mean scores at each level of time for all three groups, controlling for familywise error rate using Holm's sequential Bonferroni approach. While Group A showed no significant differences in mean scores for the pre and post survey, $t(22) = -1.81$, $p = .083$, Group B yielded a significant difference in mean scores for the pre and post survey, $t(22) = -10.27$, $p < .01$, and Group C also showed significant differences in mean scores, $t(22) = -4.078$, $p < .01$.

Table 26

Means (Standard Deviations) for Survey

Time	*Group A*	*Group B*	*Group C*
Pre Survey	2.85	2.72	2.79
	(.275)	(.286)	(.272)
Post Survey	2.93	3.19	2.95
	(.166)	(.226)	(.170)

The final lesson plan created as the artifact for the last day of the online intervention module was collected and scored by the researcher using the Technology Integration Matrix (TIM) to determine the level of technology integration employed by the participants. The five levels of technology integration from the TIM instrument (Appendix E) were assigned a point value based by the researcher on the degree of integration the participant demonstrated with their artifact. These levels lie on a continuum and include Entry (1), Adoption (2), Adaptation (3), Infusion (4), and Transformation (5). Each of the five attributes of the learning environment was scored in regard to where the attribute fit along the technology continuum. The five attributes of the learning environment include Active (1), Collaborative (2), Constructive (3), Authentic (4), and Goal-Directed (5). The maximum number of points a

participant could receive was 25 while the lowest was a 0. A score of 0 was assigned to any lesson plan that was not completed. If a task was completed and scored at the Entry level of technology integration in any of the five attributes, the task was assigned a score of 1 for that attribute. A score of 2 was assigned to any task completed at the Adoption level. A score of 3 was assigned to any task completed at the Adaptation level. A score of 4 was assigned to any task completed at the Infusion level and finally; a score of 5 was assigned to any task completed at the Transformation level. The sum of the scores for each attribute was determined and assigned to the artifact. Mean scores were determined for each group and descriptive statistics reported in Table 27.

Table 27

Statistics for Lesson Plan Artifact

	N	Incomplete or Not Submitted	Mean	SD	SEM	Range
Group A	19	8	5.47	5.210	1.195	13
Group B	20	2	7.75	3.291	.736	14
Group C	16	0	13.94	5.927	1.482	19

Discussion Boards

The purposeful selection of fifteen participants was determined by utilizing quantitative scores on both the pre- and post-survey data. The researcher chose five participants whose scores were considered to be high scores, five with mid scores and five with low scores. The collection of qualitative data from these fifteen participants was conducted by coding and analyzing discussion board posts to determine themes that suggest effects of the intervention on pre-service teachers' attitudes toward technology integration, knowledge and skills of

technology integration and instructional centeredness. Triangulation of both quantitative and qualitative data adds to the description of the pre-service teachers in this teacher preparation program.

Findings include a difference in level of participation between the three groups (Table 28). Discussion board participation was a requirement of the course as a component of the online instruction module; however, there were differences in the level of participation between the groups. Group A began with full participation (N = 25) but this number steadily decreased each day. Additionally, there were several participants who posted but did not participate in the peer interaction as requested in the directions for the discussion board. Group C also began with full participation (N = 19) but the decline was less severe as Group A. Group B (N = 23) had the least amount of fluctuation throughout the discussion board activities.

Table 28

Number of participants per group for each activity

	Group A	Group B	Group C
Pre-Survey	25	23	19
Discussion Board Day 1	25	23	19
Discussion Board Day 2	21	23	18
Discussion Board Day 3	19	22	17
Discussion Board Day 4	16	23	17
Post-Survey	20	20	16

Themes found in the discussion board posts are related to the content of the online instruction module and the research questions regarding attitudes, knowledge and skills and instructional centeredness in an online learning environment. In Task 1, participants were

introduced to the goal of the module, which was to create a lesson plan for an online learning environment. Content included a brief explanation of blended, synchronous and asynchronous learning environments and the context necessary for student learning. Additionally, the TPACK model was explained along with examples of how to use technology to create a student centered classroom environment. Bloom's Taxonomy and an introduction to the 4 C's, communication, creativity, critical thinking and collaboration added to the content. This task focused participant attention to metacognition, particularly the paradigm of online learning and instruction. Participants were asked to answer contextual questions about their hypothetical classroom and online learners for this day's artifact. The discussion board question asked participants to think about the knowledge that would be necessary for effective instruction in an online learning environment. Data indicate underlying attitudes of online learning, emphasis on content knowledge (CK), technology knowledge (TK) and knowledge of students' learning styles to be the most prevalent response. Participants also included the need to communicate on a more personal level with online students and suggested technology barriers by emphasizing the essential nature of equal access to technology and an understanding of the diverse needs of their students.

Table 29

Participant Response in Discussion Boards, Day 1

Attitudes	"Taking online courses can be boring and seem like busy work".
	"When considering teaching a lesson online, I would want to know how well the students are absorbing the material and how beneficial the technology is in comparison to traditional teaching for them".
	"They must know whether their students have had previous experience with computers. Teachers cannot assume anything about their students.
	"As teachers, we should use technologies not just because they may be available to us, but because they can enhance learning in the classroom".
Knowledge and Skills	"I would want to know their age, what they already know of the subject, and their interest level of the subject. This information would help me cater to the students individually, whether they know a lot or nothing about the subject."
	"I would want to know the students' technology skills to make sure that they are capable of navigating through the source that I am using to teach the lesson".
	"I think it's important to be aware of the diversity of your learners especially if you are not there 100% of the time to be available to them".
Instructional Centeredness	"I feel like teachers should know their students well and might need to place emphasis on building relationships with students if they have never met face-to-face".
	"Offering different learning mediums not only gives learners a chance to view a variety of ways to take in different information, but it also meets the individual needs of each student".
	"I think one of challenges to online learning would be teaching to the whole child and getting an accurate picture of that child. When a student walks into your physical classroom, you can pick up a lot of important information you might miss online (attitude, fatigue, signs of anxiety/restlessness, personal grooming, etc.) Perhaps discussion boards would be helpful in this area".

Participants were introduced to Backward Design and the proper alignment of objectives and assessments in Task 2. The artifact for this Task included the beginnings of the lesson plan: title, content area, grade, objectives and assessments, and standards. Descriptive statistics of the three groups provided evidence of participants from Groups A and B seeking licensure in a variety of content areas while those in Group C are either Early Childhood majors or Dual, Intervention Specialist and Early Childhood. Nine of the twenty participants from group B chose to create a lesson in Mathematics, while five out of nineteen from Group A and five out of sixteen in Group C chose Mathematics for their lesson plan content area. The content for this discussion board included a blog on technology use in the classroom. Themes from this discussion included more emphasis on attitudes toward technology use and TPACK. Participants expressed strong opinions, often based on their own past experiences and perceived usefulness of technology. These experiences included some discussion of the difficulty digital immigrants experience integrating technology in a pedagogically appropriate manner. There was also discussion that led to participants making connections to the Backward Design model and its use as a means of taking the focus off of the tool and onto the learning.

Table 30

Participant Response in Discussion Boards, Day2

Attitudes	"When I was in high school, I believe the teachers abused technology. They used it as there outlet to step away from the chalk board and sit behind there desk".
	"It is more difficult to focus on a screen with many distractions. Also students learn faster with paper and pencil".
	"Technology should not be used only because technology is used so abundantly in our world. Education does not need to change according to how technology

	is used".
	"Yes, students do know technology like the back of their hand, that of course is just how our society is, however what do you mean when you say that schools use technology greatly these days? What exactly are they doing? "
	"While these (laptops) could be extremely valuable tools, often times students did not use them properly and they actually act as barriers to learning, especially when teachers were not as attentive".
	"In the majority of the classrooms that I have been in, the only technology being used is a smart board and it is used as a substitute for the chalkboard".
	"Educators are using new technology to replace old technology without changing its methods. Many digital immigrants are not utilizing the many facets of technological advances and are using it to only serving a basic purpose.
Knowledge and Skills	"PowerPoint is my go-to program because it is the only thing I really know how to do".
	"I did not think about how backwards design can fix that automatic thinking, but it does make sense now. When using backwards design, we can keep learning as the goal and then go back and figure out how to integrate technology into the lesson".
	"The Backwards Design Model is excellent for avoiding this travesty. If this model is used, the goals will be the priority, followed by the means to measure evidence of learning."
Instructional Centeredness	"My natural instinct is to plan a lesson without the use of technology".
	"Technology has a collaborative aspect, which can be good to help guide student thoughts through online blogs or discussion boards".
	"I think it is important also to remember that students learn from each other... if you assign them to do a report on Abraham Lincoln and you let them CHOOSE what medium to use, the students are likely to gain a much more thorough perspective of the historical figure through a variety of more or less tech-y reports".

Day 3 included a synchronous session where all participants from a particular group logged in to Blackboard at their regularly scheduled class time. A colleague of the researcher introduced the participants to the many tools available in the synchronous classroom, providing opportunities to practice the technology in a live session. The use of a power point in addition to both modeling and active participation with the content and instructor yielded discussion of how the tools could be used (TPACK) in an online classroom to increase student learning. Many participants made connections to their own content area and began brainstorming pedagogical ideas for integrating the various technology aspects of the online learning environment. Again, participants expressed their feelings regarding teaching in an online learning environment with the inclusion of past experience and personal perception of technology and its usefulness or ease of use. Additionally, participants commented on changes in their personal understanding based upon statements and observations from their peers and specific examples of TPACK in an online learning environment were shared.

Table 31

Participant Response in Discussion Boards, Day 3

Attitudes	"An online classroom environment is naturally going to be less personal and less interactive than a live classroom environment, so all of these tools would help me to connect more and better with my class".
	"Personally, I don't see myself using too many of these tools because I would like to teach young children and I would prefer to teach in person rather than online".
	"First, to be honest, I hope I never have to teach a class online".
	"The writing tool would allow everyone to observe their work just like in a real classroom".

	" I could also see having classes from different parts of the country or even world participate simultaneously to promote understanding of cultural diversity. And think of the guest speakers you could have! Yikes! I think I could go on and on..."
Knowledge and Skills	"As a math teacher, the drawing tool is one I could definitely see myself using with my students. Graphing is a huge part of math, and the drawing tool would allow me to draw graphs in live time for my students, but it would also allow my students to draw graphs of their own on the screen. This would be extremely helpful in facilitating learning because a lot of the times with math, a concept isn't fully understood until a student can complete a task about the concept themselves. "In my online class this semester, my professor usually shares his screen which allows us to follow along with whatever he is explaining. This is helpful because it is similar to an actual classroom where you can both see and hear what is being explained". " I hadn't thought to use the whiteboard feature, but I can see how in teaching math or english, it would be extremely useful". "I could see myself using the whiteboard feature for multiple uses such as fill-in-the-blank sentences, math problems, "find the error" sentences-the list goes on an on. There are as many possibilities as there are with a real whiteboard!" "I really like what you talked about when you said that you can take the class anywhere such as a virtual hike or something. This is an interactive component that I never would have thought of otherwise and I think it's an awesome way to really engage your students in what they are learning!"
Instructional Centeredness	"These tools helped students participate because they could choose ask or answer questions, and engage in the visual aides given". "I could potentially see myself using something like the whiteboard tool for an art project so all the students could work together to create something. I could also see using the writing tools for an activity like the word search we did today". "I have taken online classes before and really like the discussion boards because it allows students to communicate back and forth". "I actually forgot about the breakout rooms until your post, and I really liked them as well. I thought it was interesting how you could break students up

	into groups online so they could participate in group work online instead of the normal classroom".

The final day of the online instruction module, Day 4, included content associated with the SAMR model of technology integration. Participants were instructed to complete the discussion board prior to the module content. The discussion board however, included two videos, which consisted of one presentation by the creator of the SAMR model, Dr. Puentedura, and, to further explain the model, another one using an analogy of Starbucks coffee that may be relevant to the participants. Themes included many connections to the synchronous session they participated in on Day 3, reflection on past experience as a student both pre-college as well as in higher education, and a return to the theme of access, but this time from the teacher's perspective. Participants provided evidence of continued construction of knowledge within the context of the online instruction module and discussion boards.

Table 32

Participant Response in Discussion Boards, Day 4

Attitudes	"For example, for the synchronous online class we all participated in on Wednesday, I would say that the tools used were merely on the Substitution level. The raise-hand button is a substitute for a physical raising of a hand, and the white board tool is a substitute for a physical white board in a physical classroom. However, the website used in order to make the class possible in the first place would be on the Modification and maybe even Redefinition level. Without the technology that allows us to have a class online, it simply would not happen. Technology is being used in a significant way that completely redesigns how a typical and physical class might occur". "I agree that technology is at the augmentation level. Technology is a great way to facilitate learning, but like you said the type of activities they are engaging in can go either way, with or without technology". "Technology does not aid in the creativity of students". [Last one to post in

	this group, therefore no peer response.] [Participant response to peer]: "That is a great point about the Power Point, when I was writing about them I did not think of them in a positive light as they can also be put online for the help of students to go back and check over their notes for accuracy". " I agree about technology being used poorly. Between distractions and teachers who did not know how to use technology, sometimes it could be a joke. Based on the other comments, it seems everyone else has had a similar experience". "I find it interesting that while you view our experience with the online classroom as redefinition, I viewed it as simply augmentation. The difference is that I was thinking that the distance of the students was not very notable, but you see it as "something previously unimaginable", as it is, I now see". "There are definitely opportunities for going to the highest level, but most teachers, in my whole education experience, either do not want to go that far or do not have the access to technology to be able to go that far".
Knowledge and Skills	" I agree with you when you say that many teachers do not have access to the type of technology that would allow them to enhance the learning of their students. For example, it is true that many schools and teachers do not have the budget to provide an iPad for every student". "…because technology changes so quickly. What I have already learned will definitely help as I continue in college especially the digital portfolio, but I think it would be really helpful to have a refresher and see what has developed. Maybe they will even offer a kind of exit technology seminar. Wouldn't that be great!"? "While reading your examples, I thought of how it's crazy that even Powerpoint is becoming so outdated, in my opinion. There are so many new tools, such as Prezi, that make Powerpoint lectures seem obsolete. Technology changes so quickly"! " But I do agree with you, it's also hard for me because we didn't grow up with very much technology in our classrooms, except those block sized computers, so to have IPads in a classroom is very new to me and I would have to research a lot in order to understand how to use them properly in the classroom".
Instructional Centeredness	"This is why even though the redefinition stage may be consuming, it also is rewarding. The students will remember what they talked about in their video

over looking at slides in a powerpoint".

"Completing this assignment through blackboard enhances the learning experience because the student is able to read their classmates reflections as well. Doing this, the student is able to learn more through exploring thoughts and deep thoughts that they other wise may have never thought of. This is an example of augmentation".

"With the generation currently in school a lot of times it takes that technological component to grab a student's attention. When it comes to modification I think that technology provides more opportunities for students to learn just because it offers a level of diversity and opportunity in the classroom that you don't get without technology".

"Through the use of the application Camtasia, one can complete this task and then publish the completed video onto YouTube for people to view all over the world".

Data was collected using a mixed-methods concurrent triangulation design, which allowed the researcher to gain information from multiple perspectives. Quantitative data was first obtained by one of the simplest modes of self-report survey instruments (Paulhus and Vazire, 2008) in which participants were asked to report directly on their own personalities. The use of survey data provided statistical estimates of characteristics of the target population that aid in describing experiences and opinions of the participants (Fowler, 2009). Additional quantitative data was obtained through the use of a published rubric and researcher scored artifacts. Finally, qualitative data from participant discussion board activities were used to further describe characteristics of these pre-service teachers enrolled in a teacher preparation program. Triangulation in this research offers construction of knowledge from using differing perspectives and a variety of methods, aiding in the validity of the research (Shank, 2006). Thus the synergy of data provided by both quantitative and qualitative methods of collection

communicates a more complete picture of the attitudes, knowledge and skills, and instructional centeredness of these participants.

Chapter V

Conclusion

Changes in the field of education brought on in part by the continued development of technology and the changing needs of today's learner require teachers' acquisition of specific knowledge of technology and the skills of its effective use in the classroom (Koehler & Mishra, 2008) particularly as technology is utilized in both blended and online learning (Watson, Murin, Vashaw, Gemin, & Rapp, 2013). These changes must be met by the transformation of traditional practices in teacher education programs, particularly those practices designed to meet the needs of students in the industrial age. Students in the digital age possess different needs in regard to utilizing the technology available for maximizing learning outcomes. This research is an examination of pre-service teachers' attitudes, knowledge and skills, and instructional centeredness relevant to integrating technology in an online learning environment. It was designed as a first step toward acknowledging the responsibility teacher preparation programs have in the formation of educators equipped to instruct in dual learning environments, thus providing pre-service teachers with opportunities and experiences to become fluent in the technological pedagogical content knowledge required for online learning environments as well as the traditional face-to-face instruction.

The purpose of the study was to determine if pre-service teachers' attitudes toward technology integration, knowledge and skills of technology, and instructional centeredness can be changed as a result of participation in an online instruction module. This determination was accomplished through a research design that included quantitative and qualitative data collection and multiple perspectives of participant interaction with the content of an online instruction intervention embedded in coursework necessary for teacher licensure.

Research Questions

The focus of this research centers on characteristics of pre-service teachers in a teacher preparation program relative to three domains. These domains are fundamental to the integration of technology and were observed in relation to the online learning environment. RQ1 and RQ4 were relative to the domain of Attitude, RQ2 and RQ5 were associated with the domain of Knowledge and Skills, while RQ3 and RQ6 correlated to the domain of Instructional Centeredness.

RQ1. In a teacher preparation program, what are the attitudes of pre-service teachers towards technology integration in an online learning environment?

RQ2. In a teacher preparation program, what are the knowledge and skills in technology integration of pre-service teachers in an online learning environment?

RQ3. In a teacher preparation program, what is the instructional focus of pre-service teachers in an online learning environment?

RQ4. What are the effects of an intervention on the attitudes of pre-service teachers towards technology integration in an online learning environment?

RQ5. What are the effects of an intervention on the knowledge and skills in technology integration of pre-service teachers in an online learning environment?

RQ6. What are the effects of an intervention on the instructional focus of pre-service teachers in an online learning environment?

Demographics

The researcher selected a purposeful sample of students in this teacher preparation program to observe characteristics that may be distinctive to novice education majors. The participants in Group A and Group B would be classified as novice due to their enrollment in a

course required early in this program's preparation. Students selected the section of this course upon registration with no prior knowledge of the instructor because both instructors were adjunct professors. Demographics for these two groups display differences in mean age (Table 5) when groups were expected to be more similar. For instance, the mean age for Group B was 21.5 while the mean age for Group A was 18.5. Group B included three participants who were older than the rest of the group by seven years or more. The influence of a more mature learner may have contributed to this group's level of participation and positive changes in the domains of this research. It should also be noted that participants engaged in this online instruction module in November, which was the later third of the semester. Factors such as instructor presence and affective characteristics (Croft, Dalton and Grant, 2010; Devine, Fahie and McGilicuddy, 2013; Hanover, 2009; Martin and Noakes, 2012), community building and collaboration (Palloff and Pratt, 2011; Rourke, et al., 2001; Swan, 2002), and experience with online discussion boards (Hanover, 2009; Niess and Gillow-Wiles, 2012; Ragan, 2007) prior to their engagement with this online instruction intervention may also have contributed to increased learning. Participants from Group B were more attentive to detail, followed directions and completed given tasks within the online instruction module in comparison to Group A as noted in Tables 27 and 28. This may be due to the maturity of the students and/or the influence of the instructor prior to this research.

Students from a methods course (Group C) were also selected for this research. These students were chosen to determine if characteristics of pre-service teachers further along in their program of teacher preparation have similar characteristics and outcomes after completing the online instruction module. These participants are more homogeneous than Groups A and B, particularly in their area of licensure (Table 6) since the course they were registered in was a

required course for all Early Childhood and Special Education majors. It would be expected that these participants were older than the first year students from Groups A and B, however, due to the three mature participants from Group B, the mean age for Group C, 20.8, was slightly younger than Group B. The instructor for this course is a fulltime faculty in the Education department and teaches three other courses besides the course included in this research. It is possible that some of the participants have taken a course with this instructor prior to engaging in the online instruction module. Along with possible history with this instructor, participants in Group C have had more experience with the learning management system used in this intervention due to its use in all education courses at this institution. Factors such as the instructor and experience with the learning management system may have contributed to learner outcomes in this research.

Attitude Domain

Attitudes toward technology integration in an online learning environment may be expressed as a readiness (Jung, 1921) to act or react in a particular manner, a tendency that may be considered habit (Eagly and Chaiken, 1993), or a motivation to respond which correlates with the degree of favor or disfavor one feels about performing a particular behavior (Venkatesh, 2008). In this research, pre-service teachers' attitudes toward technology integration in an online learning environment were measured quantitatively by self-report survey data and qualitatively through themes revealed in discussion board posts. Examining these results aids in an understanding and awareness of strengths and weaknesses of the learners in a teacher preparation program.

The first research question focuses on characteristics of pre-service teachers regarding their attitudes toward technology integration prior to engaging with the online instruction

module. Participants' attitudes were measured in pre-and post-survey data. Examination of questions #1-9, and 20-23 of pre-survey data for the three groups of participants (Tables 8, 9 and 10) indicate readiness, habit and motivation for technology integration in an online learning environment. Mean scores for the Pre Survey for the groups ranged from 2.10 – 3.32 and standard deviations ranged from 0.324 – 1.096. Standard deviations for Group B on the pre-survey ranged from 0.324 – 0.851, denoting a wider range than the other two groups (Table 9), thus greater variability. Standard error of the means for all groups on the pre-survey indicated mean scores were reliable. The only exception was question #20 for Group C, "I am thinking critically about how to use technology in an online learning environment". This question also yielded the highest value in the range for standard deviation, SD=1.096.

Group A demonstrated an attitude of confidence with technology as means were consistently higher than those of Group B or Group C for questions #1-9 and #20. It is possible that the younger students in Group A, who could be considered digital natives (Prenskey, 2011) and have a habit of using technology may relate higher attitudes of confidence with technology integration and perceive themselves as those who play around with technology, can learn technology easily and have technical skills that could be used to integrate technology in their teaching. Prior to participating in the intervention, participants from Group A agreed that they learn technology easily, keep up with important new technology, have technical skills they need to use technology appropriately in their teaching, have various ways and strategies of developing understanding of their content area, and can adapt technologies they are learning about to different teaching activities. This is an interesting level of confidence for pre-service teachers who have not had any field experience but perhaps perceive themselves as able to teach due to their twelve or more years of experiences as a student in a classroom.

Attitude is affected by prior experience with technology and for pre-service teachers this may be their experience in the classroom. Traditional classroom experiences void of current technology infusion may negatively affect the readiness, habit, and motivation toward innovative instruction and new learning environments. It is possible the older participants in Group B and Group C were not provided opportunities or experiences with technology in innovative instruction as would be possible for younger students as consistent advances in technology continue to be incorporated in classrooms across the country. This would help to explain the lower mean scores for both of these groups. Additionally, it provides information to the teacher preparation program that may be critical in the planning of future technological experiences for their pre-service teachers in foundational courses as well as methods courses.

Survey questions #21-23 measure attitude along with knowledge and skills and instructional centeredness, including language specific to the online learning environment. Pre-survey data indicated higher mean score values for Group B in regard to these questions. It would be presupposed that because all participants from Group C, with the exception of one, had been a student in an online learning environment (Table 7), this group would self report with higher means on questions with language specific to the online learning environment. However, this was not the case in the pre-survey data. Although these participants have experienced online learning as a student, one of the recommendations for effective online instructors, no additional information was reported regarding the quality of these experiences.

This research also intended to determine the effects of the online intervention module on the attitudes of pre-service teachers towards technology integration in an online learning environment (RQ4). This was accomplished through quantitative data on the post-survey as well as qualitative data from the discussion board posts. Examination of questions #1-9, and

20-23 of post-survey data for the three groups of participants (Tables 11,12 and 13) indicate increased readiness, habit and motivation for technology integration in an online learning environment. Mean scores for the groups ranged from 2.50 – 3.55 and standard deviations ranged from 0.365 – 1.025. Post-survey results indicate higher means for every question in the attitude domain were consistently obtained by Group B with the one exception of question 1 "I know how to solve my own technical problems". The online instruction module did not contain any content specific to solving technical problems. Although this teacher preparation program includes a course in computers for education and the participants may have been enrolled in this course, the course description does not include an emphasis on technical problem solving.

Analysis of post-survey results versus pre-survey results for each group identified specific questions that were significant (Tables 14, 15, and 16). All three groups made significant improvements within the Attitude domain with Group B demonstrating the most gains (Table 15). A two-way within-subjects analysis of variance was conducted to evaluate the effect of the online instruction module on each of the three groups mean scores on the survey measuring attitude toward technology integration in an online learning environment. Both the Time main effect as well as the Time X Group interaction effect was significant as reported in Chapter 4. The literature review highlighted many factors such as prior experience, field experience, technology skill, perceived usefulness, and perceived ease of use that affect a pre-service teacher's attitude toward integrating technology in an online classroom. These factors were addressed through content and activities within the intervention and may explain the significance. For instance, the online instruction module included content intended to build technological pedagogical content knowledge as participants engaged with the TPACK

framework and utilized the discussion boards to deliberate the benefits of integrating technology into their instruction. Engagement with resources such as Bloom's Digital Taxonomy, the SAMR model, and synchronous experience with Blackboard Collaborate targeted the readiness aspect of participants' attitudes toward integrating technology in an online learning environment. Videos of classroom instructors' effective integration of technology were provided as models for participants. The objective for using these videos included offering a prototype to address attitude barriers such as perceived usefulness of technology in the classroom.

Discussion board prompts included a direction to provide feedback to at least two peers and to include at least one question in order to encourage deeper thinking and continued conversation. It was noted that Group B followed these directions and offered questions within their peer feedback. Negative attitudes towards technology had their basis in prior experiences with ineffective technology integration, as expressed by personal experience in traditional classrooms. Intrinsic and extrinsic barriers (Ertmer, 1999) to effective technology integration included mention of inappropriate student use of laptops, inattentive and ill-prepared instructors, and limited access to technology. Negative prior experiences plague this generation of pre-service teachers and become evident in attitudes suggesting technology integration is not important, a waste of time, and distracting. Consideration of innovative learning environments such as an online learning environment was also met with resistance and attitudes were present similar to those discovered by Kennedy and Archambault (2012) asserting the online classroom is not a real classroom. Ignorance of the affordances of technology and of actual practice in classrooms was evident in comments made in Day 2 discussion board such as "students learn faster with paper and pencil" and "What do you mean

when you say that schools use technology greatly these days? What exactly are they doing?" Subtle changes in depth and length of posts were noted as the module continued. New knowledge building was evidenced in discussion board posts as participants challenged each other to different perspectives, particularly in the Day 4 posts regarding identification of levels of SAMR in technology use (Table 32). Day 4 posts also demonstrated evidence of reflection upon the previous day's content and activities as connections to the synchronous session were shared and discussed among participants.

Knowledge and Skills Domain

Understanding the complexity of change in our culture and the dynamics of effective instruction, teacher preparation reflects an integration of knowledge about the learner, the context, the discipline and emerging technologies (Niess, 2008). With the expansion of the classroom to include virtual learning environments, concern still exists regarding characteristics necessary for quality teaching and learning. Engagement with the TPACK and SAMR frameworks, Backwards Design, Blackboard Collaborate synchronous tools, videos descriptions of online learning environments and activities surrounding the creation of a lesson plan for an online learning environment addressed these concerns.

In this research, pre-service teachers' knowledge and skills toward technology integration in an online learning environment (RQ2) were measured quantitatively by self-report survey data (Questions # 9-23) and qualitatively through themes revealed in discussion board posts. Examining these results (Tables 8, 9 and 10) aids in an understanding and awareness of strengths and weaknesses of the learners in a teacher preparation program. Pre-survey results indicated higher mean scores in the knowledge and skills domain from Group C (Table 10), which would be expected due to their successful completion of coursework in the

teacher preparation program prior to engaging with this online instruction module. These participants reported confidence with items related specifically to learning strategies to develop understanding of their content, guiding student thinking in their content area, and pedagogical content knowledge most likely due to prior coursework in both content and methods. Additionally, more than half of the responses to questions related to the knowledge and skills domain from Group C were rated 2 or higher. These responses did not include any "strongly disagree".

All three groups indicated low means for knowledge and skills domain questions related to classroom management, assessment and technology for the online classroom. Participants began the intervention indicating a lack of knowledge and skills in effective instruction for the online learning environment. This is the gap, the problem this research intended to address.

This research also intended to determine the effects of the online intervention module on the knowledge and skills of pre-service teachers towards technology integration in an online learning environment (RQ5). This was accomplished through quantitative data on the post-survey as well as qualitative data from the discussion board posts. Examination of questions #9-23 of post-survey data for the three groups of participants (Tables 11,12 and 13) indicate a gain in knowledge and skills toward integrating technology in an online learning environment. Significant differences were evident for question 20, "I am thinking critically about how to use technology in an online learning environment," between Group B ($\mu = 3.45$) and Group C ($\mu = 2.94$). Question 21, "I can adapt the use of technologies that I am learning about to different teaching activities" was also significant between Group B ($\mu = 3.55$) and Group C ($\mu = 3.06$). While question 22 "I can select technologies to use in an online learning environment that

enhance what I teach, how I teach and what students learn" also showed significance, post hoc tests did not identify pairs of means that were significant. Identification of pairs of means that were significantly different resulted in Group B scoring significantly higher than Group C in both questions 20 and 21. Consideration of participation, entry-level knowledge and skills, and age may all help to explain these significances and the positive effects of the intervention on those participants in Group B. These participants began the intervention with limited knowledge and skills of technology integration and online learning environments. Through active involvement in this community of learners, these participants made significant gains. Viewing their engagement within the Community of Inquiry framework (Garrison et al., 2010), social presence, cognitive presence and teaching presence were evident throughout the intervention, but particularly in the discussion boards and conversation both oral and written during the synchronous session on Day 3.

A two-way within-subjects analysis of variance (Table 21) was conducted to evaluate the effect of the online instruction module on each of the three groups mean scores on the survey measuring knowledge and skills toward technology integration in an online learning environment. Both the Time main effect as well as the Time X Group interaction effect was significant as reported in Chapter 4. Components of the intervention were selected based upon information gained from previous researchers as indicated in the review of literature (Chapter 3). The introduction of online technologies in this intervention changed what was pedagogically possible, highlighting the development of new literacies including the knowledge and skills associated with this practice of online instruction. Participants were given opportunities to share ideas, stories, experiences and perspectives as they engaged in instruction specific to the online classroom. This research included the operational dimension,

skills such as the ability to use tools available online to operate desired functions, search for information, multitask online, and share resources and information effectively. The addition of telecollaboration was assistive in participants gaining these new literacies and confirming the effect of the intervention.

Discussion board posts were filled with examples of knowledge and skills they were learning about within this intervention. Participants affirmed their awareness and new understanding of the Backwards Design process and the importance of aligning objectives to assessments. Connections were made between this process of designing a lesson and integrating technology to increase learning. The inclusion of the synchronous experience on Day 3 confirmed the critical nature of experiential learning in teacher preparation as much as the appropriate use of discussion boards fostered new knowledge construction through social interaction. Participants commented on new ideas gained for integrating technology in both their content area as well as in an online learning environment. The inclusion of reflection upon their own experiences with technology, specifically on the last day of the intervention, provided additional information on these pre-service teachers' level of comfort with newer technology or technology they had not experienced in their traditional classrooms.

Instructional Centeredness Domain

Reform in education has brought on a movement away from traditional didactic instruction towards a more constructivist approach that recognizes and celebrates attributes of the individual learner. This is a shift from teacher-centered to student-centered learning. The inclusion of innovative learning spaces such as online classrooms inspires this vision of education, promoting models of teaching that underscore and develop student choice, student discovery, student initiated use of technology, student-generated content and students learning

by doing (Powell et al., 2014). A refresh process of the ISTE standards for students is currently underway as this research is being presented. In addition to including language for the online classroom environment, the draft for these standards moves away from describing the activities to a description of active, student centered learning. This iteration presents a shift in the language to focus on learners as empowered, knowledge constructors, innovative designers and global collaborators (Stoeckl, 2016). This is just one example of how the reform movement will impact the future of teacher preparation.

This research sought to answer research questions (RQ3 and RQ6) concerning the instructional centeredness of pre-service teachers in this teacher preparation program. Participants' instructional centeredness was measured quantitatively by self-report survey (questions #9-16 and 21-23) data and the TIMS rubric applied to the final lesson plan artifact. Qualitative measurement of instructional centeredness occurred through themes revealed in discussion board posts. Examining these results (Tables 8, 9, and 10) aids in an understanding and awareness of strengths and weaknesses of the learners in a teacher preparation program. Pre-survey and post-survey results, as discussed within the Attitude and Knowledge and Skills domains, enrich conjectures reached by examining lesson plan artifacts.

Rarely is a learning environment entirely teacher-centered or learner-centered, rather instruction may be viewed along a continuum such as that in figure 5 (Chapter 3). The researcher used the TIMs matrix as a rubric for associating a level of instructional centeredness to the design of the lessons created by participants in this intervention. It should be noted that Table 27 provides statistics for the final lesson plan artifact, which was the task for the final day of the online instruction module. Group C achieved the highest mean score, which may be attributed to prior exercise of this task. There were 8 out of 19 participants from Group A,

approximately 42%, who either did not submit this artifact or submitted incomplete final lesson plans. Examination of these eight participants' individual progress determined by the subtraction of the pre-survey score from the post-survey score indicated a net loss in half of these cases. These data give credence to the importance of instructor presence and prompt feedback particularly in an online learning environment where students may develop a sense of isolation.

Constructive characteristics of the learning environment portray decisions made within the learning environment that may inhibit or promote aspects of student centered learning. Mean scores for lessons plans (Table 27) help to explain previously stated inferences regarding differences between the three groups. Characteristics of traditional didactic teacher centered instruction were found in the lesson plans of all three groups. These characteristics included passive reception of content, individual student use of technology, conventional knowledge building, directions given to students by the teacher, and activities that were unrelated to the world outside of the instructional setting. Teacher-centered characteristics were more prevalent in the lesson plans of Group A and Group B. Given the lack of practice creating lessons in the first year of this teacher preparation program, these results come as no surprise. However, several of these first year participants included a note regarding changes they made due to the intervention content. For instance, one participant mentioned, "After watching the video today about making objectives that are measureable, I thought it would be a good idea to make it clearer." And " I added the slideshow and video recording component to make the project more collaborative". Group C, with higher mean scores, included more learner-centered instruction in their lesson plans. Characteristics found in these artifacts included allowing student choice regarding what technology they would use for accomplishing their

learning goal, collaboration with peers and outside resources, and conventional use of knowledge building tools with some choice in learning trajectory.

Groups A and B made significant improvements within the Instructional Centeredness domain while Group C demonstrated no significance (Table 24). A two-way within-subjects analysis of variance (Table 25) was conducted to evaluate the effect of the online instruction module on each of the three groups mean scores on the survey measuring instructional centeredness in an online learning environment. Both the Time main effect as well as the Time X Group interaction effect was significant as reported in Chapter 4. Additionally, analysis of post-survey results versus pre-survey results for each group identified specific questions that were significant (Tables 22, 23, and 24). Results indicate significance in means for instructional centeredness in question 13 "I can use a wide range of teaching approaches in an online classroom setting" between Group A ($\mu = 2.90$) and Group B ($\mu = 3.40$). This significance may be related to the overall participation of Group B as indicated in the other two domains. Significant differences between Group B ($\mu = 2.50$) and Group C ($\mu = 3.19$) for question 16 "I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure" was also noted. As stated earlier, Group C is more homogeneous in its composition with all students either Early Childhood or Intervention Specialist licensure areas. These students have completed coursework related to their content area and were enrolled in a course specific to content area pedagogy. It may be surmised that these students were able to make more specific connections to their licensure area. Evidence was also recovered in their lesson plan artifacts as Group C included more variety in teaching approaches and learner-centered characteristics.

Significance of this Study

Continued focus on the quality of educator preparation programs and the teachers produced by these programs requires a deeper understanding of the needs of students enrolled in these programs. Instructional design of quality lessons, units, and programs require time taken to gather evidence of characteristics of both the learners and the context for learning. A learner analysis includes gathering information about attitudes, knowledge and skills, learning preferences, and group characteristics. These characteristics are influential in determining the effectiveness of instructional experiences and attainment of learning goals. "They help the designer develop a motivational strategy for the instruction and will suggest various types of examples that can be used to illustrate points, ways in which instruction may (or may not) be delivered, and ways to make the practice of skills relevant for learners" (Dick, Carey & Carey, p. 94). The time it takes to use a tool such as this online instruction module is time well spent when data may be collected to inform instruction of meaningful and transferable experiences.

It cannot be denied that the use of this tool yielded significant results and provided valuable information for assessing and addressing the needs of pre-service teachers in this teacher preparation program. The online intervention module incorporates cognitive and behavioral modeling of lesson design and technology integration, providing numerous and authentic experiences with technology where pre-service teachers have an opportunity to practice using a variety of digital tools for learning, assessing and managing students in an online classroom. The integration of these learning experiences through an online intervention has the potential to revolutionize teacher preparation.

Summary

- Pre-service teachers' attitudes toward technology integration in an online learning environment can be positively affected by inclusion of online learning experiences.
- Intentional inclusion of instructional planning and design for virtual contexts positively affects pre-service teachers' knowledge and skills for integrating technology.
- Experience with synchronous online learning environments assist in pre-service teachers' attitude toward the usefulness of online tools and aids in their technology skill.
- Preparing pre-service teachers for dual learning environments promotes an awareness of diverse learners and learning environments.
- Instructor presence and prompt feedback are essential in an online learning environment.
- Effective use of discussion boards promotes new knowledge building within a learning community.
- Negative attitudes towards technology have their basis in previous experiences of ineffective technology integration in traditional classrooms.
- Pre-service teachers need experience with and modeling of student centered learning.

Recommendations

It is imperative that teacher preparation programs address the inclusion of pedagogical practices for online learning environments given the landscape of K-12 education in this country. Fostering effective integration of technology requires addressing the often-negative experiences pre-service teachers have had in traditional learning spaces. These negative attitudes may be remedied by positive experiences with innovative practices and partnerships

within online learning environments. The needs of digital learners must convince stakeholders in teacher preparation that traditional practices of instruction perpetuate tedious and synthetic education thus doing harm to the current generation of learners. Rather, this is a call for determined efforts toward incorporating student-centered instructional modeling of effective technology integration within a variety of online and blended learning spaces.

Transforming teacher preparation programs to address online instruction requires an intentional focus on integrating technology within coursework, e.g. content and methods courses, as well as offering teacher candidates technology rich field experiences. This research adds to the arguments made by other inquiries (Gronseth et al., 2010; Laffey, 2008; Polly et al., 2009; Poyo, Wilson, and Carbonara, 2013; Wetzel et al., 2014) that more strategic implementation of technology within instruction positively influences teacher candidates to integrate technology.

Continued research of best practices in online learning and effective online instruction will provide necessary substantiation of online learning as an authentic learning environment and address uninformed opinions. Increasing teacher knowledge of online practices must be undertaken in order to prepare educators for virtual contexts. It is interesting to examine the negative attitudes and criticism which participants in this research shared regarding integrating technology in an online learning environment. Each grievance may be paired to a solution offered by Chickering and Gamson's (1987) principles of effective teaching. For example:

Challenging to get an accurate picture of your students in an online class…Be Present

Online classrooms are less personal…Create Supportive Learning Communities

Online courses can be boring…Encourage Active Learning

Technology use breeds inattentive teachers…Give Prompt Feedback

Technology is used as a babysitter…Emphasize Time on Task

Technology does not aid in creativity of the students…Communicate High Expectations

The online instruction module incorporates specific content knowledge relevant to the use of the TPACK framework and the SAMR model, which will assist pre-service teachers in identifying, evaluating, and improving their online teaching. This framework, when used in teacher preparation programs, would allow pre-service teachers to go beyond treating technology as supplementary and focus on the connection of all three domains specifically within the context of online instruction and learning. Additionally, the intentional focus on TPACK and SAMR within the online learning space affords the pre-service teacher with transferable experiences and knowledge necessary for the wide variety of instructional experiences possible within any classroom connected to open education resources.

Teacher preparation programs need to include discussion of how and why learning occurs in any classroom, be it face-to-face or online, to heighten the novice teacher's awareness that the teacher really does make a difference. Metacognitive discourse, discussion of rationales for decisions made within the design process of lesson planning, puts professional knowledge learned into context. The use of the TIMs matrix while designing lesson plans will provide pre-service teachers with ideas for transitioning into a more student-centered model of instruction. As mentioned in the literature review, the website for this tool contains links to numerous authentic examples of technology integration within a variety of content areas. Offering students in a teacher preparation program opportunities to view models of instruction that they may never have experienced in their traditional classrooms facilitates extrapolation and assists in shifting attitudes and habits of mind.

In regard to the use of an online instruction module, the researcher recommends inserting formative assessment within the daily instructional content videos to monitor and assess participation and progress. In this research, information regarding participant engagement with the content could only be measured by survey, artifact, and discussion board activity. Each day within the module included video content, which was a required component of the course. However, the researcher was unable to determine which of the participants actually did view the video content. With formative assessment embedded in the videos, data may be collected to indicate and assess participation. This data may then contribute to findings and correlate to significant differences attained by individual participants.

It is entirely possible that participants experienced a sense of isolation while interacting with this online module. Research indicates the importance of instructor presence in an online learning environment (Cleveland-Innes and Garrison, 2010; Means, Bakia, and Murphy, 2014; Ragan, 2007; Rice, 2012) particularly when attempting to create a community of learners. The visibility of the instructor, both privately and publicly, encourages the development of relationships, the connection with other learners, and the accomplishment of learning goals. However, for the purpose of this study, instructor interaction was not promoted. Content videos included the voice of the researcher, but no visual image was provided to connect with. The exception occurred on Day 3 when the students engaged in a synchronous session including both audio and visual images of a guest instructor, a colleague of the researcher. Participants were able to ask questions about the content of the module for Day 3 and receive instant feedback from the guest instructor. Including a synchronous component is effective for increasing engagement with the content by employing real-time communication (Bayram, 2012). To eliminate isolation and promote full participation, the researcher recommends

instructor feedback be given to participants regarding lesson design and discussion board posts. Learners portray an increase in their motivation and engagement following the delivery of intentional and specific feedback (DiPietro, et al., 2008; Ragan, 2007). Including the instructor as an active member of the learning community may dissuade learners from seeking anonymity within an online asynchronous learning segment.

There are numerous purposes for the inclusion of video in pre-service teacher training, including providing examples of effective teaching practice, presenting situations that highlight student thinking, and fostering skills related to content knowledge. Due to the various learning goals associated with video pedagogy, careful selection of specific videos that address these learning goals is required (Bloomberg, et al., 2013). In this research, participants engaged in videos reflecting all three of the learning goals listed. While careful identification of learning goals and selection of appropriate video material were considered, "video is only a tool; it does not produce learning itself " (Bayram, 2012, p.1010).

In online instruction, providing content through the use of video may require additional attention to reflection upon what was presented in the video. This was addressed through the inclusion of discussion boards for communicating personal reflection and sharing in community knowledge building. However, one group experienced a steady drop in participation as the module progressed. Considering the need for prompt feedback and instructor presence in an online learning experience, formative assessment could have been used within the videos themselves. The development of new educational technology offers the communication of information pertaining to the learner's performance through assessments with automatic correction (prompt feedback). If formative assessment had been included in the videos, perhaps the participation rate for all three groups would have been more similar.

Additional conclusions regarding effects of the intervention on pre-service teachers could be made with the knowledge that participants were engaged in all of the content of the intervention. Data such as this is most beneficial for determining which principles of effective teaching in an online learning environment need to be addressed, aiding in the transformation of traditional practices to equip pre-service teachers with the technological pedagogical content knowledge necessary for instruction in online learning environments.

Future Research

Further research of the effects of this type of intervention should include an investigation of the effects of instructor characteristics and learner behavior in regard to participation in tasks associated with those included in this online instruction intervention. Group A and Group B were two sections of the same course taught by two different instructors. Although it was hypothesized that there would not be significant differences between these two groups, the results of this research showed otherwise. Online experiences such as those presented in the use of discussion boards had been a regular occurrence prior to their engagement in this intervention for the group that made significant improvement. If students have experience with effective use of discussion boards and are in a routine of utilizing this form of online community building and collaboration, will their participation in this intervention provide deeper knowledge building of the content?

Examining when the instruction module is offered to pre-service teachers within the semester may also result in determining the most appropriate time within a semester to administer this instrument. Would it be a more effective tool at the beginning of the semester? Do other factors exist such as stress from deadlines and projects in other courses and time commitments to extracurricular activities that may be associated with the end of a semester and

thus interfere with student progress in this type of online instruction module if delivered at that time?

Continued research and investigation into causes for Group C's lack of significant differences in post-survey versus pre-survey results might add to the growing knowledge of the positive effects of integrating technology into content and methods courses. What were the prior experiences of these pre-service teachers during their freshman and sophomore years in this teacher preparation program? Were they already equipped with experience in planning and designing instruction for online learning? Do they believe planning and designing for this learning environment is any different than planning and designing for a traditional classroom?

These conjectures provide opportunities for further research. Understanding the target audience is the key to designing effective instruction. The implementation of an intervention such as this online instruction module may help other teacher preparation programs identify strengths and weaknesses of their pre-service teachers in regard to their attitudes, knowledge and skills, and instructional centeredness for online learning environments. This valuable information may also provide necessary guidance for program goals specific to the institution of higher education incorporating this intervention.

The ultimate goal is that all teacher preparation programs will include training to teach in online and blended learning environments. Teacher education programs must therefore undertake a transformation to include the preparation of pre-service teachers for dual learning environments, face-to-face as well as online.

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Appendix A

DUQUESNE UNIVERSITY

600 FORBES AVENUE ♦ PITTSBURGH, PA 15282

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE: Transforming Traditional Practices of Teacher Preparation: Attitudes, Knowledge and Skills, and Instructional Centeredness for Online Learning

INVESTIGATOR: Dr. David Carbonara
School of Education/Department of Instruction and Leadership
412-396-1995

SOURCE OF SUPPORT: This study is being performed as partial fulfillment of the requirements for the doctoral degree in Instructional Technology at Duquesne University.

PURPOSE: You are being asked to participate in a research project that seeks to investigate how the use of an online instructional module in a teacher preparation course may support pre-service teachers' attitudes, knowledge and skills and instructional centeredness in an online learning environment.
In order to qualify for participation, you must be enrolled in EDU 218 A, EDU 218 B, or EDU 300 during the Fall semester of 2015.

PARTICIPANT PROCEDURES: To participate in this study you will be asked to permit the researcher to collect de-identified (will not contain any information that can be connected to you) copies of your artifacts and survey responses while you are completing a two-week instruction module required by your course instructor. Participation in the online instruction module is a required component of your course, however, by signing this form you will be allowing the researcher to collect the artifacts and survey

responses you create within this module after your instructor de-identifies them. These artifacts include a survey of pre-service teachers' knowledge and skills of teaching and technology, a lesson plan, reflection and discussion board posts.

This is the only request that will be made of you.

RISKS AND BENEFITS: There are no risks greater than those encountered in everyday life associated with participating in this study. Long-range benefits may include professional development in the areas of technology integration and lesson planning.

COMPENSATION: Participants will not be compensated for participation in this study.

Participation in the project will require no monetary cost to you. Your response will be put into an envelope without any identifying information, sealed and then given to the investigator.

CONFIDENTIALITY: Your participation in this study and any personal information that you provide will be kept confidential at all times and to every extent possible.

Your name will never appear on any survey or research instruments. All written and electronic forms and study materials will be kept secure. Your response(s) will only appear in statistical data summaries. Any study materials will be maintained for two years after the completion of the research and then destroyed.

RIGHT TO WITHDRAW: You are under no obligation to participate in this study. You are free to withdraw your consent to participate at any time. You may choose to withdraw submitted data by contacting your instructor who will then remove the data and provide a new data set to the researcher.

SUMMARY OF RESULTS: A summary of the results of this research will be supplied to your course instructor who will provide it to you, at no cost, upon request.

VOLUNTARY CONSENT: I have read the above statements and understand what is being requested of me. I also understand that my

participation is voluntary and that I am free to withdraw my consent at any time, for any reason. On these terms, I certify that I am willing to participate in this research project.

I understand that should I have any further questions about my participation in this study, I may call Dr. David Carbonara at 412-396-4039. Should I have questions regarding protection of human subject issues, I may call Dr. Linda Goodfellow, Chair of the Duquesne University Institutional Review Board, at 412.396.1886.

_____ _____

Participant's Signature Date

_____ _____

Researcher's Signature Date

Appendix B

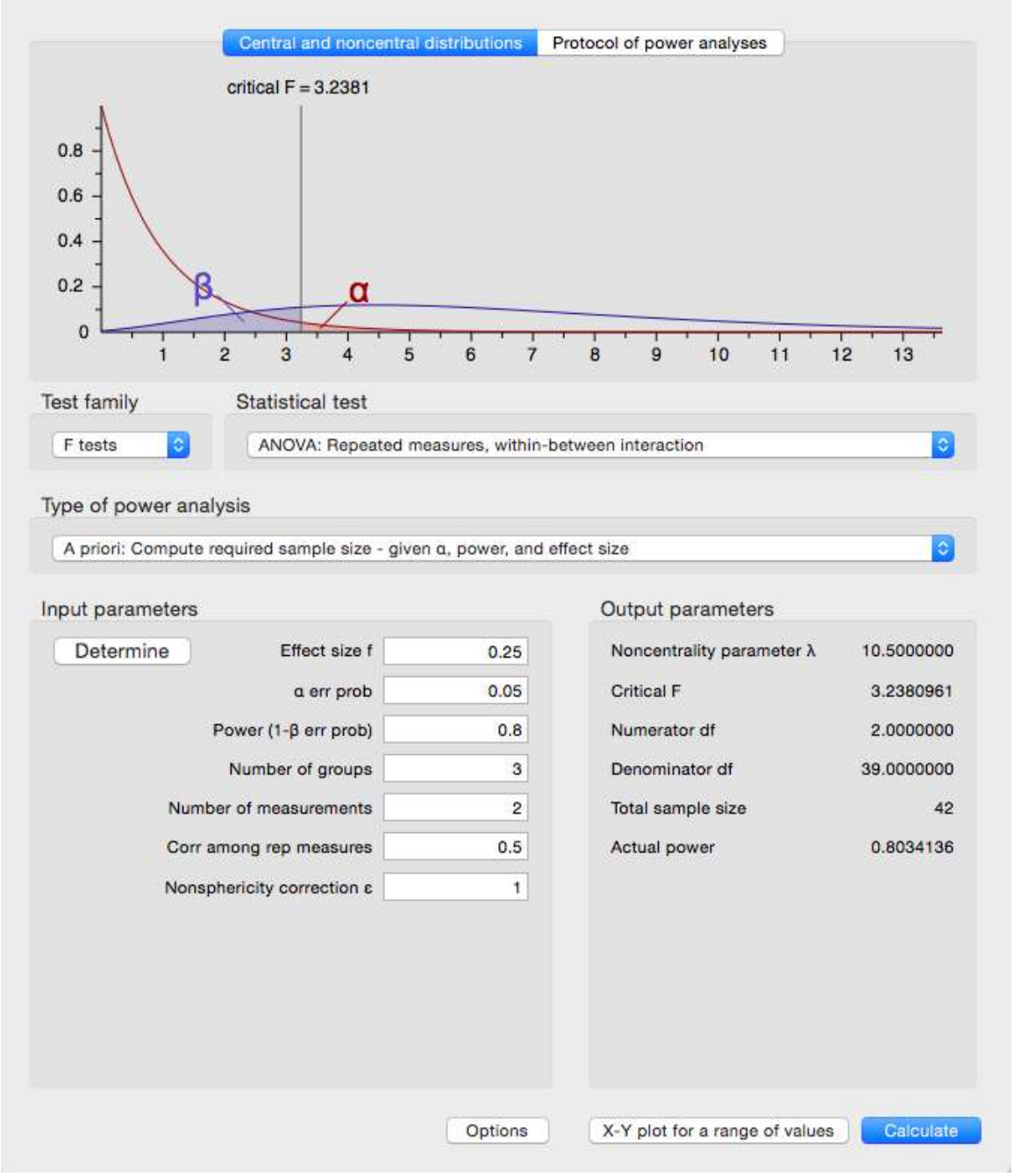
Directions for Creating a Personal Identification Number (PIN)

(These directions will be read aloud to all participants)

The reason we are asking for you to create your own personal identification number is to ensure that the data collected by the researcher is completely anonymous. You will use your PIN number to identify your work within the online instruction module.

1. Please take a blank index card as they are being passed around.
2. Write your name on the top line of the index card.
3. Create your own 6-digit personal identification number and write it on the index card below your name. Make sure your selected PIN is 6 digits.
4. Record your PIN somewhere for you to access as needed throughout this course.
5. I will now collect all index cards in this envelope. I will securely store this envelope.
6. Do not tell anyone your PIN. Keep your PIN secure.
7. I will inspect the index cards to determine if any identical numbers were selected. I will notify you if you need to select a new number.

Appendix C


Central and noncentral distributions
Protocol of power analyses
critical F = 3.2381
0.8
0.6
0.4
0.2
0
β
α
1
2
3
4
5
6
7
8
9
10
11
12
13
Test family
F tests
Statistical test
ANOVA: Repeated measures, within-between interaction
Type of power analysis
A priori: Compute required sample size - given α, power, and effect size
Input parameters
Determine
Effect size f
0.25
α err prob
0.05
Power (1-β err prob)
0.8
Number of groups
3
Number of measurements
2
Corr among rep measures
0.5
Nonsphericity correction ε
1
Output parameters
Noncentrality parameter λ
10.5000000
Critical F
3.2380961
Numerator df
2.0000000
Denominator df
39.0000000
Total sample size
42
Actual power
0.8034136
Options
X-Y plot for a range of values
Calculate

Appendix D

A Survey of Preservice Teachers' Knowledge of Teaching and Technology

Modified by Susan Poyo

Demographic Information

1. As of today, what is your age?

2. What is your 6-digit pin number anonymously created for this study?

3. What is your gender?
   a. Female
   b. Male

4. Is your permanent residence in Ohio?
   When not in school, is your permanent address in Ohio?
   a. Yes
   b. No

5. What is the area of certification you are working towards?
   a. Early childhood
   b. Intervention Specialist
   c. Dual Licensure
   d. Middle Childhood
   e. AYA (Secondary)

6. How many Education courses have you successfully completed
   a. 0
   b. 1-4
   c. 5-8
   d. 9 or more
   e. I have completed 1-4 Education courses at another institution.
   f. I have completed more than 4 Education courses at another institution.

7. What semester do you intend to student teach?
   a. Spring 2016
   b. Fall 2016
   c. Spring 2017
   d. Fall 2017
   e. Spring 2018
   f. Fall 2018
   g. Spring 2019
   h. Fall 2019
   i. Other _____

8. I have been a student in an online course.
   a. Yes
   b. No

Technology is a broad concept that can mean a lot of different things. For the purpose of this questionnaire, technology refers to digital technologies or digital tools we use such as laptops, iPads, handhelds, interactive whiteboards, software programs, apps, Web 2.0, etc. Please answer all of the questions using the scale:
Strongly disagree Disagree Agree Strongly agree

1. I know how to solve my own technical problems.
2. I can learn technology easily.
3. I keep up with important new technologies.
4. I frequently play around with technology.
5. I know about many different technologies.
6. I have the technical skills I need to use technology.
7. I have had sufficient opportunities to work with different technologies.
8. I have various ways and strategies of developing my understanding of the content area in which I am seeking licensure.
9. I know how to assess student performance in an online classroom.
10. I know how to adapt my teaching based-upon what students currently understand or do not understand.
11. I know how to adapt my teaching style to different learners in an online environment.
12. I know how to assess student learning in multiple ways in an online environment.
13. I know how to use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)
14. I am familiar with common student understandings and misconceptions.
15. I know how to organize and maintain classroom management in an online learning environment.
16. I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.
17. I know about technologies I can use in an online environment for understanding and doing the content area in which I am seeking licensure.
18. I can choose technologies that enhance the teaching approaches for a lesson in an online learning environment.
19. I can choose technologies that enhance students' learning for an online lesson.
20. I am thinking critically about how to use technology in an online learning environment.
21. I can adapt the use of technologies that I am learning about to different teaching activities.
22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.

23. I can use strategies in an online learning environment that combine content, technologies and teaching approaches that I learned about.

Appendix E

The Technology Integration Matrix
Table of Summary Descriptors

This table contains summary descriptors for each cell of the Technology Integration Matrix (TIM). Other available resources include a tables detailing student activity, teacher activity, and instructional settings for each TIM cell.

Levels of Technology Integration into the Curriculum

Characteristics of the Learning Environment	Entry	Adoption	Adaptation	Infusion	Transformation
Active	Information passively received	Conventional, procedural use of tools	Conventional independent use of tools; some student choice and exploration	Choice of tools and regular, self-directed use	Extensive and unconventional use of tools
Collaborative	Individual student use of tools	Collaborative use of tools in conventional ways	Collaborative use of tools; some student choice and exploration	Choice of tools and regular use for collaboration	Collaboration with peers and outside resources in ways not possible without technology
Constructive	Information delivered to students	Guided, conventional use for building knowledge	Independent use for building knowledge; some student choice and exploration	Choice and regular use for building knowledge	Extensive and unconventional use of technology tools to build knowledge
Authentic	Use unrelated to the world outside of the instructional setting	Guided use in activities with some meaningful context	Independent use in activities connected to students' lives; some student choice and exploration	Choice of tools and regular use in meaningful activities	Innovative use for higher order learning activities in a local or global context
Goal-Directed	Directions given, step-by-step task monitoring	Conventional and procedural use of tools to plan or monitor	Purposeful use of tools to plan and monitor; some student choice and exploration	Flexible and seamless use of tools to plan and monitor	Extensive and higher order use of tools to plan and monitor

The Technology Integration Matrix was developed by the Florida Center for Instructional Technology at the University of South Florida College of Education and funded with grants from the Florida Department of Education. For more information, visit http://mytechmatrix.org.

Appendix F
Survey of Preservice Teachers' Knowledge of Teaching and Technology Crosswalk

Conceptual Framework

Attitudes: *Readiness, Habit, and Motivation* **(Jung; Eagly & Chaiken; Ertmer)**
Knowledge and Skills: *TPACK components* **(Koehler & Mishra)** *SAMR framework* **(Puentedura)**
Instructional Centeredness: *Responsibility, Engagement, and Formative Assessment* **(Weimer; Mostrum & Blumberg)**

Survey Question	Conceptual Framework	Research Question
1. I know how to solve my own technical problems	Attitudes toward technology (Readiness)	In a teacher preparation program, what are the **attitudes** of pre-service teachers toward technology integration in an online learning environment?
2. I can learn technology easily	Attitudes toward technology (Readiness)	In a teacher preparation program, what are the **attitudes** of pre-service teachers toward technology integration in an online learning environment?
3. I keep up with important new technologies.	Attitudes toward technology (Readiness)	In a teacher preparation program, what are the **attitudes** of pre-service teachers toward technology integration in an online learning environment?
4. I frequently play around with technology.	Attitudes toward technology (Habit)	In a teacher preparation program, what are the **attitudes** of pre-service teachers toward technology integration in an online learning environment?
5. I know about a lot of different technologies.	Attitudes toward technology (Readiness)	In a teacher preparation program, what are the **attitudes** of pre-service teachers toward technology integration in an online learning environment?
6. I have the technical skills I need to use technology appropriately in my teaching.	Attitudes toward technology (Readiness)	In a teacher preparation program, what are the **attitudes** of pre-service teachers toward technology integration in an online learning environment?

7. I have had sufficient opportunities to work with different technologies.	Attitudes toward technology (Habit)	In a teacher preparation program, what are the **attitudes** of pre-service teachers toward technology integration in an online learning environment?
8. I have various ways and strategies of developing my understanding of the content area in which I am seeking licensure.	Attitudes toward technology integration	In a teacher preparation program, what are the **attitudes** of pre-service teachers toward technology integration in an online learning environment?
9. I know how to assess student performance in an online learning environment.	Knowledge and skills of an online instructor (Pedagogical knowledge) Attitudes toward technology integration Instructional centeredness	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment? In a teacher preparation program, what are the **attitudes** of pre-service teachers toward technology integration in an online learning environment? In a teacher preparation program, what are the **instructional centeredness** behaviors of pre-service teachers in an online learning environment?
10.I can adapt my teaching based-upon what students currently understand or do not understand.	Knowledge and skills of an online instructor (Pedagogical knowledge) Instructional centeredness	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment? In a teacher preparation program, what are the **instructional centeredness** behaviors of pre-service teachers in an online learning environment?
11.I can adapt my teaching style to different learners in an online environment.	Knowledge and skills of an online instructor (Technological pedagogical knowledge)	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment?

	Instructional centeredness (Engagement)	In a teacher preparation program, what are the **instructional centeredness** behaviors of pre-service teachers in an online learning environment?
12.I can assess student learning in multiple ways in an online environment.	Knowledge and skills of an online instructor (Technological pedagogical knowledge) Instructional centeredness (formative assessment)	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment? In a teacher preparation program, what are the **instructional centeredness** behaviors of pre-service teachers in an online learning environment?
13.I can use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)	Knowledge and skills of an online instructor (Technological pedagogical knowledge) Instructional centeredness (Engagement)	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment? In a teacher preparation program, what are the **instructional centeredness** behaviors of pre-service teachers in an online learning environment?
14.I am familiar with common student understandings and misconceptions.	Knowledge and skills of an online instructor (Pedagogical knowledge) Instructional centeredness (Engagement)	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment? In a teacher preparation program, what are the **instructional centeredness** behaviors of pre-service teachers in an online learning environment?

15.I know how to organize and maintain classroom management in an online learning environment.	Knowledge and skills of an online instructor (Technological pedagogical knowledge) Instructional centeredness (Engagement)	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment? In a teacher preparation program, what are the **instructional centeredness** behaviors of pre-service teachers in an online learning environment?
16.I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.	Knowledge and skills of an online instructor (Pedagogical content knowledge) Instructional centeredness (Responsibility for learning)	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment? In a teacher preparation program, what are the **instructional centeredness** behaviors of pre-service teachers in an online learning environment?
17.I know about technologies I can use in an online environment for understanding and doing the content area in which I am seeking licensure.	Knowledge and skills of an online instructor (Technological content knowledge)	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment?
18.I can choose technologies that enhance the teaching approaches for a lesson in an online learning environment.	Knowledge and skills of an online instructor (Technological pedagogical knowledge)	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment?
19.I can choose technologies that enhance students' learning for an online lesson.	Knowledge and skills of an online instructor (Technological pedagogical content knowledge)	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment?

20.I am thinking critically about how to use technology in an online learning environment.	Knowledge and skills of an online instructor Attitudes toward technology (Readiness)	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment? In a teacher preparation program, what are the **attitudes** of pre-service teachers toward technology integration in an online learning environment?
21.I can adapt the use of technologies that I am learning about to different teaching activities.	Knowledge and skills of an online instructor (Technological pedagogical content knowledge) Attitudes toward technology integration Instructional centeredness	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment? In a teacher preparation program, what are the **attitudes** of pre-service teachers toward technology integration in an online learning environment? In a teacher preparation program, what are the **instructional centeredness** behaviors of pre-service teachers in an online learning environment?
22.I can select technologies to use in an online learning environment that enhance what I teach, how I teach and what students learn.	Knowledge and skills of an online instructor (Technological pedagogical content knowledge) Attitudes toward technology integration Instructional centeredness (Formative assessment)	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment? In a teacher preparation program, what are the **attitudes** of pre-service teachers toward technology integration in an online learning environment? In a teacher preparation program, what are the **instructional centeredness** behaviors of pre-service teachers in an online learning environment?

23.I can use strategies in an online learning environment that combine content, technologies and teaching approaches that I learned about.	Knowledge and skills of an online instructor (Technological pedagogical content knowledge) Attitudes toward technology (Motivation) Instructional centeredness	In a teacher preparation program, what are the **knowledge and skills** of pre-service teachers toward integrating technology in an online learning environment? In a teacher preparation program, what are the **attitudes** of pre-service teachers toward technology integration in an online learning environment? In a teacher preparation program, what are the **instructional centeredness** behaviors of pre-service teachers in an online learning environment?

Appendix G

Dear Colleague,

Thank you for taking a moment to assist me in my doctoral research. This instrument "A Survey of Preservice Teachers' Knowledge of Teaching and Technology" is an adaptation of a survey developed by Schmidt et al. (2009). Please assist with content validity by following the given directions. To assist you, I am including a brief summary of the conceptual framework for my research.

Conceptual Framework

Attitudes: *Readiness, Habit, and Motivation* (Jung; Eagly & Chaiken; Ertmer)
The research examines how factors such as a pre-service teacher's readiness to use technology or their habits of using technology affect their ability to do so with students. Additionally, past experiences including field experiences and modeling by their instructors affect their attitude toward integrating technology.

Knowledge and Skills: *TPACK components* (Koehler & Mishra) *SAMR framework* (Puentedura). The research examines these two frameworks in particular to focus on effective technology integration decisions that account for context, content, and what aids the learner in meeting the objectives.

Instructional Centeredness: *Responsibility, Engagement, and Formative Assessment* (Weimer; Mostrum & Blumberg). The research examines the continuum of teacher centered learning to student centered learning, particularly as it pertains to the planning stage of instruction and decisions made related to responsibility (teacher directed or student directed), engagement, and formative assessment within a lesson plan.

The Pre-service teachers' survey includes the following about the definition of "technology":

> *"Technology is a broad concept that can mean a lot of different things. For the purpose of this questionnaire, technology refers to digital technologies or digital tools we use such as laptops, iPads, handhelds, interactive whiteboards, software programs, apps, Web 2.0, etc."*

Directions: Please indicate to what extent you believe the following 23 questions measure the given characteristic on a scale of 1 to 10, with *1 being the least and 10 being the most*. If you would like to offer any suggestions or feedback for any of the questions you may do so in the space provided. Upon completion, please email the attachment to me, Susan Poyo, at spoyo@franciscan.edu

Thank you for your assistance!

1. I know how to solve my own technical problems.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

2. I can learn technology easily.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

3. I keep up with important new technologies.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

4. I frequently play around with technology.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

5. I know about a lot of different technologies.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

6. I have the technical skills I need to use technology.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

7. I have had sufficient opportunities to work with different technologies.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

8. I have various ways and strategies of developing my understanding of the content area in which I am seeking licensure.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

9. I know how to assess student performance in an online learning environment.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

10. I know how to adapt my teaching based upon what students currently understand or do not understand.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

11. I know how to adapt my teaching style to different learners in an online environment.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

12. I know how to assess student learning in multiple ways in an online environment.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

13. I know how to use a wide range of teaching approaches in an online classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning, etc.)

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

14. I am familiar with common student understandings and misconceptions.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

15. I know how to organize and maintain classroom management in an online learning environment.

	Least									Most

Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

16. I know how to select effective teaching approaches to guide student thinking and learning in the content area in which I am seeking licensure.

	Least								Most	
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

17. I know about technologies I can use in an online environment for understanding the content area in which I am seeking licensure.

	Least								Most	
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

18. I can choose technologies that enhance the teaching approaches for a lesson in an online learning environment.

	Least								Most	
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

19. I can choose technologies that enhance students' learning for an online lesson.

	Least								Most	
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

20. I am thinking critically about how to use technology in an online learning environment.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

21. I can adapt the use of technologies that I am learning about to different teaching activities.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

22. I can select technologies to use in an online learning environment that enhance what I teach, how I teach, and what students learn.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

23. I can use strategies in an online learning environment that combine content, technologies and teaching approaches that I have learned about in my teacher preparation program.

	Least									Most
Attitude	1	2	3	4	5	6	7	8	9	10
Knowledge and Skills	1	2	3	4	5	6	7	8	9	10
Instructional Centeredness	1	2	3	4	5	6	7	8	9	10
Comment:										

Appendix H
Task 1 Context For Learning

In this Task, you will communicate a picture of your hypothetical classroom. This description will allow the reader to envision the classroom space as well as the students you are instructing. Begin by indicating the type of class, grade, content area (discipline), and central focus. Next, describe the background information necessary for your lesson.

Virtual Class: What type of online classroom is this lesson designed for?	**Choose One**: Synchronous, Asynchronous or Blended
Grade or Ages of learners: What is the approximate grade level this lesson is designed for?	
Content Area(s): What is the content area this lesson is designed for? If it will be interdisciplinary, please include all content areas addressed in the lesson.	
Central Focus: What is the overarching theme or unit this lesson will be supporting?	
Parental Support: What type or amount of support will your learner need for this lesson?	
Technology and Support: What type of technology will be used? What amount of technology support will your learner need for this lesson at school and at home?	
Prior Knowledge: What should the students already know or be able to do prior to your lesson? How will you determine if your students already know this?	
Personal/cultural/ community assets: Are there any interests you can use as scaffolding for your lesson?	
Differentiation: How will you tailor instruction based on your learners?	

Appendix I

Intervention Module Lesson Planning Template Task 2

Lesson Planning Template

Lesson Title:_____

Grade:_____ **Content Area**: _____

Central Focus: This lesson will be part of a unit on_____

Objectives: *What should students know and be able to do as a result of the lesson?*
Describe the exact learning expectations for students. You must phrase the expectations in a way that you will be able to say what a student did or did not learn (the verb must be something you can observe).

Content Standards: Write the number of the standard and the text of the standard to describe what the learners will be doing.

Common Core State Standards www.**corestandards**.org	
ISTE NETS-S Standards http://www.iste.org/standards/standards-for-students	

Assessment: *What will students do to show what they have learned?*
How good is good enough to meet standards?
Describe the tools and techniques you will use.

Type of assessment (formal or informal; formative or summative)	**Description of assessment** *What will students do to show what they have learned?*	**Modifications** to the assessment so that all students may demonstrate learning	**Evaluation Criteria**- *How good is good enough to meet standards?* (related to the learning objectives) Include scoring guide, rubric or other criteria

Appendix J

Intervention Module
Lesson Planning Template Task 4

Lesson Planning Template

Lesson Title:_____
Grade:_____ **Content Area**: _____
Central Focus: This lesson will be part of a unit on_____

Objectives: *What should students know and be able to do as a result of the lesson?* Describe the exact learning expectations for students. You must phrase the expectations in a way that you will be able to say what a student did or did not learn (the **verb** must be something you can observe).

Content Standards: Write the number of the standard and the text of the standard to describe what the learners will be doing.

Common Core State Standards www.**corestandards**.org	
ISTE NETS-S Standards http://www.iste.org/standards/standards-for-students	

Assessment: *What will students do to show what they have learned? How good is good enough to meet standards?* Describe the tools and techniques you will use.

Type of assessment (formal or informal; formative or summative)	**Description of assessment** *What will students do to show what they have learned?*	**Modifications** to the assessment so that all students may demonstrate learning	**Evaluation Criteria**- *How good is good enough to meet standards?* (related to the learning objectives) Include scoring guide, rubric or other criteria

Materials: List materials for both *Student Need*s and *Teacher Needs*
(this includes all technology needs, websites, exemplars, instructional materials, etc.)

Lesson Plan
Opening: Describe how you will introduce the activity or problem. Consider questions that will elicit students' prior knowledge needed for the activity, set a purpose, get students curious about the task, and/or relate to their personal background or interests. In addition, consider giving directions for getting started on the focus task.

Presentation and Practice: How will new knowledge be presented? Will you be modeling? Will there be guided practice? What groupings will you use? Describe the expected actions of the students during this phase. What are they to be doing? How are you making sure each child understands? What will you ask students as you observe? (Ask questions related to your objectives and language function) Describe possible extensions or challenges you will have ready for early finishers. Describe possible re-teaching strategies for students lacking acceptable understanding.

Closure: This is the most important part of a lesson! What questions will you ask students that will help them toward deeper understanding of the content they explored in their task or activity? How will you structure those questions so that all students will participate in answering each question? Will students be presenting new knowledge? How will this be structured?

Resources: Include assessments, rubrics, and online resource links incorporated into the lesson, if applicable.

Changes: Were any changes made to the objectives or assessments from Task 2 to Task 4? If so, please indicate the changes made and the reasons why they were modified.