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A Mixed-Methods Study of a Teacher Preparation Program: Preservice Teachers' Perceived Preparedness to Integrate Technology Effectively

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Approval Page

This dissertation was submitted by Erin Banks Davis under the direction of the persons listed below. It was submitted to the Gardner-Webb University School of Education and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Gardner-Webb University.

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Abstract

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The purpose of this study was to examine the extent to which preservice teachers within a teacher preparation program perceived themselves to be prepared to integrate technology, specifically examining the level of confidence preservice teachers perceive themselves to have towards TPACK-related skills needed to integrate technology into their instruction. Participants in this research study were solicited based on their enrollment in the selected teacher preparation program within the last 5 years; also included were current seniors enrolled in their final semester before degree completion. This research study contains a sample size of 20 participants from a small, private university in western North Carolina. All of the participants were preservice teachers either presently employed in a public education setting after graduation or currently enrolled in the teacher preparation program at the university; and all sought or are seeking certification in grades kindergarten through twelfth grade. Like many other teacher preparation programs across the United States, this university focuses on continued improvement in preparing preservice teachers to enter future classrooms equipped with technology as part of the learning environment.

Three questions were addressed in this study: (1) To what extent does the teacher preparation program adequately prepare the preservice teachers to integrate technology in their classroom pedagogical practices? (2) To what extent does modeling by instructors influence the disposition preservice teachers have towards integrating technology into their classroom practice? (3) To what extent does technology knowledge play a role in the preservice teacher's confidence towards technology integration?

A mixed-methods research design was used to explore the preparation of preservice teachers who received their training at a small, private, western North Carolina university. The Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) was used to gather both quantitative as well as qualitative data pertaining to the participants. The quantitative data gathered were analyzed by grouping 5-point Likert-scale responses into positive and negative responses using percentages to identify overall perceptions based on the seven domains of Mishra and Koehler's (2006) TPACK framework. Additionally, the researcher utilized the qualitative responses given by participants from the open-ended questions at the end of the survey as well as during a focus group to strengthen the quantitative data and formulate answers to the posed research questions.

Each set of data was analyzed separately, which allowed for triangulation (Creswell, 2009). The positive results produced by the survey results and focus-group responses conveyed how preservice teachers perceive they have been prepared to effectively integrate technology in their classroom lessons; however, the researcher recommends further research into preservice teachers' capacity to integrate technology through continuous assessment and reflection.

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Chapter 1: Overview

Overview of Problem

Previously conducted research reports more than two thirds of preservice teachers exiting teacher education programs believe they were not prepared to use technology in their classroom (Francis-Pelton, Farragher, & Riecken, 2000). Lawless and Pellegrino (2007) provided additional evidence of the limited exposure to technology integration preservice teachers have during the preparation process; even when teachers are using technologies, they are only using them to produce the needed materials and content for traditional pedagogical lesson delivery (Graham, Tripp, & Wentworth, 2007) or "teacher-centered" activities such as presenting lesson content (Sheffield, 2011).

Technology's role in the classroom has shifted dramatically in the last 10 years (Abbas, Lai-Mei, & Ismail, 2013); therefore, to prepare preservice teachers for this shift in classroom instructional practice, it is vital for teacher preparation programs to better integrate technology in their curriculum, instruction, and assessments throughout the course of the program. Jonassen (2003) identified the need for technology integration to occur within the teacher preparation program in order to enhance the skills future educators need to reach students in the 21st century classroom. Unfortunately, the rapid technological advancements have outpaced preservice teachers' abilities to keep up with the improvements (Sandholtz & Reilly, 2004; West & Graham, 2007); and researchers continue to report preservice teachers as feeling inadequately prepared to use technology for instructional purposes (Hew & Brush, 2007; National Education Association, 2008).

Based on previous research, the researcher justified the need to investigate preservice teachers' perceived levels of preparedness to effectively integrate technology upon completing their preparation program requirements. This research provided

additional insight into preservice teachers' views on their preparation programs, thereby shining light on areas where improvements could be made to better prepare future preservice teachers.

Purpose of Study

The purpose of this research was to examine the perceived preparedness of preservice teachers to effectively integrate technology in their classrooms based on the training they received at a rural university in western North Carolina. Previous research identified a continuous need to study teacher preparation based on the emphasis on 21st century learning (Partnership for 21st Century Learning, 2002) as well as the need for educators to shift and incorporate computer-based, electronic technologies while also integrating learning with technologies into academic subject areas (Neiss, 2005). Doering, Hughes, and Huffman (2003) stated preservice teachers are not adequately prepared in educational technology. Brown and Warschauer (2006) provided additional evidence that higher education must continuously become more informed about the needs of preservice teachers while integrating technology into curricula during their preparation.

History of the Problem

Sputnik was launched by the Russians in the early 1950s. During this time, Americans took note that our system of education was no longer leading the way (Brady, 2008). The publication of *A Nation at Risk: The Imperative for Educational Reform* (National Commission of Excellence in Education, 1983) highlighted the United States education system as being in "crisis." Congress announced in 1994 that helping teachers use technology effectively might be the most crucial step in assuring that current and future investments in education and technology are fulfilled. This eventually led to the

1996 report, Getting America's Students Ready for the 21st Century, which documented the benefits of using technology in the classroom (Riley, Kuin, Smith, & Roberts, 1996). This report documented increased higher order skills as well as student understanding of complex processes and lesson engagement and student ability to collaborate with their peers using digital discussions and reflections (Riley et al., 1996). This publication was released when the personal computer was just beginning to make an entrance into the educational marketplace; therefore, new doors were opening for educators to explore additional ways to increase student achievement through educational reform (Price, 2003).

Previous research has suggested that in order to effectively prepare technology-proficient educators, the use of a comprehensive approach must be considered (Duran, Fossum, & Luera, 2006). Studies conducted by Strudler and Wetzel (1999) and Vannatta and Beyerbach (2000) indicated that teacher technology skill proficiency alone does not appear to be enough to facilitate effective integration into teaching practices. According to an Educational Technology in Teacher Education Programs for Initial Licensure study conducted in 2006, 100% of all teacher preparation programs in the United States provide instruction on technology integration (Kleiner, Lewis, & Greene, 2003). The creation of technology standards by the International Society for Technology in Education (ISTE) gave universities and institutions of higher education a framework to establish goals in their programs to prepare preservice teachers to integrate technology effectively (National Education Technology Standards–Teachers [NETS–T, 2000) and theoretically increase student achievement. Included in the comprehensive approach, an institution's faculty and their ability to model technology integration effectively was found to be essential to the process of preparing preservice teachers (Stubbs, 2007). Anderson and

Dexter (2003) concluded that modeling effective integration is about helping teachers to create their own understanding of how to teach while incorporating technology, not just operating technology.

It has been documented that a large percentage of professors use technology to prepare lessons, create handouts for their students, and conduct their research; but a much smaller percentage work to integrate technology into their coursework (Greher, 2011). According to Teo (2011), effective technology integration for the purpose of teaching and learning begins with the instructor's ability to model its use for instruction and learning. Therefore, when faculty are literate in the use of technology, a portion of the teacher preparation program intentionally considers technology to be a tool available to them as part of the pedagogical process of instruction (Teo, 2011); however, developing frameworks for teacher preparation which include authentic experiences whereby technology empowers the educational process and helps preservice teachers face the challenges associated technology integration has proven difficult (MacKinnon, 2010).

Understanding preservice teachers most often model what they have seen during their preparation to become teachers (Ball, 1990), it has been concluded that it is vitally important to examine teacher preparation programs to reflect on how technology is being introduced, integrated, and modeled for preservice teachers. A faculty's ability to model teaching while integrating technology is key, in that prior to their clinical experiences, preservice teachers understand the proper ways to integrate technology into their teaching practice (Dexter, Doering, & Riedel, 2006). Often, however, preservice teachers have not been adequately provided the necessary modeling in order to be successful (Banister & Vannatta, 2006; Brown, 2003; Brown & Warschauer, 2006; Smerden et al., 2000).

The need for research was foreseen and conducted on the "Net Generation" by

Caruso and Kvavik (2005). The Annual Study of Students and Information Technology found that the majority of students enrolled in higher education owned a computer and a cell phone; and they used technology to study, interact socially with their peers, and entertain themselves (Caruso & Kvavik, 2005). Students responding to the survey perceived themselves to be skilled in technology; however, the top three technology uses indicated in survey results were (1) composing, reading, and sending email (99.7%); (2) writing documents for coursework (98.9%); and (3) surfing the internet for information to support coursework (98.4%).

Following this study, a research project was conducted by several Australian scholars working together from three institutions of higher education. Their research project looked to explore two things: (1) both student and teacher current technological experiences and preferences and (2) a range of issues connected with the implementation of emerging technology in learning and teaching context (Kennedy et al., 2009, p. 25). From this project, six major findings emerged: (1) the rhetoric that university students are Digital Natives and University Staff are Digital Immigrants is not supported; (2) there is a great diversity in student and staff experiences with technology and their preferences for the use of technology in higher education; (3) emerging technologies afford a range of learning activities that can improve student learning processes, outcomes, and assessment practices; (4) managing and aligning pedagogical, technical, and administrative issues are necessary conditions of success when using emerging technologies for learning; (5) innovation with learning technologies typically requires the development of new learning and teaching and technology-based skills which is effortful for both students and staff; and (6) the use of emerging technologies for learning and teaching can challenge current university policies in learning and teaching and IT (Kennedy et al., 2009, pp. 25-26).

Alignment for the purpose of comparing these two studies conducted by Caruso and Kvavik (2005) and then by additional researchers in Australia outlines a common thread: The utilization of technology for personal benefits such as email, cell phones, and the internet amplifies its current limited use for the benefit of enhancing learning through integration in the classroom.

Current graduates of education programs need a conceptual understanding of "digital natives"; and the need to understand the differences in the world they grew up in (as opposed to the students they teach) is imperative (Prensky, 2001b). The term "digital natives" was coined by Prensky (2001a). Digital natives are defined as students/persons who have grown up immersed in technology (Prensky, 2001a); therefore, they have an innate ability to speak the language of computer technology in what has been labeled the Digital or Information Age (Eisenberg, 2008). Education programs have been tasked with preparing preservice teachers who meet the needs of digital natives; however, they themselves are known as "digital immigrants" (Prensky, 2001a).

Digital immigrants are those not born into the Information Age but instead grew up in a pre-digital world (Prensky, 2001a). Integrating rapidly changing technology into digital immigrant's lives has become essential and is consequently paralleling the world of teacher preparation. Prensky (2010) discussed the changes our world has undergone as a result of technology and the globalized environment our students now have come to know as normal. Pensky (2010) further stated, today's students are continuing their education afterschool as "kids are teaching themselves and each other all kinds of important and truly useful things about their real present and future" (pp. 1-2).

Organization of the Study

Using the traditional five-chapter format, Chapter 1 gives an overview of the

problem and a brief description of the history surrounding the accountability movement beginning with *A Nation at Risk* and No Child Left Behind (NCLB Act, 2002) legislation. Followed by the identified problem and research questions is the definition of terms surrounding this research, the framework and methodology, the significance of the research for the education profession, the role of the researcher, researcher assumptions, and the limitations and delimitations of the study.

Chapter 2 provides a review of the literature summarizing the history of teacher preparation, history of technology in education, efficacy, pedagogy, learning theories and situated cognition, modeling technology integration by instructors, standards for technology integration, program design, role of the instructor in technology integration, Technological Pedagogical Content Knowledge (TPACK; Mishra & Koehler, 2006), and the themes which emerged during the research.

Chapter 3 outlines procedures used by the researcher in order to collect this research. Included within Chapter 3 are the setting of the study, research design and rationale, research questions, methodology used to conduct this study, participant selection logic, instruments used to gather data both qualitatively and quantitatively, the role of the researcher, data analysis procedures, any potential threats to validity, limitations of the study, and ethical procedures followed to ensure valid results.

Chapter 4 presents the results gathered throughout the study. The results were organized for analysis according to the planned research questions which emerged from the literature review. The gathered data are displayed in research question order with both quantitative and qualitative data pertaining to each question. Quantitative data are presented in tables alongside a narrative description of the data. Additionally, according to Creswell's (1994) mixed methodological framework, the qualitative data gathered

provided deeper insight into the preservice teachers' perceptions of their ability to integrate technology effectively.

Chapter 5 presents a summary and conclusion for each posed research question. Additionally, the researcher readdresses the limitations of the study, the implications identified in the study, and recommendations for future study.

Research Questions

The primary purpose of this research was to discover whether preservice teachers completing their degree requirements in the education department graduate from this teacher preparation program perceiving they have the ability to effectively integrate technology. The following research questions were used to guide this study.

1. To what extent do preservice teachers perceive themselves to be prepared to integrate technology into their classroom pedagogical practice?
2. To what extent does instructor modeling influence the disposition of preservice teachers towards integrating technology into their own classroom practice?
3. To what extent does technology knowledge play a role in the preservice teacher's confidence towards technology integration?

The Significance of the Research

ISTE (2000) determined education programs of study need to provide multiple perspectives on K-12 students as learners as well as offer meaningful opportunities for teachers to develop skills in the use of technology. Based on past research, the researcher sought to determine whether preservice teachers graduating from this teacher preparation program felt as though they have been equipped to effectively integrate technology in their approach to educating students. Mishra and Koehler's (2006) TPACK framework

was used as a lens to explore this topic. A previous framework created by Shulman (1986), "pedagogical content knowledge," connects with the TPACK framework based on teacher integration of technology into their teaching methods (Mishra & Koehler, 2006).

Integrating technology effectively requires preservice teachers to have a deep understanding of the relationship between content, pedagogy, and technology as well as how it can be used to support student learning (Koehler, Mishra, & Yahya, 2007). Therefore, preservice teachers' preparation to integrate technology in their classroom practice is a key focus for many teacher-education programs (Chai, Koh, & Tsai, 2010). Considering the origin of educational technologies in the classroom, technology has developed beyond skill-and-drill and understanding specific pieces of software applications to creating multimedia projects and advanced forms of networking technology for the purpose of enhancing learning for students. Overall, this study examined how technology integration during the process of preparing preservice teachers leads to a perceived feeling of preparedness to effectively integrate technology into their future in a classroom.

The Role of the Researcher

The role of the researcher demands an objective point of view requiring all subjectivity be removed from the research. Since the research being conducted was within the researcher's own professional field of study, it was difficult for the researcher to remove all subjective thoughts, experiences, and feelings from the research process. In order for the researcher to have upheld her objective analysis throughout this research process, it required an acknowledgement of a viewpoint which could have potentially altered her ability to remain objective in her analysis. Through time spent in the

education field, the researcher has formed thoughts, feelings, and experiences which shape who she has become as an educator. The researcher worked to reflect and understand to remove a potential biased viewpoint she could have brought into the research and took initiative to "disclose to the readers where self and subject became joined" (Pershkin, 1988, p. 17).

The researcher currently holds a valid teaching certificate in the state of South Carolina and is a full-time Instructional Technology Integration Specialist certified in Elementary Education; she holds a master's degree in supervision and administration; and she has 13 years of classroom experience at multiple levels ranging from kindergarten to seventh grade. All of the researcher's experiences with technology, education, and administration were in the state of South Carolina. The researcher's first experiences in the field of education were during a time when technology was heavily introduced to the classroom. A lack of connectivity, resources, and professional development prevented the researcher from implementing many of the technological tools in her classroom upon their original release for instructional purposes. As time has passed, the researcher has been able to obtain connectivity for all students in the classroom. With a 1:1 initiative in her school district, all students have access to what has been deemed as an equitable amount of resources.

The leadership within the researcher's school district urges its educators to employ technology every day for the purpose of student learning. Working in a district where all students receive their own personal iPad has given the researcher first-hand experience in ways technology can be integrated both effectively as well as ineffectively. Understanding and being familiar with the obstacles of implementation as well as the potential benefits technology has to reach each and every student provides the researcher

with a subjective opinion of what "effective technology integration" is and how it should look in the classroom.

Due to the researcher's current position and the 1:1 initiative, the researcher has attended professional development sessions where she was taught to use multiple platforms to aid in the pedagogical process of designing lessons to instruct students while integrating technology. While obtaining her master's degree in supervision and administration, the researcher became acquainted with several of the faculty who could potentially have been a part of this study; however, the researcher does not maintain open lines of communication with these personnel who would have potentially been involved. The experiences, feelings, and thoughts formed throughout the researcher's time in education have caused her to have assumptions towards teacher preparation to effectively integrate technology. Since the researcher is responsible for ensuring technology is effectively integrated in her place of employment, the researcher had an administrator's attitude towards technology and its integration for the purpose of student learning.

As an educator, the researcher understands both the need to prepare students for the ever-changing world they are about to face and how trends in technology could potentially provide a pathway to success. The researcher assumed course requirements aligned with the standards for teacher preparation in North Carolina as well as technology integration; however, the researcher also understood each underlying course within the program design played a unique role in meeting the demands of preparing preservice teachers. The classroom culture in each researched setting had a unique learning environment, classroom management style, and interaction process between the course instructor and the preservice teacher. Acknowledging the autonomous nature of teachers as leaders in their classrooms of instruction played a key role in the researcher's ability to

conduct this study. Overall, the researcher's role in this study was to add to the body of knowledge surrounding teacher preparation, specifically the effective integration of technology in the classroom. The researcher worked to maintain an objective point of view throughout the duration of this research.

Limitations of the Research

Utilizing a mixed-methods research approach, the researcher designed this study to investigate preservice teachers' perceived preparedness to effectively integrate technology upon degree completion. The sample size of participants, the location of the university, and the requirements within the program were recognized as potential limitations. The instructors within the program evaluated posed another limitation due to the varying levels of experience, professional development, and individual knowledge of effective technology integration.

Realizing the instructor is autonomous as well as the preservice teachers within each course, the researcher realized both entities come from different backgrounds and multiple variables played a role in the preservice teachers' perceptions of their ability. The data reported by the preservice teachers within the study potentially held social bias if they felt the researcher wanted them to respond in a certain way; however, the researcher worked to analyze and remove these variables throughout the study to pinpoint where limitations could be overcome. The researcher sought validity through the combination of online anonymous surveying methods as well as through focus-group discussions where prescribed questions were formatted and approved by the research committee for the purpose of this study.

Delimitations of the Research

This study was conducted at a small, private, western North Carolina university

and only dealt with preservice teachers either currently enrolled or previously enrolled in the Education Department. The results of this study are only related to the population studied for research; however, other universities or departments of education with a similar population may find these results applicable to their setting. In the areas of professional development, preservice teacher preparation methodology and program design might utilize the results to ease barriers to the teacher preparation process.

The timeframe when this study was conducted only allowed for preservice teachers graduating between the fall of 2011 and spring of 2017 to be included in this research. Preservice teachers chosen for this research fulfilled degree requirements up to their clinical teacher experience or were in the final stages preparing for the clinical experience. Data were gathered over this 5-month timespan which began in May 2016 and was finalized in September 2016. Preservice teachers were selected for this study based on the recommendations provided by the researcher's committee as well as the preservice teachers' willingness to participate in the study for the purpose of potentially improving their teacher preparation program.

Definitions of Terms

1:1 (one to one). One computing device allocated to one person (Hooft & Swan, 2007).

21st century learning skills. The skills believed necessary to contribute to workforce production and maintenance of a high quality of life in the 21st century including skills related to creativity, collaboration, communication, critical thinking, information literacy, media literacy, and technology literacy (Partnership for 21st Century Learning, 2002).

Authentic learning. Learning situated in a real-world complex problem using

role playing, problem-based activities, case studies, and participation in virtual communities of practice (Reeves, 2006).

Content knowledge. A framework for teacher knowledge within a subject area (Koehler & Mishra, 2008).

Disposition. The professional attitudes, values, and beliefs demonstrated through verbal and nonverbal behaviors as educators interact with students, families, colleagues, and communities (National Council for Accreditation of Teacher Education [NCATE], 2007).

Pedagogical knowledge. The knowledge about how to teach the standards and what strategies to use that will deepen student knowledge, understanding, and application (Koehler & Mishra, 2008).

Situated cognition. A form of sociocultural learning whereby an expert scaffolds curriculum into skills and practices from which the learner can make meaning for everyday application (Collins, 1988; Tennant, 1997).

Preservice teachers. According to Kellough and Jarolimek (2008), students who are enrolled in a teacher preparation program; teachers in training.

Technology integration. Creating, using, and managing innovative and appropriate technological processes and resources to enhance learning and performance; the effective implementation of educational technologies to accomplish intended learning outcomes; the practice and art of incorporating technology into educational contexts; the use of information and educational technology in instructional settings to support learning (Spector, Merrill, Elen, & Bishop, 2014, p. 963)

Technological knowledge. The knowledge of and about technical tools and their capability to improve the ability to do work (Koehler & Mishra, 2008).

Summary

According to Bandura (2003), "a teacher's beliefs in their personal efficacy to motivate and promote learning affect the types of learning environments they create and the level of academic progress their students achieve" (p. 117). Technology in the classroom and its use for instruction has created a critical paradigm shift educators must acknowledge (Earle, 2002). Chapter 1 was meant to showcase the need for this research by outlining the problem, providing a brief overview of teacher preparation, outlining how this study was organized based on the research questions, designating the role of the researcher, listing the limitations and delimitations of this study, and providing an overview of the terms needed to understand the research.

Located in the following chapters is an in-depth review of the literature surrounding teacher preparation, the methodology used to conduct this research, a presentation of the quantitative and qualitative data gathered to aide in answering the research questions, and the conclusions reached by the researcher based on the themes and implications within the data. Additionally, in the final chapter of this research study, the researcher gives recommendations for additional research based on the research results to further extend the body of knowledge surrounding teacher preparation for effective technology integration.

Chapter 2: Literature Review

Introduction

This chapter presents a review of the literature relevant to the study of undergraduate teacher preparation programs, the program design process, the candidates' disposition towards implementing technology in the classroom, the candidates' pedagogical knowledge for teaching effectively with technology, and the candidates' content knowledge towards technology itself. This chapter is organized around the themes represented in the research questions which include (a) a brief history of teacher preparation, (b) history of technology in education, (b) theory of situated cognition, (c) standards for technology integration, (d) program design, (e) role of the instructor in technology integration, (f) overview of program requirements at the university being researched, (g) evaluation of the tools utilized, (k) and a breakdown of the TPACK framework used to evaluate a teacher's knowledge of technology and its implementation for classroom instruction. A review of the literature began with a look at the history of teacher preparation which substantiated a need to look in-depth at the process used to prepare teachers to integrate technology effectively in their future classrooms.

A Brief History of Teacher Preparation

PK-12 teachers were not the only ones put on the front lines to aide in closing the achievement gap between ourselves and the rest of the industrialized world; higher education was thrown into the hot seat as well. Promising Practices: New Ways to Improve Teacher Quality was a report that summarized the need to more adequately prepare teachers for our nation's classrooms (U.S. Department of Education, 1998). The report articulated,

> teaching is the essential profession, the one that makes all other professions

> possible. . . . Accordingly, what teachers know and are able to do is of critical importance to the nation, as is the task of preparing and supporting the career-long development of teachers' knowledge and skills. (U.S. Department of Education, 1998, p. 1)

Faced with the task of preparing generation after generation of citizens in our nation, ensuring quality teacher preparation has been at the forefront of importance since the early 20th century. Teaching is a multidimensional job; and to learn to be an effective teacher, candidates need to master a number of skills. These included but were not limited to knowing your subject matter (content knowledge), knowing your practice and your instructional methods (pedagogy), knowing your students (dispositions), knowing your classroom, knowing your school environment, and knowing the community in which you serve (social constructivism) (Gold, 1996).

History of Technology in Education

From the launch of Sputnik in the 1950s through the 1970s, advancements in educational technology forced Americans to become more aware of the increasing importance of technology in the classroom. Research supported a positive relationship between increased academic achievement and the use of computers by students (Cradler, McNabb, Freeman, & Burchett, 2002; Lei & Zhao, 2007; Krentler & Willis-Flurry, 2005).

Since the publication of *A Nation at Risk* (National Commission on Excellence in Education,1983) more than 40 years ago, multiple levels of educational reform have occurred and have ultimately led to a restructuring of teacher preparation programs. This process included a set of standards including a baseline of knowledge required by teachers to assist students in meeting the challenges of an evolving world (Wise &

Leibbrand, 2000). The U.S. Office of Technology Assessment (1995) found that schools designated no more than 15% of their technology budgets to professional development. At the end of the 20th century, in schools where students were at a socioeconomic disadvantage with 70% of students receiving the free/reduced lunch rate, only 39% of classrooms had Internet access; however, schools reporting less than 11% of students receiving free/reduced lunch rates reported 74% of classrooms with Internet access (Solomon, Allen, & Resta, 2003). As a method to encourage technology integration, in 1997, NCATE (now Council for Accreditation of Educator Preparation [CAEP]) adopted ISTE's National Educational Technology Standards (NETS) as a vehicle to emphasize technology's place in teacher preparation. During 2012-2014, NCATE and TEAC united to form the Council for the Accreditation of Educator Preparation (CAEP) to become the recognized accrediting organizational body for educational-certification programs (CAEP Standards, 2013).

NCLB outlined and included a timeframe for preparing students, stating by eighth grade, all students should be technologically literate and technology should be used to support teaching and learning across the curriculum (Culp, Honey, & Mandinach, 2003). Additionally, to ensure students are prepared to compete as global citizen, STEM (Science, Technology, Engineering, and Mathematics) concepts were initiated to contextualize learning (Dettelis, 2011). In 2010, President Barack Obama recognized digital technologies as the essential means to advance the United States in a globally competitive society, consequently introducing the National Education Technology Plan (NETP, 2010). NETP was a 5-year plan which served as a comprehensive model for enhancing 21st century teaching and learning through specific technology goals. The five goals identified were learning through technology should embrace relevant

opportunities to expand student existing technology knowledge and empower students to use technology as a tool to prepare for entering the workforce; assessment using technology should measure application of 21st century technology skills and capture student knowledge and problem-solving abilities; teachers should use technology to enhance learner outcomes by preparing and connecting digital literacies through 21st century resources including professional development and data collection tools; an infrastructure should provide iterative access to the people, tools, and emerging resources necessary to implement a grand scale technological transformation; and productivity should involve redesigning and transforming the landscape of how technology is used in the classroom to capitalize on the strengths of personalizing learning in a technological society (NETP, 2010). However, just because students are connected does not mean they are receiving the best of the Internet nor does it mean they are developing the skills needed to be tomorrow's digital citizens (McCollum, 2011).

Divides exist not only in the access to technology in the classroom but at multiple levels within the educational process. In the latter part of the 20th century, a second level of digital divide began to develop. This level of divide exists not based upon access but rather on how the access is being used and its frequency of use (Reinhart, Thomas, & Toriskie, 2011), which determined there are differences between information computer technology (ICT) and how it is being used within schools. Furthermore, Hohlfeld, Ritzhaupt, Barron, and Kemker (2008) proposed a third divide that identifies how the technology is used to empower individuals and students within the educational context of school.

There is no clear standard definition of technology integration in K-12 schools or in higher education (Bebell, Russell, & O'Dwyer, 2004). Mishra and Kholer (2003)

wrote an article addressing the fact that it is *Not "What" but "how": Becoming design-wise about educational technology.* In 2003, 32 states in the U.S. included an explicit technology requirement for teacher certification, and most states have also developed technology plans that office a detailed outline for the expectation of technology implementation in the classroom.

For some experts, technology integration was understood and examined in terms of types of teacher computer use in the classroom (e.g., students doing multimedia presentations, collecting and interpreting data for projects; Cuban, Kirkpatrick, & Peck, 2001). However, for others, technology integration was understood and examined in terms of how teachers used technology to carry out *familiar* activities more reliably and productively and how such use may be reshaping these activities (Hennessy, Ruthven, & Brindley, 2005); while there are still others who consider technology integration in terms of teachers using technology to develop student thinking skills (Lim, Zhao, Tondeur, Chai, & Tasi, 2013).

Picciano (2002) declared, "Technology in and of itself is limited. But as a tool and when placed in skillful hands, it can open new possibilities and enrich learning regardless of grade level" (p. 54). Where the teacher lies in the implementation of technology is the key to creating a classroom that integrates technology into the curriculum to enhance student experiences and better prepare them for their future.

History of Technology in Teacher Preparation

Schrum and Glassett (2006) told us it is important to look at technology integration through a theoretical lens – a lens that allows us to look at the energy and effort required to integrate technology into curriculum and activities within the classroom. Additionally, Fullan (2001) proposed teachers are learners who need the time

to gain technology content knowledge and then have additional time to intertwine this new knowledge into their pedagogical practices for instruction, thereby leading to the creation of models and frameworks for technology integration into education.

Program graduates' impact on student learning and development is the ultimate goal of teacher education programs (CAEP Standards, 2013). Although there has been much debate about what teachers need to know about technology, less attention has been paid to how they are supposed to learn it (Koehler & Mishra, 2005). Previous research determined that it cannot be assumed teachers who demonstrate proficiency with software and hardware applications have the ability to successfully integrate technology into their instruction in meaningful ways (Pierson, 2001).

Almost 6 years have passed since Obama introduced the National Educational Technology Plan (NETP), and a shift has been made from whether or not technology should be used in learning to how it should be used in the learning process. Ertmer (1999) stated technology's use in education is a beneficial tool for contextualizing teaching and learning; pedagogical and content knowledge is relayed through technology. However, the teacher must be able to understand and determine how the technology can be integrated to teach the content and whether or not technology is the best tool to address the content being taught (Mishra & Koehler, 2006).

Learning Theories and the Theory of Situated Cognition

Vygotsky, one of the most recognized names in learning theory among education professionals, described learning as being embedded within social events and occurring as a child interacts with people, objects, and events in the environment. Vygotsky's (1986) theory articulated when students learn, they are not independent from their learning context; instead, their learning is influenced through their zone of proximal

development. However, research has concluded many students experience problems transferring knowledge acquired in a formal learning environment to everyday application (Lave, 1977; Perkins, 1985). More recent research indicates the social context in which teaching and learning communities are situated has an effect on the students' abilities to learn (Walker, 2003).

Piaget (1972), Bloom (1984), Gagne (1985), and Vygotsky (1986) are well-recognized theorists in the area of learning theory. Derived from their research, we find a constructivist theory of learning that stresses the importance of experiences, experimentation, problem solving, and the construction of knowledge. In a construction project, there is a need for a designer; in education, the designer is the teacher and the designer considers the technology-supported learning environment as a micro-world in which problems (mathematical, scientific, social issues, case studies) are presented. A teacher (designer) acts as a guide in the process and provides informational tools and resources that enable learners to engage in and solve the problems available to the learner. In theory, according to Picciano (2002),

> the learner learns by interacting with the available resources (teacher, tutor, information, media, etc.) and drawing on their own experiences to construct the knowledge to solve the problem. The technology roles become integrated with, and facilitate, the problem-solving activity. Based on the vast information and resources technology can provide; how technology should be integrated is left to the creativity of administrators, teachers, and instructional designers. (p. 86)

Teachers are designers and facilitators. As facilitators, teachers become learning strategists who constantly plan ways to enable students to master complex content knowledge and develop their critical-thinking, problem-solving, communication, and

collaboration skills (Martinez & McGrath, 2014). They must be strategic in creating opportunities for students to become responsible learners developing their critical-thinking, problem-solving, communication, and collaboration skills (Martinez & McGrath, 2014). In contrast, the theory of situated cognition recognizes the inability to separate thoughts from the context in which an event happens (Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1992). Therefore, stemming from Vygotsky's (1986) theory on pedagogical practices being grounded in sociocultural theories, the cognitive development of students is associated with higher order thinking and is often socially situated. It is further theorized that knowledge is the active byproduct of a connection between an individual and their environment; learning is then assumed to be a natural byproduct of a person's engagement with knowledge and is acquired naturally (Bednar, Cunningham, Duffy, & Perry, 1991; Brown, Collins, & Duguid, 1989). Situated cognition focuses on providing enabling experiences in authentic versus decontextualized contexts as well as cultivated learning processes/experiences leading to successful learning outcomes (Choi & Hannifin, 1995).

Situated cognition is a form of sociocultural learning theory branching off Vygotsky (1986) and Bandura (1977), whereby an expert scaffolds curriculum into skills and practices from which the learner can make meaning in everyday application. One of the founders in theory of situated cognition, Collins (1988, p. 2), defined situated learning (cognition) as the notion of learning knowledge and skills in contexts that reflect the way they will be used in real life. Tennant (1997) echoed Collins's belief in that all new knowledge and learning must be grounded within a context, and new knowledge is therefore conceived and applied in communities of practice. Based on the theory of situated cognition, preservice teachers need to be immersed in the sociocultural learning

environment during the apprenticeship state of their teacher preparation, thereby enabling them to acquire skills and knowledge about teaching they will be able to transfer into future classroom practices (Brown et al., 1989; Lave, 1977; Perkins, 1985). Since Vygotsky and Bandura have helped educational professionals understand the theory behind student learning, Collins helped them to further understand how the situations created throughout the course of a preservice teacher's preparation enable them to learn as well as teach.

Pedagogy

Pedagogy is currently understood as who we teach, what is taught, and how we teach it (Mortimore, 1999; Salvatori, 1996). However, a founder of the Child Study Movement in United States Psychology and Education previously defined pedagogy as "the process by which information is given" (Hall, 1905, p. 1), further declaring, "education is more humanistic and evolutionary and aims to unfold the powers of the individual to their maximum maturity, and strength and is essentially cultural, while teaching, learning, and didactics generally consist of the transmitting of knowledge" (p.1). Hall (1905) conveyed pedagogy as a way of delivering information with which the learner can construct knowledge. Based on research, it can be seen that pedagogy's definition has been in fine-tuning mode for approximately 100 years, and as it seems it will continue to be refined for many years to come based on the evolutionary process of educating students for the needs of the future.

When institutions of higher education create teacher preparation programs, pedagogical content knowledge must be a priority and opportunities to acquire this knowledge made available to preservice teachers (Pamuk, 2012; Shulman, 1986). Another wrinkle in the pedagogy paradigm involves the preparation to integrate

technology into preservice teacher preparation and provide opportunities for them to experience and practice what is being modeled independently (Darling-Hammond, 2006). According to Hughes (2004), teachers equipped with technology knowledge combined with pedagogical knowledge "possess the unique ability to understand, consider, and choose to use technologies *only* when they uniquely enhance the curriculum, instruction, and students' learning" (p. 346).

By purposefully planning learning experiences which are unfamiliar, combining a variety teaching styles, and appropriately modelling the expectations of future educators (Darling-Hammond, 2006), preservice teachers will have the opportunity to acquire the pedagogical knowledge needed to be successful in the classroom. A teacher preparation program's capacity to communicate how pedagogical knowledge connects to content knowledge and technology knowledge will determine whether or not preservice teachers perceive themselves to be prepared to effectively integrate technology in the classroom.

Efficacy

The RAND Corporation in 1976 was the first to introduce the term efficacy through a study reported to the United States Office of Education. This study looked to examine effectiveness of the preferred reading program of chosen schools in the Los Angeles Unified School District. Through this study, it was found that "the most effective reading teachers had a strong sense of personal efficacy" (Armor, 1976, p. 38). The following year in 1977, RAND continued to study efficacy, out of which came the term teacher efficacy. From this report, the term teacher efficacy was defined as "a belief that the teacher can help even the most difficult or unmotivated students" (Berman, 1977, p. 136); and this research determined teacher efficacy is connected to the amount of teacher change and improved student performance and is clearly related to goals achieved

in the classroom.

Bandura has used 2 decades of research to prove that an individual's confidence in his/her abilities affects performance, motivation, and success/failure on specific tasks (Bandura, 1982, 1986, 1993, 1996, 1997). Bandura's (1977) research outlined how a person's personal efficacy (self-efficacy) is related to their performance accomplishments. As a way to increase a person's self-efficacy, mastery experiences were found to lead to feelings of success therefore increasing one's sense of efficacy. Repeatedly having positive experiences was determined to create a strong sense of self-efficacy (Bandura, 1993). Once self-efficacy is strengthened through positive experiences, even negative experiences were found to be less likely to influence one's sense of self-efficacy (Bandura, 1993). Therefore, given previous positive experiences, future obstacles are met with a perseverance to succeed and continue to strengthen their self-efficacy.

While enrolled in the university's teacher education program, experiences are planned and embedded throughout the coursework in an attempt to create a framework of experiences for preservice teachers. Hoy (2000) concluded vicarious experiences influence a teacher's sense of self-efficacy. Vicarious experiences within a teacher preparation program happen while preservice teachers observe master teachers who apply specific teaching approaches or tools for instruction during the delivery of a lesson. Through master teacher observation, research has proven preservice teachers are more confident in their ability to use similar pedagogical practices when teaching independently (Hoy, 2000). In summary, a teacher preparation program, when viewed as a vicarious experience, is intended to provide preservice teachers with opportunities to learn in an environment surrounded by effective teaching practices (Hoy, 2000);

therefore, increasing preservice teachers' positive feelings towards similar teaching approaches in their classroom.

Furthermore, considering purposefully planned positive experiences relate to building instructional mastery within the teacher preparation program helps to understand how the process of preparing preservice teachers is directly related to the construction of teacher efficacy. The creation of routines, a common language among teachers and students, and a positive culture in the classroom are all related to instructional mastery and the process of teacher preparation (Balls, Eury, & King, 2011).

A teacher's sense of self-efficacy was found by Marcinkiewicz (1994) to be directly related to their use of technology as a part of instruction. Due to technology's increased presence in the classroom (Abbas et al., 2013), future teachers must be prepared to incorporate it as a pedagogical tool for instruction. Borchers, Shroyer, and Enochs (1992) found a teacher's self-efficacy increases as they are given opportunities to participate in appropriate professional development. Since preservice teachers enrolled in a teacher preparation program are in a constant state of professional development throughout the process of preparation, it can be concluded that vicarious, planned positive experiences with technology during preparation will lead to a higher sense of self-efficacy towards integrating technology in their future classrooms (Balls et al., 2011; Bandura, 1993; Hoy, 2000; Marcinkiewicz, 1994). In summary, it can be theorized based on this previous research that preservice teachers' positive vicarious experiences while enrolled in a teacher preparation program will lead to a confidence in their abilities to teach while integrating technology into their pedagogical approaches to instruction.

Modeling Technology Integration by Instructors

The National Center for Educational Statistics (Parsad, Lewis, & Westat, 2001)

found that less than 20% of current teachers reported feeling comfortable and prepared to integrate educational technology into classroom instruction. Teacher perceptions about technology are directly partial to their philosophy of education. Resistance to utilizing technology comes from a teacher's existing attitudes and beliefs about technology (Norton, McRobbie, & Cooper, 2000) which are formed during both their initial education experience and their teacher preparation program. A study done by Moeller and Reitzes (2011) found that only 23% of teachers feel prepared to integrate technology into their pedagogy, and many only use it to present information.

In his social learning theory, Bandura (1977) put great emphasis on the relevance of observing and modeling optimal professional behaviors. He stated, "Learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do" (Bandura, 1977, p. 22); fortunately, most human behavior is learned observationally through modeling. From observing others, individuals form an idea of how new behaviors are performed, and on later occasions this coded information serves as a guide for action (Bandura, 1977). Ball (1990) found preservice teachers emulate the practices they have observed during their teacher preparation program and take on, to some extent, the characteristics of their instructors. Since teachers tend to teach as they were taught (Lortie, 1975), preservice teachers must be taught in a similar way in which they will be expected to teach postgraduation. The situation in which a set of skills are observed is "a fundamental part of what is learned" (Putnam & Borko, 2000, p. 4). Therefore, the teacher preparation environment created by professors of education plays a significant role in preservice teachers being prepared to effectively integrate technology.

It was assumed that preservice teachers enrolled in teacher education programs

after the year 2000 would be more prepared to use technology and thus would be more willing to integrate technology in the classroom (Hall, 2006); however, according to research, even though preservice teachers have more experience with technology and in some cases are even well-versed in using said technology, their efforts were often not effective in their approach. This led to extensive research funded by federal grant programs such as Preparing Tomorrow's Teachers to Use Technology (PT3).

PT3 targeted faculty development in order to create a model of technology integration in the hope of better preparing preservice teachers to apply technology in the classroom (Mims, Polly, Shepherd, & Inan, 2006). PT3 found that "modeling" was a common approach to increase preservice teacher preparedness (Banister & Vannatta, 2006; Hall, 2006; Nelson & Thomeczek, 2006; Wentworth, 2007). According to Bannister and Vannatta (2006), "teacher candidates must see technology modeled by faculty in their universities and [by classroom teachers] in field placements" (p. 210).

Standards for Technology Integration

Recent educational technology standards such as those developed by ISTE and adopted by NCATE (2010) have seen a paradigm shift from the basic skills alone and now have itemized a series of higher order goals found to be essential for effective pedagogy while integrating technology (Glenn, 2002a, 2002b; Handler & Strudler, 1997; Wise, 2001). Standards for technology integration conceptualize technology proficiency as a wide range of competencies for teachers to master (National Education Technology Standards–Students [NETS–S], 2007). These standards include concrete skills such as keyboarding and connecting the computer to a network; however, other standards include software applications such as using word processor software to create a document or a spreadsheet, whereas the key technology concept of networking in a globalized society

places emphasis on technology's ability to transform the classroom to create a learner-centered environment (Wiebe & Taylor, 1997).

Most recently, ISTE standards for teachers (NETS–T) have the following expectations: facilitate and inspire student learning and creativity, design and develop digital age learning experiences and assessments, model digital age work and learning, promote and model digital citizenship and responsibility, and engage in professional growth and leadership (NETS–T, 2000). ISTE has worked to study the implementation of these standards and the conditions which must be present in order for technology integration to be successful.

ISTE has served as one of the 22 national organizations charged with developing the standards CAEP, formerly NCATE, uses to accredit colleges of education throughout the United States. In October 2012, ISTE-CAEP released a set of standards aimed at teacher preparation programs to assist in the development of teachers with the capacity to integrate technology in the classroom. This particular set of standards was developed using the NETS model as it aligned with the 2002 NCATE (CAEP) principles.

ISTE NETS		NCATE (CAEP) Principle
Content Knowledge and Professional Growth	=>	Content Knowledge
Teaching, Learning, & Assessments	=>	Pedagogy
Visionary Leadership Digital Age Learning Environments Professional Development and Program Evaluation	=>	Learning Environments
Digital Citizenship	=>	Professional Knowledge and Skills

ISTE developed the Technology Coach standards using the NETS model. The correlation above shows how the standards correlate to the NCATE (CAEP) principles presented in section B.3 of the SASB Policies and Procedures Handbook, 2010 (ISTE-Technology Coach Program Standards & Rubrics, 2012).

Figure. ISTE NETS–T Standards aligned with CAEP Principle.

Program Design

Powerful teacher education programs have a clinical curriculum as well as an informative curriculum. Clinical curriculum is action based in the fact that the preservice teacher is gaining knowledge while in the field based on their experiences in the classroom, whereas informative curriculum requires the preservice teacher implore a scientific approach to engage students in the pedagogical process of learning. Relating the procedure/process used for preparing teachers to the growing call for technology integration is a demand that must be met by higher education institutions.

Colleges and universities nationwide have received the ISTE NETS Distinguished Achievement Award. In 2005, Hofer began to compare the first schools to receive this award with more recent recipients and found each to have a set of core elements. These core elements within the program were coordinated technology experiences, emphasis on technology throughout the entire preparation program, and technology integrated into clinical experiences (Hofer, 2005). The coordinated technology experiences required

faculty and leadership to share a vision for how technology would play a role in preparing the preservice teacher. When preservice teachers were given opportunities to integrate technology throughout their preparation process as well as during their clinical experiences, they graduated with higher proficiencies in the technology standards (Hofer, 2005).

Strudler and Wetzel (1999) researched four colleges of education which had been rated outstanding by the Office of Technology Assessment. They too noted critical components leading to successful technology integration into teacher preparation programs. The access to hardware and software, a variety of classroom spaces, and the variability between the types and quantities of technology for students and faculty all played a role in the process of teacher preparation (Strudler & Wetzel, 1999). When combined with the study conducted by Hofer (2005), Strudler and Wetzel further solidified the need for teacher preparation programs to place emphasis on program-wide planning for technology integration while using the national technology standards.

Though there are multiple versions or sets of technology standards out there for teacher education programs to utilize in their task of preparing educators for the future, the earlier versions of these standards are more of a checklist of skills and knowledge rather than a utilization process for teaching and learning (Bruce, 1999). Lankshear (1997) summed it up by saying, "Underlying these lists was the implicit assumption that teachers who can demonstrate proficiency with software and hardware will be able to incorporate technology successfully into their teaching" (p. 101).

Agencies of accreditation such as NCATE (now known as CAEP) and ISTE are good examples of organizations looking to move beyond just the basic skill acquisition. ISTE standards contain a list of foundational skills for all teachers to acquire, but

embedded inside these standards are higher order goals that are essential for effective pedagogy with technology. Through this, they have provided insight into what can and should be achieved with the skills inside the standards. NCATE/CAEP is the primary governing body officially sanctioned by the U.S. Department of Education to accredit schools of education, and ISTE is the frontrunner in educational technology; combining their influence has had a significant impact on both developing and promoting change in the structure of the teacher preparation programs. In summary, the newest set of standards have altered preparation by advocating basic skills through emphasizing the pedagogical role that technology can play and the nature of teacher knowledge that is required to fully utilize technology for teaching and learning.

The National Academy of Sciences (2010) report found that three areas of teacher preparation are "likely to have the strongest effects on outcomes for students: content knowledge, field experiences, and the quality of teacher candidates" (p. 180). Utilizing this knowledge, the commission recommended Standard 1: Content and Pedagogical Knowledge; Standard 2: Clinical Partnerships and Practice; and Standard 3: Candidate Quality, Recruitment, and Selectivity.

Within CAEP Standard 1 (see Appendix A), a completer is a term used to describe candidates exiting from degree programs and also candidates exiting from other higher education programs or preparation program conducted by alternative providers that may or may not offer a certificate or degree. The term provider is used to refer to the sponsoring organization for preparation, whether it is an institution of higher education, a district- or state-sponsored program, or an alternative pathway organization (CAEP Standards, 2013).

TPACK Framework

Shulman (1986) asked, "How do teachers decide what to teach, how to represent it, how to question students about it, and how to deal with problem misunderstanding?" (p. 8). Shulman and his colleagues constructed a theoretical framework of pedagogical content knowledge which has been an effective framework to analyze teacher knowledge and teacher preparation programs. As defined by Shulman, "Pedagogical Content Knowledge is an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction" (p. 8).

Due to a rapid paradigm shift requiring the integration of technology to prepare students for the 21st century, what teachers need to know and understand has also shifted dramatically (Mishra & Koehler, 2006). A modified version of Shulman's (1986) pedagogical content knowledge has transformed into Mishra and Koehler's (2006) TPACK framework whereby the "T" represents technology. The framework, according to TPACK, is comprised of three individual yet intertwined components: technology, pedagogy, and content knowledge (Mishra & Koehler, 2006). As the demand for teachers to integrate technology effectively increases, access to technology by itself is not the solution to technology integration (Inan & Lowther, 2010); however, according to Spires, Wiebe, Young, Hollerbrands, and Lee (2012), increased access to technology has the potential to change the instructional environment as long as the classroom teacher has the pedagogical knowledge to facilitate learning in a technology-rich classroom.

Higher education is responsible for preparing the teachers of tomorrow. Therefore, it is the educators of our future teachers who should be placing instructional technology education in the framework for lesson preparation, delivery, and learning in

the classroom (Mayo, Kajs, & Tanguma, 2005). As a result, teachers and individuals in preparation programs have to conceptualize what technology proficiency is and what it means to become a master teacher integrating technology effectively in the classroom (Wiebe & Taylor, 1997).

Darling-Hammond (2006) stated that schools of education must create teacher preparation programs which aide prospective teachers in understanding a wide array of contexts that contribute to learning. Darling-Hammond further went on to discuss the dilemmas for teacher education and the realities of what it takes to teach in U.S. schools; noting poverty levels of students, learning differences, language barriers, and cultural diversity as areas in need of intervention; and stating that we should create teacher preparation programs that venture away from the college campus and form relationships with policymakers, administration in schools, and classroom teachers to embark on a journey of continuous transformation. Having a deep understanding of learning and learning differences goes a long way in creating a framework for curriculum that has not historically been a vital part of teacher education (Darling-Hammond, 2006).

Connecting what is to be learned to the learners themselves requires an analysis of the curriculum and the creation of a framework for curriculum delivery based on the individuals in the class based on access to a range of texts, materials, and technology (Darling-Hammond, 2006). Darling-Hammond (2010) elaborated further, stating, "traditional versions of teacher education have often had students taking batches of front-loaded course work in isolation from practice and then adding a short dollop of student teaching to the end of the program" (p. 37).

The theoretical framework behind TPACK is built on Shulman's (1986) construct of pedagogical content knowledge to include technology knowledge as situated within

content and pedagogical knowledge. TPACK utilizes a triad of content theory where the framework provides insight into the relationship and complex connectivity between the three basic components of knowledge: technology, pedagogy, and content (Koehler & Mishra, 2008; Mishra & Koehler, 2006). Pierson (1999, 2001), Keating and Evans (2001), and Zhao and Frank (2003) similarly described the relationships between technology, content, and pedagogy. At the framework's intersection of these three knowledge types is an intuitive understanding of teaching content with appropriate pedagogical methods and technologies (Mishra & Koehler, 2006).

There are seven components included in the TPACK framework: (1) technology knowledge, (2) content knowledge, (3) pedagogical knowledge, (4) pedagogical content knowledge, (5) technological content knowledge, (6) technological pedagogical knowledge, and (7) TPACK. Each of the seven components are defined in *Technological Pedagogical Content Knowledge (TPACK): The Development and Validation of an Assessment Instrument for Preservice Teachers* (Schmidt et al., 2009).

Schmidt et al. (2009) defined technology knowledge as the knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the Internet, digital video, interactive whiteboards, and software programs. A survey by the Milken Family Foundation and ISTE found that teacher preparation programs provide formal stand-alone information technology coursework does not correlate well with technology skills and the ability to integrate technology into teaching (Milken Exchange on Education Technology, 1999; U.S. Department of Education, 2010). Professionals of the 21st century think and act differently than those of previous centuries, due at least in part to the radically different tools they use to perform their jobs (Ertmer & Ottenbreit-Leftwich, 2010); however, this

expectation is rarely applied to classroom teachers. Teachers of the 21st century use roughly the same tools as those who came before them (Cuban, 2001).

Mishra and Koehler (2006) theorized that TPACK was the result of three key knowledge sources: technological knowledge, pedagogical knowledge, and content knowledge. TPACK can be viewed in two different ways: as a transformative view where TPACK is a synthesis of technology knowledge, pedagogical knowledge, and content knowledge such that the influences of each cannot be detached from one another (Gess-Newsome, 1999); and in recent years, the TPACK framework has been used to redesign teacher preparation programs and teacher development workshops (Burns, 2007; Niess, 2005, 2007; Niess, Suharwoto, Lee, & Sadri, 2006; Shoffner, 2007). In 2009, Angeli and Valanides' preliminary research found TPACK to be body of knowledge unto itself that was developed through design projects (Angeli & Valanides, 2009; Koehler & Mishra, 2005), microteaching activities (Cavin, 2008), and participation in communities of practice (Rodrigues, Marks, & Steel, 2003).

Summary

This chapter has reviewed the existing research related to the history of teacher preparation, the history of technology in education, learning theories and situated cognition, the standards for technology integration, program design, the role of the instructor in technology integration, and the TPACK framework. Great volumes of research have been done in the areas of educational technology, teacher preparation, and learning theory; however, research relating to a teacher candidate's perceived preparedness to integrate technology has not been extensively researched. Through this study, the researcher hopes to be able to communicate how prepared teacher candidates perceive themselves to be for effectively integrating technology upon degree completion

at this university.

Determining the perceived level of preparedness preservice teachers have towards effectively integrating technology upon degree was the researcher's goal. Through this literature review, the researcher sought to uncover common links between the standards for teacher preparation, technology integration, theories of learning, and the perceived level of preparedness of preservice teachers. Through this process of discovery, the researcher worked to uncover literature and previous research studies surrounding her research questions in an attempt to find additional insight into the process of teacher preparation.

Located in the following chapters are a review of the methodology used to conduct this research study, a presentation of the quantitative and qualitative data gathered to aid in answering the research questions, and the conclusions reached by the researcher based on the themes and implications within the data. Additionally, the final chapter of this research study recommends additional research in areas where further study is needed to add to the body of knowledge surrounding teacher preparation to effectively integrate technology.

Chapter 3: Methodology

Introduction

This chapter describes the methods and research design used to conduct this study and analyze the data provided throughout this study of preservice teachers, beginning with a description of the university where the data were collected, the research questions used to gather information, the research design and rationale, and finally the role of the researcher in the collection and analysis of data. Also located in this chapter is a review of the methodology used to both collect and analyze the data as well as issues of validity, reliability, and potential limitations.

This study explored the extent to which preservice teachers felt they were adequately prepared to integrate technology into their practices to educate students upon degree completion; specifically, to determine whether preservice teachers from the previous 5 years of graduates as well as current preservice teachers currently enrolled in their final semester of clinical experience perceived themselves to be ready to effectively integrate technology.

Setting of the Study

The school of study reviewed is located in the United States. Specifically, the university is located in western North Carolina and is a small private institution of learning. This university is known for being a place where Christian ideals, liberal arts, and academics meet. The university has an approximate total student population of 2,700 students enrolled in undergraduate studies across campus. This student body's population is made up of approximately 70% females and 30% males (anonymous, personal communication, August 2016).

Within the teacher preparation program studied, preservice teachers will graduate

and be certified in the state of North Carolina to teach kindergarten through twelfth grades. The program has been described as one that "offers instruction in a broad spectrum of topics, giving you the toolkit you'll need to excel in the classroom" (anonymous, personal communication, 2015). Preservice teachers at this university are provided with training through instruction in a traditional classroom setting as well as field experiences embedded throughout the preparation process.

Research Design and Rationale

The data collected for analysis of this university's undergraduate preservice teachers were gathered using a mixed methodological approach developed in the last 2 decades (Creswell & Garrett, 2008). For the purpose of this study, the researcher believed both quantitative and qualitative methods provided an increased level of validity to the research results (Creswell, 2003). According to Creswell (2003), a mixed-methods approach to research balances the weaknesses from each form of data collection by providing for triangulation of the data. The program evaluation design was informed by research done previously by Mishra and Koehler (2006) on the TPACK framework. The TPACK framework builds on Shulman's (1986) pedagogical content knowledge. The literature reviewed around this topic, located in Chapter 2, which pertains to preservice teacher perceived readiness to integrate technology effectively in the classroom provided additional evidence that a mixed methodological approach would be best.

Schmidt et al. (2009) worked collaboratively in the creation of an instrument used to determine the TPACK level of preservice teachers: the Survey of Pre-service Teachers' Knowledge of Teaching and Technology.

For the purpose of this study, participants were questioned using the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009).

This research instrument utilized a questionnaire created to identify the demographic perspective of the participants and their current level of education. Additional sections were created (Koehler & Mishra, 2009) to address levels of knowledge toward teaching and technology as they are aligned to the TPACK framework for preservice teacher preparation. These additional sections are known as the seven domains of the TPACK framework: technology knowledge, content knowledge, pedagogical knowledge, pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge, and TPACK. Also within the Survey of Pre-service Teachers' Knowledge of Teaching and Technology are sections which address the teacher preparation program's faculty and clinical partnerships and their ability to model the TPACK framework to preservice teachers. Summing up the survey are three open-ended questions that allowed for a qualitative evaluation of participant perceptions of the program and themselves.

The quantitative data gathered for the purpose of research are cited in Chapter 4 in the form of tables according to each research question. A narrative description outlining the results of each table provides a description of the data presented in each table to convey the data in multiple ways. The numerical data helped to identify trends, attitudes, or possibly the opinions of the participants (Creswell, 2003); however, since the researcher chose to utilize a mixed methodological approach which also included a qualitative questionnaire piece, the researcher was able to hear and analyze the individual voices of participants provided through identification of personal experiences while enrolled in the program without predetermined responses (Creswell, 2015). Through this process, the researcher was able to gain greater understanding of how the data gathered related to the research questions more so than any singular methodological approach

would provide.

Research Questions

The review of the literature surrounding teacher preparation for the purpose of technology integration is vast and includes many research studies completed over the last several decades. Due to the fact that technology evolves and continues to gain momentum for the purpose of education, persistent research is needed to keep pace with rapid technological advancements. As identified in Chapter 1, the focus of this research sought to answer these three questions.

1. To what extent do preservice teachers perceive themselves to be prepared to integrate technology into their classroom pedagogical practice?
2. To what extent does instructor modeling influence the disposition preservice teachers have towards integrating technology into their classroom practice?
3. To what extent does technology knowledge play a role in preservice teacher's perceived confidence to integrate technology into their classroom practice?

integrating technology.

Methodology

For the purpose of this study, the researcher utilized a mixed methodological approach (Creswell, 1994). Many researchers advocate the use of mixed methodology, including Creswell (1994); Greene, Caracelli, and Graham (1997); Morgan (1997); Patton (1990); and Tashakkori and Teddlie (2003). However, it was the work of Creswell (2009) that proposed factors such as timing, weighting, strategy, and analysis also play a role in the results of a study. Therefore, the timing and collection of the data were sequential and included two phases of data collection: first, the quantitative data collection, followed by the qualitative collection to support and enhance the numeric

data. The use of two phases sequentially helped to determine whether the preservice teachers believe there is emphasis on technology integration and helped to examine the relationship between preservice teacher confidence in technology usage and its application within the classroom to enhance learning.

In the first phase, participants (preservice teachers) completed the Pre-service Teachers' Knowledge of Teaching and Technology survey which included the open-ended response questions. This survey provided the quantitative data for examining the demographics of the participants and assessing their perceptions using a five-point Likert scale. Simultaneously, in phase one, qualitative data were gathered within the last three open-ended response questions. Qualitative data gathered during a focus group provided additional insight into preservice teacher experiences in the preparation program. This focus group was formed and was comprised of random, voluntary participants gathered after a final informational meeting for seniors entering their final clinical experience. Willing participants were interviewed in a closed-door setting with open-ended, guiding questions approved by the researcher's committee chair (see Appendix B). Data gathered provided deeper understanding into whether the preservice teachers at this rural western North Carolina University felt they were adequately prepared to integrate technology in their future classroom.

Participants Selection Logic

Preservice teachers from the last 5 years of graduates as well as currently enrolled seniors in their final semester of their clinical experience were the target data sample for this study. The school selection was based on convenience and the researcher's ability to acquire and analyze data pertaining to this study. Access to a network of colleagues, friends, and educational professionals aided in the researcher's ability to adequately

gather the data required to perform a valid and reliable study for the benefit of the teacher preparation program at this university.

The selected school met the criteria for research, meaning it offered a teacher preparation program the researcher sought to evaluate and it was willing to participate. After receiving approval to conduct research from the university's internal review board, preservice teachers were invited to participate in the study through a formal email (see Appendix C). The email correspondence included the purpose of the study, the procedures pertaining to how the study was to be conducted, the nature of the study, the risks and benefits of the study, the confidentiality policies/practices, and information about the researcher as well as the researcher's personal contact information. The dates of the study were noted as well as potential times for meeting throughout the process of the research. Responses for the research were gathered via Google Forms and included an electronic signature (IP address) as well as the potential for the participants to voluntarily give their typed name.

The Uniform Electronic Transactions Act defines electronic signatures as a person's typed name or email address (National Conference of State Legislatures, 2015). Electronic signatures are legal in 46 states; and in order for them to be valid documentation, both parties must agree to conduct the transaction electronically (National Conference of State Legislatures, 2015).

Instrumentation

The questionnaire Survey of Pre-service Teachers' Knowledge of Teaching and Technology (see Appendix D) was developed to specifically measure preservice teachers' self-assessments of the TPACK domains, not their attitudes towards TPACK (Schmidt et al., 2009). This survey was previously used in a number of other studies and has already

been evaluated for validity and reliability (Schmidt et al., 2009). As stated earlier, the instrument is designed to measure (both quantitatively and qualitatively) the preservice teachers' perceived confidence levels within each of the TPACK domains based on their teacher preparation program.

Using Google Forms, the researcher recreated the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) digitally in a web-based format. Within the instrument, there are 70 questions, in which 47 questions target TPACK skills: nine questions that are related to the demographics of each participant and their current level of education while participating in the study; seven questions about their technology knowledge; 12 questions about their content knowledge (mathematics, social studies, literacy, and science) (content knowledge); seven questions about their pedagogical knowledge; four questions about their pedagogical content knowledge; four questions about their technological content knowledge; five questions about their technological pedagogical knowledge; eight questions about their TPACK; 11 questions about faculty and modeling of TPACK; and finally three open response questions were used to qualitatively assess their self-perceptions towards each of the TPACK domains by identifying and outlining experiences within the preparation program.

Procedures for Participation and Quantitative and Qualitative Data Collection

Participation in this study occurred in the second semester of the school calendar, (spring semester 2016), as well as during the following first semester of the school calendar (fall semester 2016). The 5 previous years of graduating classes as well as current seniors enrolled in their final clinical experience semester made up the field of participants. The survey was available to participants 24 hours a day for the duration of the data collection period from April 2016-September 2016. Google Forms allowed the

researcher to document submissions as well as collect participant consent to participate by accessing the survey electronically. The information collected was password protected and only accessible to the researcher for the purposes of analyzing the data. The data gathered were triangulated and complement each other in such a manner that reliability can be assured (Creswell, 2015).

Quantitative Components

The quantitative data gathered through the survey used a five-point Likert scale for self-evaluation purposes where a one would represent a situation where the participant strongly disagreed with the statement and a five would represent a situation in which the participant strongly agreed with the statement. The data for this portion of the research were gathered using the online survey format provided through Google, specifically Google Forms. According to Creswell (2003), survey design methodology offers opportunities to collect attitudes, behaviors, beliefs, and the practices of the participants.

Qualitative Components

After a thorough review of the literature written on technology integration as well as in-depth conversations held with the researcher's committee chair, it was determined the three open-ended questions presented at the end of the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) gave candidates the opportunity to verbalize where they perceived TPACK to be identified, modeled, demonstrated, or implemented in their preparation; thus giving the preservice teacher a chance to document experiences framed in the program for the purpose of gaining TPACK knowledge as well as opportunities to implement acquired knowledge during different phases throughout the program.

As mentioned earlier, the focus group was comprised of voluntary participants

from attendees of a final clinical experience meeting where the researcher solicited participants to stay behind to answer a few questions in a closed setting. While in the focus-group setting, participants were made aware of the fact that they were being digitally recorded for the purposes of transcription and data analysis evaluation. Participants were then given the opportunity to leave. The questions asked during the focus-group meeting were meant to generate a deep understanding of the preservice teachers' experiences which could then be tied back to their self-assessment generated through the Survey of Pre-service Teachers' Knowledge of Teaching and Technology. From the data transcription, the researcher examined the results to find commonalities between the survey responses, the open-ended response questions, and the focus-group dictation results.

Role of the Researcher

The role of the researcher in this study was to direct participants to take the online questionnaires through email correspondence, gather both quantitative and qualitative data by conducting observations, and lead a focus-group discussion. The researcher was the single person in charge of collecting data; and the researcher's personal perspective, professional experiences, and beliefs could potentially cause bias in the research.

The researcher currently works in a district where continuous professional development opportunities are available for teachers to learn strategies for effectively integrating technology into their classroom practice; as a result, the researcher could potentially have ideas and opinions about how and what effective technology integration preparation looks like. The researcher did not have any type of relationship with any members of the data sample, neither personal nor professional, and understood she had to play a passive and objective role in the research process to eliminate potential bias.

The researcher's professional experiences in the classroom and educational training preparation potentially could have created bias since she holds a degree in elementary education. Her background expertise in elementary education represented a portion of the participants; therefore, the researcher paid close attention to ensure she remained objective in her perspective throughout the study. However, the knowledge gained during the researcher's educational and personal experiences are what led to interest in this research topic. The researcher intends for the knowledge gained from this research to benefit the preparation of teachers and the future of students.

Data Analysis

The quantitative data collected throughout this research were summarized using descriptive statistics. Descriptive statistics provide opportunities to review the data in several ways: through measures of central tendency (mean, median, mode), measures of variability (standard deviation), or measures of relative standing (percentiles). Since the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) utilizes a 5-point Likert scale, the researcher chose to group strongly disagree and disagree into a percentile of negative responses. The same method was used for grouping the positive responses by combining the number of strongly agree and agree together to create a percentile. Neutral responses were gathered but not used as part of the inferential conclusions made during the data analysis. The data from the percentage of positive and negative responses were analyzed and presented in a numerical fashion within a table along with a narrative to potentially increase understanding.

Transcription was required to generalize the perceptions of participants in order to analyze the qualitative data provided by the open-ended questions and focus groups. Within the transcriptions, the researcher was able to find threads of information which led

back to specific research questions, thereby producing themes in participant answers (e.g., pedagogy, dispositions, technology, content knowledge, and modeling). From the qualitative information, the researcher was able to better understand how the teacher preparation program affected its preservice teachers' perceived abilities to integrate technology.

Threats to Validity

The participant sample was taken from a single university and not multiple universities; therefore, the results are only related to the university where the participants received their training during the timeframe researched. Making sure to avoid generalization to the entire population of preservice teachers ensures internal validity will not be impacted. It cannot be assumed all preservice teachers would evaluate themselves similarly, because each university is unique in the way preservice teacher preparation is conducted. The Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) has previously been found to be a valid and reliable instrument to obtain objective data; therefore, the researcher chose it as a way to eliminate threats to the validity of the data.

While creating the digital format of the survey, the researcher provided it to a panel of experts for critical feedback prior to administration. The panel consisted of individuals knowledgeable about teaching and learning, educational technology, survey design, and teacher preparation. Based on the feedback, the researcher made the following changes necessary before administering the survey. The necessary changes included modifications to the year of degree completion to provide an option of "other" in case participants did not fall into one of the prefilled response selections, addition of the "other" option to the area of specialization to provide preservice teachers the

opportunity to list specified majors offered by the university but not listed as a response selection, and an additional response of "does not pertain to my area of specialization" was added in the sections which contained content knowledge and pedagogical content knowledge to give secondary education majors the ability to answer questions only when they determined they were directly related to their preparation process.

The researcher sought assistance in motivating the preservice teachers in the program to participate in the study from her dissertation chair by adding his name to the contact information in the original correspondence. The researcher also reached out to another member of her committee during the process of gathering research to find a time to solicit participants for the focus group. When participants were selected to participate in the qualitative research, the researcher verified none of the preservice teachers selected was personally related to her in order to prevent a potential threat to the study's validity. According to Creswell (2009), it is believed if participants know the researcher or have a relationship with the researcher, they may want to answer questions in a fashion that pleases the researcher. Additionally, it is also believed that care should be taken in the wording of open-ended questions to ensure they are not suggestive and participants cannot perceive a "right answer." Another threat to validity within the process of gathering qualitative data is the bias of the researcher conducting the interview and his/her reactivity to the answers provided by the participant (Maxwell, 2005). The researcher understood her reactions could play a role in participant responses to the open-ended questions. This knowledge during the interview process helped the researcher to remain as neutral as possible in her reactions to avoid leading their responses and to maintain focus on the research. The sequence in which this study was conducted, the procedure for selecting participants, the selection of reliable questions, and ensuring the

quantitative results align and explain the qualitative results also helped to eliminate threats to the validity and reliability in the research findings throughout this study.

Limitations of the Study

This study was limited to individuals in the teacher preparation program at one university in rural western North Carolina where the research was conducted. The sample size was small and is only relatable to the university where the data were gathered. In addition, the study was limited by the willingness of preservice teachers to participate in the study and share their experiences from the time in the program. Another limitation could potentially have been the extent to which participants gave accurate and thorough information during both the survey responses as well as during the focus group. Finally, the researcher understood quantitative research methods much clearer than qualitative which could have, as a result, led her to placing unequal weight on their significance in the study. Recognizing these limitations, the researcher worked to overcome their potential to interfere in her ability to conduct this research.

Ethical Procedures

Participants in the study were asked to participate based on their previous or current enrollment in the teacher preparation program within the last 5 years. All potential participants were provided with the required documentation. In the form of a formal email, participants were provided the necessary information and asked to participate through consent by following the provided link to the Survey of Pre-service Teachers' Knowledge of Teaching and Technology in the digitized format. Located in the email, all participants were provided with information regarding their role in the study, the purpose of the study, and the data collection methods both quantitatively and qualitatively (Creswell, 2009). The participants were given the option to withdraw from

the study at any time without consequence. All of the preservice teachers were informed regarding their responses remaining confidential indefinitely and that their responses would in no way affect their course grades or prevent them from graduating.

No names were noted on any of the reported data or documentation. If a direct quote was used, the participant was identified using a pseudonym. The data gathered are located in a password-protected location within an online cloud storage server. At the conclusion of this study, upon completion of the analysis, and final research reports are approved, the information gathered will be deleted, leaving no trace in the memory neither of the devices in which the data were stored nor via cloud server.

Summary

In summary, Chapter 3 is meant to be a detailed description of the methodology the researcher used to conduct this research on preservice teachers' perceived readiness to effectively integrate technology based on their teacher preparation program at this rural western North Carolina university. Throughout this chapter, the researcher described the setting in which this research was conducted, the research design methods used, the research questions, and hypothesized results as well as the role of the researcher. Chapter 3 included the methodology, the instruments used to gather data, the data collection process and analysis procedures, foreseen potential threats to the validity of this study, the potential limitations of the study, and the ethical procedures followed to ensure valid and reliable data.

In Chapter 4, the researcher displays the data gathered throughout this study and looks for possible answers to the research questions previously presented. Additionally, Chapter 5 consists of summarized findings, the possible implications based on the data, and the researcher's recommendations for further research.

Chapter 4: Results

Introduction

The purpose of this research was to gain deeper insight into whether preservice teachers graduate from the teacher preparation program at this rural western North Carolina University perceiving themselves to be prepared to integrate technology effectively in their future classrooms. Three questions guided this study in seeking to better understand education majors' beliefs surrounding their perceived ability to integrate technology effectively upon graduation.

1. To what extent does the teacher preparation program adequately prepare preservice teachers to integrate technology into their classroom pedagogical practices?
2. To what extent does modeling by instructors influence the disposition of preservice teachers towards integrating technology into their own classroom practice?
3. To what extent does technology knowledge play a role in the preservice teacher's confidence towards technology integration?

To ensure the researcher was able to answer each of the research questions to the best of her ability, a mixed-methods approach was used to gather data (Creswell, 2009). The Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) was used to obtain both quantitative data and a portion of the qualitative data. This instrument was proven valid and reliable through previous research studies regarding preservice teacher beliefs related to technology integration (Schmidt et al., 2009). Qualitative data were also gathered during a focus group. During this focus group, preservice teachers were asked preapproved targeted questions aimed to gather

information related to the researcher's research questions. Preservice teacher experiences with technology while enrolled in the teacher preparation program provided insight into the personal technology integration exposure each participant encountered. Combining the results from the Survey of Pre-service Teachers' Knowledge of Teaching and Technology with the qualitative data from the focus group provided in-depth details regarding the preservice teacher's perceived ability to integrate technology.

This chapter outlines the statistical analyses used to complete this study as well as the results. Presented within is a brief description of the methodology the researcher used to gather this data, an outline of the survey instrument intended to gather data both quantitatively and qualitatively, demographic information about the participants, a breakdown of the technology domains (technology knowledge, technological content knowledge, technological pedagogical knowledge, and TPACK) as they are related to the research questions which arose during the literature review, and brief summary of the results gathered.

Methodology

The data collection process for this study took place during the spring, summer, and fall semesters of 2016 at a small private university in rural western North Carolina. Research focused on preservice teachers' perceived abilities to effectively integrate technology based on their training during the teacher preparation program through the lens of Mishra and Koehler's (2006) TPACK framework and a focus group. Preservice teachers participating in the study were all recent graduates (within the last 5 years) or final semester seniors (enrolled in their clinical experience) of the education program. First, preservice teachers were asked to complete the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) via a Google Form

distributed by email with the consent of the university's internal review board (IRB). Two advantages existed in distributing a survey via email: the convenience in the ability to contact targeted participants as well as the minimization of potential data entry errors (Dillman, 2007).

Instrument Description

Within the survey instrument, the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) preservice teachers were asked a series of questions related to their demographic information as well as the seven domains within the TPACK framework. The TPACK framework breaks down the preservice teacher's teaching knowledge into seven domains: technology knowledge, content knowledge, pedagogical knowledge, pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge, and TPACK.

It is important to highlight the fact that this TPACK survey was originally developed to assess early childhood or elementary education preservice teachers' TPACK knowledge (Schmidt et al., 2009, p. 9). For this research, the survey was adapted to gather data from all participants within the teacher preparation program by having the participant designate whether or not questions related to "their area of specialization."

In order to answer the posed research questions, the researcher chose to focus on the domains: technology knowledge, technological content knowledge, technological pedagogical knowledge, and TPACK. Questions from the TPACK framework survey, Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) utilized a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The TPACK survey administered, the Survey of Preiservice Teachers'

Knowledge of Teaching and Technology (Schmidt et al., 2009) consisted of 70 items in total. Questions 1-4 were used to gather demographic information about the participants: the participant's gender, age, year of degree completion, and area of specialization in the field of education. Questions 5-11 were used to have the participants rate their perceived technology knowledge using the 5-point Likert scale. Questions 12-23 had participants rate their perceived content knowledge in the specialized areas of mathematics, social studies, science, and literacy. Due to the fact all education majors across all department areas were solicited to participate in this research study, an option of "does not pertain to my area of specialization" was added as an option for participants to select when answering the 5-point Likert scale questions if they did not perceive the question as being related to their "area of specialization." Questions 24-30 gathered data related to the participant's perceived abilities in the area of pedagogical knowledge. Questions 31-35 were used to assess the participant's perceived abilities to combine content knowledge and pedagogical knowledge to form Shulman's (1986) pedagogical content knowledge. Questions 36-40 collected data associated to the participant's perceived abilities to merge technology knowledge and content knowledge to form technological content knowledge. Questions 41-45 helped the researcher assemble data related to the participant's perceived ability to conjoin technology knowledge and pedagogical knowledge to construct technological pedagogical knowledge. Questions 46-54 were designed for the researcher to be able to compile data related to the participant's perceived ability to unite technology knowledge, content knowledge, and pedagogical knowledge to form Mishra and Koehler's (2006) TPACK. In the header description for each of these seven domains, the survey provided a description of the domain to enable participants to form an understanding of how the domain they were asked to evaluate coincided with their

teacher preparation program. Questions 55-62 had participants rate their professor's ability to appropriately model the combination of content, technologies, and teaching approaches (pedagogical knowledge) or TPACK. It is important to note that each of the seven domains were related back to their professor's ability to model TPACK as a part of their preparation process.

The next portion of the survey instrument, Questions 63-65, were designed to collect information quantitatively about the experiences preservice teachers had with professors while enrolled in the teacher preparation program. Due to the fact that some preservice teachers experience a vast number of professors while others potentially only experience between two and five while enrolled in the program, these questions were omitted from the reported results because they could not be generalized to the entire participant sample. The three quantitative questions omitted were

1. In general, approximately what number of your teacher education professors provided an effective model of combining content, technologies, and teaching approaches in their teaching? *(please indicate your answer in numeric form)*
2. In general, approximately what number of your professors outside of the teacher education program provided an effective model of combining content, technologies, and teaching approaches in their teaching? *(please indicate your answer in numeric form)*
3. In general, approximately what number of your cooperating teachers provided an effective model of combining content, technologies, and teaching approaches in their teaching? *(please indicate your answer in numeric form)*

Questions 66-68 from the survey instrument gathered information qualitatively by having the preservice teachers to describe specific episodes they experienced while

enrolled in the teacher preparation program. Each of these questions gave the researcher a deeper understanding of the experience preservice teachers had during their preparation as well as what the preservice teachers deemed to be effective efforts to combine content, technologies, and teaching approaches.

66. Describe a specific episode where a professor or instructor effectively demonstrated or modeled combining content, technologies, and teaching approaches in a classroom lesson. Please include in your description what content was being taught, what technology was used, and what teaching approach(es) were implemented.
67. Describe a specific episode where one of your cooperating teachers effectively demonstrated or modeled combining content, technologies, and teaching approaches in a classroom lesson. Please include in your description what content was being taught, what technology was used, and what teaching approach(es) were implemented. *(If you have not observed a cooperating teacher modeling this, please indicate that you have not.)*
68. Describe a specific episode where you effectively demonstrated or modeled combining content, technologies, and teaching approaches in a classroom lesson. Please include in your description what content you taught, what technology you used, and what teaching approach(es) you implemented.

The final portion of the survey, Questions 69-71, were designed by the researcher to gather information about whether participants were willing to participate in a focus group through email correspondence or telephone conversation to gain further insight into the qualitative data provided by the participant in previous questions. Using this information, the researcher attempted to contact participants via email as well as by

telephone; however, no correspondence occurred. Therefore, the researcher sought out alternative methods to gather a focus group.

After contacting personnel within the education department, the researcher discovered important dates when preservice teachers would be meeting for training before entering into their last semester of clinical experience. The researcher made arrangements to attend this meeting and waited until afterwards to ask for voluntary participation, informing the potential participants that the focus group would only consist of a few questions and their responses would be kept confidential indefinitely and not affect their ability to graduate. Participants were also made aware of the fact their responses would be recorded by and their responses would be kept anonymous. The preservice teachers who chose to become participants were then asked a series of questions regarding their experiences with technology integration throughout their time in the teacher education programs at the university.

Participants

For this study, 20 preservice teachers from the university chose to participate in this research study. The participants were 20% male and 80% were female. The group of preservice teachers used for this study ranged from 18 to 32 years of age. Participation was solicited via email correspondence using the university's email address list for both previous and current preservice teachers who met the criteria. This research study asked preservice teachers to indicate their year of degree completion which fell between the fall of 2012 and the spring of 2017. Participants also indicated their area of specialization within the field of education with 35% being elementary education majors, 40% being music education majors, 15% being physical education majors, 5% being science education majors, and 5% being English language arts education majors.

Organization of the Data Analysis

The identified themes related to the research questions and are presented in the form of tables along with narrative descriptions. The results of the qualitative research gathered during the open-ended questions from the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) as well as during the focus group were used to enhance the quantitative findings. The qualitative findings related to the quantitative data in its ability to enrich the data and provide the necessary themes to further explain the results. Themes emerging from the data were organized according to each research question.

Research Question 1

To what extent does the teacher preparation program adequately prepare preservice teachers to integrate technology into their classroom pedagogical practices? Both quantitative and qualitative data were related to Research Question 1. The researcher determined more than one of the seven domains in the Survey of Pre-service Teachers' Knowledge of Teaching and Technology were associated with Research Question 1. The TPACK domains of technological content knowledge, technological pedagogical knowledge, and TPACK were all attached to Research Question 1.

Technological content knowledge was defined for the participants as the knowledge of how technology can create new representations for specific content (mathematics, science, social studies, literacy, and specific areas of specialization); it suggests teachers understand that by using specific technology, they can change the way learners practice and understand concepts in a specific content area (Schmidt et al., 2009). These data were derived from Questions 36-40 in the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) and were

previously found to be a valid and reliable way to determine a preservice teacher's perceived technological content knowledge.

In Table 1, preservice teachers believe they are most prepared to combine technology and content instruction while teaching in their area of specialization with a high positive response rate of 85% and 0% negative responses. In the areas of the survey identifying specific content knowledge (mathematics, literacy, science, and social studies), the percent of positive responses ranged from 40-70%, with literacy having the highest number of positive responses and mathematics having the lowest number of positive responses. The highest number of negative responses in this domain was found when asking preservice teachers to combine the mathematical content knowledge and technology, with 25% of the responses being negative. It is important to cite the researcher's modifications to the survey which enabled some of the participants to answer "does not pertain to my area of specialization" within this domain due to content specificity in the areas of mathematics, literacy, science, and social studies.

Qualitative data gathered from the open response questions within the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) as well as during the focus group revealed further insight into the preservice teachers' perceived ability based on their training. Question 68 specifically sought to address the participants' perceived ability to combine their technology knowledge and their teaching approach(es). This was done by having them identify a specific episode where they believed they were able to effectively demonstrate or model the combination of content, technologies, and teaching approach(es).

The participants included responses which were directly related to the participant's perceived level of technological content knowledge: 15% of the participants

did not respond to the survey with information relevant to the question thereby not allowing qualitative data to be gathered; 5% of the participants responded negatively to this question; and the remainder of the participants responded positively about their ability to combine content technologies and teaching approaches.

Responses included the following.

> Instead of a strict test for my final in the three-week unit with my students, I had students work as a team to create their own script that met the criteria of a very strict rubric. Students were then required to get into character of whatever their job title was (pirate, interviewer, film producer) for the project to be filmed using the touch cast app. The students LOVED it.
>
> I did a music/history lesson where I played different songs from the Revolutionary War period and students had to talk about the different feelings behind them. The students were also asked to look at lyrics to Yankee Doodle Dandy and analyze the historical significance of the song.
>
> In the introduction to a tennis lesson (striking skills), I used an iHome and an iPad to play music. I would introduce the skill, play music while the students practiced the skill, and stop the music as a signal for them to stop practicing and listen for what to do next.
>
> I effectively demonstrated how to create a number bond in a math lesson using school software on the Promethean Board. I used an interactive approach that let students come up and practice this new process for breaking down a math addition problem.

During the focus group, 100% of the responses were positive in nature, with participants able to give specific examples where technology intersected content

knowledge and pedagogical knowledge. Quoted responses included

> My experience in this program definitely made me feel more comfortable in the English field; we did stuff like Tumbler and stuff like that to assess students online. So using stuff like that and social media has made me more open to using technology in the classroom (male English education major, personal communication);

and "in a Physical education setting, using like Wii and Wii bowling as far as integrating technology and still keeping the kids moving as the same time" (male physical education major, personal communication).

Table 1

Perceptions of Research Participants Related to Technological Content Knowledge

Survey Question	Does not Pertain	Strongly Disagree	Disagree	Neither A/D	Agree	Strongly Agree	Percent Negative	Percent Positive
Technology and Math (Q-36)	25%	0%	25%	10%	40%	0%	25%	40%
Technology and Literacy (Q-37)	10%	0%	15%	5%	50%	20%	15%	70%
Technology and Science (Q- 38)	25%	0%	5%	15%	50%	5%	5%	55%
Technology and S.S. (Q- 39)	20%	0%	10%	15%	50%	5%	10%	55%
Technology and Area of Spec. (Q- 40)	0%	0%	0%	15%	60%	25%	0%	85%

Also related to Research Question 1, technological pedagogical knowledge was defined for participants as knowledge of how various technologies can be used in

teaching and to understanding that using technology may change the way teachers teach (Schmidt et al., 2009). Questions 41-45 from the Survey of Pre-service Teachers' Knowledge of Teaching and Technology were specifically related to this domain that seeks to answer Research Question 1. The questions in this section were worded to determine whether preservice teachers perceive they have the ability to choose technologies which would enhance their approach to teach.

The technological pedagogical knowledge domain results showed that preservice teachers in this teacher preparation perceive themselves to have the ability to choose technology which would enhance their teaching approaches. Questions 41 and 42 both resulted in participants having 0% negative responses and between 90-95% positive responses. Question 43 asked preservice teachers to connect their perception back to the education program through the statement, "My teacher education program has caused me to think more deeply about how technology could influence the teaching approaches I use in my classroom." Seventy-five percent of the participants answered Question 43 in a positive manner, while 10% responded negatively. Question 44 asked preservice teachers about their perceived ability to think critically about how to use technology in the classroom; the results showed the least number of positive responses for this domain with only 55% and 10% of the participants disagreeing with the statement, "I am thinking critically about how to use technology in my classroom." Finally, Question 45 asked preservice teachers to evaluate the statement, "I can adapt the use of the technologies that I am learning about to different teaching activities." Results revealed 80% of the participants responded positively to this statement with 0% answering negatively.

Compiling the quantitative data gathered with the qualitative data from the open-ended survey responses and focus-group data, participants had both positive and negative

responses in the qualitative data. An example of a positive response gathered was,

> I used a video in my lesson to engage the students in a book study that we were about to begin. I think this gave students the ability to connect with the book in a different way than before. Students were then allowed to blog about what they learned based on questions my cooperating teacher and I created before delivering the lesson in class.

A negative response was gathered from a previous graduate and stated,

> This question is based on the assumption that I have access to technology in my classroom. I do not. Other than my own personal iPad, computer, and projector which are used every day for the purpose of recording, using YouTube, sight reading, and demonstration/assessment. There is no appropriate musical technology available at my school, nor do I have access to even a set of computers for the class. Elective teachers get last priority. I would love to do more.

Even though this response was negative in nature, it is not related to the teacher preparation program and is instead related to the preservice teachers' current situation. Both of these qualitative responses, even though one was negative and one was positive, communicated participants perceived themselves to be able to follow through and effectively showcase their ability to combine content, technologies, and teaching approach(es).

Table 2

Perceptions of Research Participants Related to Technological Pedagogical Knowledge

Survey Question	Strongly Disagree	Disagree	Neither A/D	Agree	Strongly Agree	Percent Negative	Percent Positive
Tech to enhance teaching approach (Q-41)	0%	0%	5%	70%	25%	0%	95%
Tech to enhance student learning (Q-42)	0%	0%	10%	65%	25%	0%	90%
Deep thinking about tech influence on teaching approach (Q-43)	0%	10%	15%	35%	40%	10%	75%
Critical thinking about tech in the classroom (Q-44)	0%	10%	35%	30%	25%	10%	55%
Adapting tech to teaching activities (Q-45)	0%	0%	20%	55%	25%	0%	80%

The TPACK domain from the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) was also determined to aid in answering Research Question 1. TPACK was first defined in Chapter 1 to be "the intersection of teachers' knowledge of curriculum content, general pedagogies, and technologies" (Harris & Hofer, 2009). In the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009), TPACK was defined for the participants as the knowledge required by teachers for integrating technology into their teaching in any content area (Schmidt et al., 2009). Survey Questions 46-54 asked participants to evaluate their perceived abilities in the area of TPACK.

Participants were first asked to rate their perceived level of TPACK in the four

main subject areas of mathematics, literacy, science, and social studies. However, a portion of the participants did not find that these areas specifically related to their area of expertise; the modification made to the survey gave these participants the opportunity to respond "does not pertain to my area of specialization" and only rate their ability in "their area of specialization" in order to survey all participants in TPACK. This modification allowed the researcher to gain information about all participants perceived TPACK level based on their preparation experience. The four main content areas revealed the following statistics. Mathematics had 35% positive responses, 10% negative responses, and 30% of the participants did not believe mathematics was related to their area of specialization. Literacy had 70% positive responses, 5% negative responses, and 10% of the participants did not believe that literacy was related to their area of specialization. Science had 60% positive responses, 5% negative responses, and 30% of the participants did not believe that science was related to their area of specialization. Social studies had 45% positive responses, 10% negative responses, and 25% of the participants did not believe that social studies related to their area of specialization. The modified question (Question 50) asked participants to rate their TPACK level based on "their area of specialization." Results from this question showed 90% of preservice teachers had a positive perception and 0% negative perception when rating TPACK level for their area of specialization.

Question 51 assessed the participant's perceived ability to select technologies to use in the classroom that enhance what is taught, how it is taught, and what students learn; preservice teachers responded 90% positively and 0% negatively. Question 52 asked if participants felt they could use strategies learned during coursework for TPACK. These responses were 85% positive and 5% negative. Question 53 had participants rate

their ability to provide leadership in helping others to coordinate TPACK in their instruction; at 35%, this domain had a low percentage of positive responses. Finally, Question 54 asked participants about their perceived ability to choose technologies that enhance the content of a lesson; these responses were 95% positive and 0% negative.

The qualitative responses provided by participants in the focus group showed a level of confidence in their ability to determine where technology intertwines with their pedagogical practices in the classroom. This was evidenced in their responses with statements such as "I was teaching a lesson on symbiotic relationships . . . used Nearpod which required the use of iPads and an interactive approach . . . throughout the lesson, the students were able to answer polls and quizzes during the lesson to check for student understanding" and "I used a video to engage the students in a book study that we were about to begin . . . gave the students the ability to connect with the book in different way than before . . . blog about what they learned." Not all participants provided this depth of a response, but the remainder of these responses indicated they perceived they had the ability to choose where content, technologies, and teaching approach(es) should intersect for the purpose of student learning.

Table 3

Perceptions of Research Participants Related to TPACK

Survey Question	Does not Pertain	Strongly Disagree	Disagree	Neither A/D	Agree	Strongly Agree	Percent Negative	Percent Positive
Math and TPACK (Q-46)	30%	5%	5%	25%	25%	10%	10%	35%
Literacy and TPACK (Q-47)	10%	0%	5%	10%	50%	25%	5%	75%
Science and TPACK (Q-48)	30%	5%	0%	5%	50%	10%	5%	60%
S.S. and TPACK (Q-49)	25%	0%	10%	20%	35%	10%	10%	45%
Specialization and TPACK (Q-50)	0%	0%	0%	10%	65%	25%	0%	90%
Using Tech to Enhance Teaching (Q-51)	0%	0%	0%	10%	60%	30%	0%	90%
Strategies for TPACK (Q-52)	0%	0%	5%	10%	60%	25%	5%	85%
Leadership and TPACK (Q-53)	0%	0%	15%	40%	35%	0%	15%	35%
Tech to Enhance Content (Q-54)	0%	0%	0%	5%	75%	20%	0%	95%

Research Question 2

To answer Research Question 2, quantitative and qualitative data were gathered. Research Question 2 was written in order to determine what extent does modeling by instructors influence the disposition of preservice teachers to integrate technology into their own classroom practices. From the Survey of Pre-service Teachers' Knowledge of

Teaching and Technology (Schmidt et al., 2009), the researcher identified two domain sections to gather data pertaining to Research Question 2: Models of TPACK (faculty, professors, and instructors) and the qualitative open-ended response question where participants were asked to "describe a specific episode where a professor or instructor effectively demonstrated or modeled combining content, technologies, and teaching approaches in a classroom lesson. Please include in your description what content was being taught, what technology was used, and what teaching approach(es) were implemented." Models of TPACK were not defined for the preservice teacher participants in this section since TPACK was defined in the previous section.

Presented in Table 4 are the quantitative data disclosing the results from survey Questions 55-62 related Research Question 2. This section of the Survey of Pre-service Teachers' Knowledge of Teaching and Technology had preservice teachers evaluate whether they believed professors appropriately modeled TPACK. This section of the survey is meant to isolate specific content area preparation, educational foundation professors, instructional technology professors, professors outside of the education department, as well as the preservice teachers' cooperating teachers during their clinical experience charged with their preparation to teach.

To begin, participants were asked to rate content-specific professors: Question 55 rated mathematics professors and had 10% positive responses and 20% negative; 55% of participant responses indicated they believed mathematics did not pertain to their area of specialization. Question 56, Models of TPACK literacy, showed 65% of the responses were positive, 5% were negative, and 20% believe that literacy did not pertain to their area of specialization. Question 57, TPACK in science resulted in 25% of the responses being positive, 5% being negative, and 45% of the participants not believing science

pertained to their area of specialization. Question 58, TPACK in social studies resulted in 35% of the responses being positive, 0% being negative, and 55% of the respondents did not believe that social studies pertained to their area of specialization. Participants were also asked to give their perspective on the TPACK ability of their instructional technology professors in Question 59. Participants responded positively 75% of the time while responding negatively only 10% of the time; and 5% of the participants did not believe instructional technology professors pertained to their area of specialization. It is important to note an instructional technology course is not part of the university's teacher preparation program; instead, the program is designed to have these skills taught in content specific methods classes required for their major. Question 60 asked participants whether they perceived their educational foundations professors had the ability to model TPACK. Responses for this question were 75% positive and 5% negative as compared to the responses when evaluating professors outside of the teacher preparation program where the responses were only 50% positive and 30% negative. Finally, participants were asked about their cooperating teachers' ability to appropriately model TPACK. The responses for cooperating teachers were 70% positive and 5% negative.

Qualitative data were gathered through an open-ended response question during the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009), where participants were asked to "describe a specific episode where a professor or instructor effectively demonstrated or modeled combining content, technologies, and teaching approaches in a classroom lesson." The participants were also asked to include the content which was being taught, what technology was used, and what teaching approaches were implemented. Participant answers to this question varied due to the fact some participants did not answer the question completely. Some of the

responses were very minimal, stating, “Using tech with social studies methods class”; however, others were more in-depth in nature, saying,

> Professors A and B in my SSED course instructed the students to create a touch cast app to complete an assignment. Rather than writing a paper we collaborated with other students to work on this assignment together. The professors were allowing students to be hands on and in control of our reflections. This assignment truly impacted me because I eventually used this app during my student teaching classroom as well.

Still others provided a much different viewpoint, indicating,

> Honestly, I can’t recall. I know in the music department we had a music technology class that was a waste of time, it is better now. Professor C used to use technology all the time in their class and it was great.

It is significant to note that 15% of the data gathered were not in the form of a valid response and did not provide the researcher with answers relevant to Research Question 2.

During the focus-group discussion, participants were prompted and asked to elaborate on how instructors modeled the integration of technology into their specific content areas. Only four of the six participants spoke up in response to the prompt. Examples included “We created a game on Kahoot that asked questions about the information students should have learned from our teachings, and then we used the technology to collect all the data and put it into a spreadsheet for us” and

> In another class I taught a track unit plan, and taught them how to use starting blocks, and then at the end of the unit I assessed them using video recording to provide them with feedback about what they learned. Coach’s Eye was used to

record and assess the students.

Table 4

Perceptions of research participants Models of TPACK – Faculty, Professors, and Course Instructors

Survey Question	Does not Pertain	Strongly Disagree	Disagree	Neither A/D	Agree	Strongly Agree	Percent Negative	Percent Positive
Math Professors and TPACK (Q-55)	55%	0%	20%	15%	5%	5%	20%	10%
Literacy Professors and TPACK (Q-56)	20%	0%	5%	10%	55%	10%	5%	65%
Science Professors and TPACK (Q-57)	45%	0%	5%	25%	25%	0%	5%	25%
S.S. Professors and TPACK (Q-58)	55%	0%	0%	10%	15%	20%	0%	35%
Instructional Tech Professors and TPACK (Q-60)	5%	5%	5%	10%	60%	15%	10%	75%
Education Professors and TPACK (Q-61)	0%	0%	5%	20%	65%	10%	5%	75%
Non-Ed Professors and TPACK (Q-62)	0%	0%	30%	20%	35%	15%	30%	50%
Cooperating Teachers and TPACK (Q-63)	0%	0%	5%	25%	50%	20%	5%	70%

Research Question 3

An analysis of the quantitative and qualitative data was completed in order to organize results related to Research Question 3. Research Question 3 was written to

assess the extent to which technology knowledge plays a role in the preservice teacher's perceived ability to integrate technology. Technology knowledge is one of the domains in the TPACK framework and is specifically assessed in the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009).

The technology knowledge domain results were analyzed to aide in answering Research Question 3. As indicated earlier in Chapter 1, technology knowledge is defined as all tools, materials, and technical skills to be used in teaching and learning (Graham et al., 2007). Technology knowledge was defined in the survey for participant understanding as "digital technologies, the digital tools we use such as computers, laptops, iPods, iPads, handheld devices, interactive whiteboards, software programs, etc." (Schmidt et al., 2009, p. 4). Questions 5-11 in the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) were specifically written to measure the participant's perceived technology knowledge.

Located in Table 5 are the quantitative data related to participants perceived technology knowledge. Participants were asked in Question 5 whether they believed they had the ability to solve their own technical problems: 65% of the time participants answered in a positive way, while 10% of the time the participants answered in a negative manner. When asked whether they believed they had the ability to learn technology easily in Question 6, 90% of participants answered positively and 5% of them answered negatively. Participants' perceived ability to keep up with new important technologies was assessed in Question 7; the data showed 70% of the time participants responded positively and 10% of the time negatively. In Question 8, participants were asked to rate whether they frequently spent time playing around with new technology. The results showed 60% of the responses being positive, while 15% were negative. Participant

experiences with a number of different technologies said participants perceived they had this ability due to 40% of the responses being positive and 15% being negative in Question 9. In Question 10, participants were asked whether they perceived themselves to have the technical abilities needed to use technology; responses were positive 85% of the time and negative 10% of the time. Finally, the participants were asked whether or not they were given sufficient opportunities to work with different technologies in Question 11. From this particular question, the researcher found that participants answered positively 55% of the time and 20% of the time negatively. Additionally, one quoted response from the focus group directly related to Research Question 3. The preservice teacher declared, "Using technology in the education department definitely made me more open to explore and experiment with technology" (female math major, preservice teacher candidate for graduation Spring 2017).

Table 5

Perceptions of Research Participants Related to Technology Knowledge

Survey Question	Strongly Disagree	Disagree	Neither A/D	Agree	Strongly Agree	Percent Negative	Percent Positive
Solve own technical problems	0%	10%	25%	45%	20%	10%	65%
Learn technology easily	0%	5%	5%	80%	10%	5%	90%
Keep up with important new technologies	5%	5%	20%	70%	0%	10%	70%
Frequently play with technology	5%	10%	25%	60%	0%	15%	60%
Know a lot of different technologies	0%	15%	45%	40%	0%	15%	40%
Have the technical skills needed to use technology	0%	10%	5%	75%	10%	10%	85%
Sufficient opportunities to work with different technologies	10%	10%	25%	45%	10%	20%	55%

Addition Information Gathered

The Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) also gathered data related to participants' perceived content knowledge, pedagogical knowledge, and pedagogical content knowledge. These domains were examined to determine whether or not the participants perceived themselves to have gaps in their content knowledge, pedagogical knowledge or pedagogical content knowledge which could potentially affect the participants' perceived ability when they intersect with technology. When examining the data related to content knowledge gained by participants while enrolled in the teacher preparation program, we are able to understand the participants' perceived level of content knowledge as it relates to their

abilities in the classroom. Content knowledge was defined for the participants as "the knowledge about actual subject matter that is to be learned or taught; a teacher's knowledge about the content they are going to teach and how the nature of knowledge is different for various content areas" (Schmidt et al., 2009, p. 3). As stated earlier in the chapter, this research included all disciplines within the education department; an option of "does not pertain to my area of specialization" was added as an option when answering questions specifically related to content knowledge. Based on participant responses, the areas of mathematics and science yielded a smaller percentage of positive responses, while social studies and literacy had 0% of the participants responding negatively. Within the qualitative data, participants did not indicate perceived abilities in specific content areas as it was directly related to content knowledge only.

Pedagogical knowledge was an additional domain within the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) which was assessed as a part of this research. The term pedagogical knowledge was first defined in Chapter 1 for the purpose of this research as the principles and strategies of teaching, learning, classroom management, student assessment, motivation, and all other issues of teaching and learning (Mishra & Koehler, 2006; Shulman, 1986). For the purpose of surveying the participants, pedagogical knowledge was defined in the survey as "the methods and processes of teaching and includes knowledge in classroom management, assessment, lesson plan development, and student learning" (Schmidt et al., 2009, p. 5). The results for pedagogical knowledge indicated a high percentage of positive responses with positive response results falling between 90-100% positive. When participants responded to the statement, "I can adapt my teaching style to different learners," 100% of the responses were positive. When evaluating the statement, "I am

familiar with common student misunderstandings," the least number of positive responses were given; however, none of the responses were negative either.

The last domain evaluated by the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) in this research was pedagogical content knowledge. As evidenced by earlier research conducted by Shulman (1986), the connectedness between pedagogy and content knowledge plays a key role in a teacher's ability to teach effectively. Pedagogical content knowledge was defined first in Chapter 1 as "the ways of representing and formulating the subject that make it comprehensible to others" (Shulman, 1986, p. 9). For the purpose of surveying preservice teachers as participants in this study, pedagogical content knowledge was defined as being different for various content areas as it blends both content and pedagogy with the goal being to develop better teaching practices in the content areas (Schmidt et al., 2009). In the area of mathematics, 40% of the participants responded positively and 10% responded negatively when determining their perceived ability to select effective teaching approaches to guide student thinking and learning in mathematics. However, the remaining content areas had participants in the research study responding neutrally or positively about their perceived ability to select effective teaching approaches to guide student thinking and learning in each of these areas.

Summary

In summary, the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) was used to gather both quantitative and qualitative data. As a secondary method of gaining further insight into the quantitative data was the use of an open-ended question and a focus group. The sample size of participants providing these data was small; however, due to the broad spectrum of teacher

preparation departments represented by the participants, the sample size was deemed sufficient. The demographic statistics showed some difference in the fact that 80% of the participants were female and 20% of the participants were male.

Research Question 1: To what extent does the teacher preparation program adequately prepare candidates to integrate technology into their classroom pedagogical practices? The analyses showed the participants believe themselves to be most prepared when integrating technology into the content of literacy with a positive response rate of 70% or their area of specialization with a positive response rate of 85% as displayed in Table 1 earlier in this chapter. Participants conveyed they felt they were least prepared to integrate technology into the content of mathematics due to the section receiving the highest number of negative responses at 25%. Qualitative responses given by both participants in the open-ended response questions as well as during the focus group indicated they perceive themselves to be able to appropriately combine technology within their area of specialization.

Additionally, Research Question 1 also addresses technological pedagogical knowledge in determining the participants' perceived ability to combine their technology knowledge with their pedagogical knowledge. Results showed an overall positive perception towards their abilities to combine their approaches for teaching with technology in their classroom. This was shown in Table 2, displayed earlier in this chapter, with all but one of the questions in this domain receiving between 75-95% positive responses. The question stating, "I am thinking critically about how to use technology in my classroom," received the least number of positive responses with only 55% of the participants perceiving themselves to agree or strongly agree with this statement. Qualitative data revealed a deeper understanding about the participants'

perceived ability to fuse their pedagogical knowledge with their technology knowledge.

Finally, the data attributing to Research Question 1 was found in the domain of TPACK. Quantitative data gathered from the participants in Table 3 suggested participants felt most comfortable combining content, technologies, and teaching approaches while teaching literacy or within their area of specialization. Participants also indicated they believed they could use technology to enhance what they teach, how they teach, and what students learn with 90% positive responses and 0% negative response to this particular question. From this domain, the statement, "I can choose technologies that enhance the content of a lesson," received the highest percentage of positive responses with 95% of the participants indicating they either agreed or strongly agreed with the statement and 0% of the participants indicating they either disagreed or strongly disagreed with the statement. The statement, "I can provide leadership in helping others to coordinate the use of content, technologies, and teaching approaches at my school and/or district," received the lowest number of positive responses with only 35% of the participants responding positively. Qualitatively responses by the participants showed they were able to communicate through an open-ended response question as well as during the focus group about a time where they perceived themselves to be able to effectively display TPACK skills.

Research Question 2: To what extent does modeling by instructors influence the disposition of teacher candidates towards integrating technology into their own classroom practice? This research question was analyzed through examining the data provided in Table 4. The questions presented in this section of the survey were assessed by asking participants to evaluate their methods instructor's ability to appropriately model the combination of content, technologies, and teaching approaches in their

teaching. For each of these questions, there was a percentage of participants who did not find that the question pertained to their area of specialization in the field of education. Literacy received the highest number of positive responses with 65% and mathematics the lowest number with 10%. Participants were then asked to evaluate what they determined to be instructional technology professor's ability to model the combination of content, technologies, and approaches to teaching. Within these results, it was found that 75% of the time participants either agreed or strongly agreed with the statement.

An evaluation of instructors within the education programs versus outside of the education programs showed participants viewed the TPACK abilities of their instructors within the education programs to exceeded instructors' abilities outside of the education programs with the number of positive responses decreasing by 25% and the number of negative increasing by 25%. When answering a similar question about their cooperating teachers, results were similar to professors within the teacher preparation program. Qualitatively, the participants were able to provide specific examples to back up their perception of the professors during their preparation. The examples provided relevant usable data and gave the required details such as the content being taught, the technology that was used, and the teaching approach(es) that were implemented. Even though all of the responses did not provide useable data, none of the responses shed a negative light on an instructor's ability to appropriately model TPACK to their preservice teachers.

Research Question 3: To what extent does technology knowledge play a role in the teacher candidate's confidence towards technology integration? This research question was analyzed in Table 5 provided earlier in this chapter. The number of positive responses for the section of the survey assessing technology knowledge ranged between 40-90%, while some responses indicated participants perceived themselves to be capable

in some areas of technology knowledge while lacking in others. Participants indicated they believed they had the ability to learn new technology and had the skills needed to use the technology; however, participants communicated they did not frequently play around with new technologies nor did they have sufficient opportunities to work with different technologies during their preparation program. Within the qualitative data, positive responses mentioned "using technology in the education department definitely made me more open to explore and experiment with technology" and "it definitely made me more comfortable in the English field, we did stuff like Tumbler to assess students online"; while negative responses such as "this question is based on the assumption that I have access to technology in my classroom" solidify why the perceptions are different among the quantitative data.

Finally, the data gathered to analyze the posed research questions from the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) and a focus group helped the researcher to understand and gain insight into the participant's perceived ability to effectively integrate technology in the classroom after their teacher preparation experience. A deeper discussion of the possible implications of this study are located in Chapter 5 along with the researcher's recommendations for further study on the topic of TPACK in the process of teacher preparation.

Chapter 5: Conclusions

Introduction

The purpose of this research was to gain deeper insight into whether preservice teachers perceived themselves to be prepared to integrate technology effectively based on their training from this teacher preparation program in rural western North Carolina. In this chapter, the researcher reviews the methodological approach used to obtain data to address each of the research questions, a summary of the results, and possible implications based on the findings in this research. The motivation behind this study was based on the rapidly changing expectations for teachers to enhance instruction with technology and whether or not preservice teachers perceived themselves to be prepared to complete this task (Abbas et al., 2013). Three questions guided this study to better understand preservice teacher beliefs surrounding their perceived ability to integrate technology effectively upon graduation.

1. To what extent does the teacher preparation program adequately prepare preservice teachers to integrate technology into their classroom pedagogical practices?
2. To what extent does modeling by instructors influence the disposition of preservice teachers towards integrating technology into their own classroom practice?
3. To what extent does technology knowledge play a role in the preservice teacher's confidence towards technology integration?

Methodology

Using the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) in combination with qualitative data gathered through

open-ended questions during the survey and a focus-group discussion, the researcher worked to draw conclusions for the posed research questions. Using a mixed methodological approach, the researcher analyzed quantitative data using descriptive statistics by grouping positive and negative responses. To enhance the findings within the quantitative data, the researcher connected open-ended and focus-group responses to further solidify her drawn conclusions. According to Creswell (2009), the qualitative research will give way to a deeper understanding of the quantitative results. By using this approach, the researcher gained knowledge into whether preservice teachers perceived themselves to be prepared to integrate technology based on their teacher preparation program.

Summary of Research Question 1 Results

In an attempt to determine the extent to which the teacher preparation program preservice teachers perceived themselves to be able to integrate technology into their classroom, the researcher found specific portions of the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) provided quantitative data; a portion of the qualitative data; and when combined with the focus-group responses, allowed the researcher to generate a conclusion to the posed question. Sections of the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) which provided the quantitative data were technological content knowledge, technological pedagogical knowledge, and TPACK.

The first section of the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) which helped to answer Research Question 1 was technological content knowledge. This section of the survey asked participants to consider whether they perceived themselves to be able to understand how using specific

technology can change the way learners practice and understand concepts in a specific content area (Mishra & Koehler, 2003). The data from this section supported a positive perception which preservice teachers have towards their ability to integrate technology into their area of specialization 85% of the time. The researcher chose to focus on Question 40 which specifically asked preservice teachers to assess their technological content knowledge in their area of specialization in order to generalize the data provided through this section of the survey.

Additionally, the survey provided quantitative data about the preservice teachers' pedagogical knowledge when using technology for the purpose of teaching in a section of the survey titled technological pedagogical knowledge. The results from this portion of the survey show preservice teachers at this university have a positive perception of their ability to use technology to enhance their instruction as well as to enhance student learning. Other questions in this section asked the preservice teachers to assess their ability to think critically about how to use technology in the classroom and their ability to think deeply about how technology influences their teaching approaches. Even though these questions did not result in overall negative perceptions, the researcher noticed these two questions were the only ones in this section that revealed negative perceived abilities, with 10% of the participants stating they disagreed with the statements "my teacher education program has caused me to think more deeply about how technology could influence the teaching approaches I use in my classroom" and "I am thinking critically about how to use technology in my classroom." Further examining these two questions specifically, the researcher documented when preservice teachers were asked to critically think about how to use technology in the classroom, participants had 20% less positive responses than any other question in this section of the survey but between 15-20% more

neutral responses than other questions.

The TPACK domain provided additional quantitative data where the participants were asked to evaluate their ability to combine technology knowledge, pedagogical knowledge, and content knowledge together for the purpose of instruction. Participants were asked to rate their abilities as they pertained to the specific content areas of mathematics, literacy, science, social studies, and their area of specialization. When examining the results of these four questions within the TPACK section of the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009), the researcher discovered between 10-30% of the participants did not believe these questions were related to their area of specialization. Therefore, in order to examine the data further, these percentages were extracted from the same to determine the results from the participants which noted this content area was related to their area of specialization. TPACK, as it was related to participants' perceptions in the content of mathematics, resulted in 14% of the participants having a negative perception of their ability and 50% of the participants responding positively. In the content area of literacy, only 10% of the participants did not believe the content was related to their area of specialization, and the remainder of the participants responded negatively 6% of the time and positively 83% of the time. When participants were asked to evaluate their perceptions related to TPACK and science participants, 7% of the participants responded negatively and 86% responded positively. Finally, the section on social studies showed participants responding negatively 13% of the time and positively 60% of the time.

In order for the researcher to be able to generalize the data and determine an overall perceived perception of the participants, the researcher focused on the question where participants were asked to rate their perceived ability to use TPACK skills while

teaching in their area of specialization (Table 3). This question yielded results where 0% of the participants responded negatively. Therefore, when participants were asked to respond based on skills acquired in their area of specialization, they perceived themselves to have TPACK skills necessary while integrating technology. Furthermore, 90% of the responses from this question were positive in nature, indicating they perceived themselves to be able to teach lessons which appropriately combine their content, technologies, and teaching approaches.

The quantitative results from these three sections showed the preservice teachers at this university perceive themselves to have the ability to effectively integrate technology while instructing their students. According to Creswell (2009), examining both the quantitative data alongside the qualitative data provided deeper insight into the concluded results. As a part of the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009), qualitative questions were asked for this purpose along with the conduction of a focus group.

In order to gain a deeper understanding of preservice teachers' perceptions related to Research Question 1, a qualitative question was asked during the survey as well as during the focus group. From the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009), participants were asked to describe a specific episode where they effectively demonstrated or modeled combining content, technologies, and teaching approaches in a classroom lesson; while during the focus group, participants were asked, "Do you feel like your experience here at this university adequately prepared you to integrate technology effectively in your classroom?" From these two questions, the researcher was able to examine the participants' perceived ability to be able to/not be able to complete a given task as well as whether or not they could

accurately provide an example of a time where they were able to demonstrate their perceived ability.

Overall, the researcher concluded preservice teachers from this teacher preparation program believed they have been adequately prepared to integrate technology effectively in the classroom based on the high percentage of positive responses in each of the related sections of the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) as well as the positive language within responses gathered during the focus-group discussion. By examining the quantitative and qualitative data collectively, both sections of data complimented one another and reinforced conclusions gathered by the researcher to answer Research Question 1.

The teacher preparation program's ability to create a situation in which a set of skills is learned is "a fundamental part of what is learned" (Putnam & Borko, 2000, p. 101). Based on research conducted almost 2 decades ago in the year 2000, it was discovered that more than two thirds of preservice teachers did not believe they were prepared to use technology in the classroom (Francis-Pelton, Farragher, & Riecken, 2000). According to research, this was due to the limited exposure to technology integration during the teacher preparation process (Lawless & Pellegrino, 2007). It was determined that integrating technology effectively requires preservice teachers to have a deep understanding of the relationship between content, pedagogy, and technology as well as how technology can be used to support student learning (Koehler et al., 2007). Additional research specifies a preservice teacher's TPACK as a crucial part of teachers being able to effectively integrate technology into the modern classroom (Guzey & Roehrig, 2009; Koehler & Mishra, 2005; Mishra & Koehler, 2006; Pierson, 2001). Therefore, equipping preservice teachers to integrate technology in the classroom should

be a key focus of teacher preparation programs (Chai, Koh, & Tsai, 2010).

Reinhart et al. (2011) conveyed technology integration is not just about access to technology but about how the access is being used. Authentic learning experiences where technology has empowered the educational process helps preservice teachers face the challenges associated with technology integration and aids in the creation of a positive perception (MacKinnon, 2010). Having repeated positive experiences during their teacher preparation program has been known to strengthen a person's self-efficacy (Bandura, 1993) and was determined to be directly related to their use of technology as a part of instruction (Marcinkiewicz, 1994).

Based on the results of this study and previous research, it can be concluded that the more knowledge, exposure, and experience preservice teachers have with TPACK while enrolled in their preparation program, the greater their confidence will be towards integrating technology to enhance student learning and instruction. "Future teachers need to be able to look at goals in their content area and then consider the many technologies that may assist in meeting those goals or extending the students' learning" (Mayo, Kajas, & Tanguma, 2005, p. 344).

Summary of Research Question 2 Results

Research conducted by PT3 found modeling was a common approach used to increase preservice teacher preparedness (Banister & Vannatta, 2006; Hall, 2006; Nelson & Thomeczek, 2006; Wentworth, 2007). Research Question 2 targeted whether a professor's ability to model TPACK for preservice teachers will affect their disposition to integrate technology in the future. The researcher again gathered both quantitative and qualitative data. Research Question 2, "to what extent does modeling by instructors influence the disposition of preservice teachers towards integrating technology into their

own classroom practices," was assessed using the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) through two sections. First, the section titled Models of TPACK (faculty, professors, and instructors) gathered quantitative data; and the open-ended question asking participants to describe a specific episode where a professor or instructor effectively demonstrated or modeled combining content, technologies, and teaching approaches in a classroom lesson gathered qualitative data. Additional qualitative data were gathered during the focus group; participants were asked to elaborate on how instructors modeled the technology integration process while in the education department.

The Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009) asked participants to isolate their opinions of specific pedagogical content preparation they received while enrolled in the teacher preparation program as well as evaluate their professor's TPACK abilities outside of the education department. Results specific to the content areas of mathematics, literacy, science, social studies, and instructional technology were asked first, followed by a perception of the educational foundation professors, non-education professors, and cooperating teachers. An examination of the results reported in Chapter 4 revealed a noteworthy portion of the participants did not believe the specific content areas pertained to their area of specialization. Therefore, the researcher chose to recalculate the percentage of positive and negative responses in order to better understand the perceptions of participants who did find the question relevant to their preparation process. The results indicated as follows: In the content area of mathematics, 22% of the responses were positive, while 44% of the responses were negative; in the content area of literacy, 81% of the responses were positive, while 6% of the responses were negative; in the content area of science,

45% of the responses were positive, while 9% were negative; in the content area of social studies, 78% of the responses were positive, while 0% of the responses were negative; and finally, when asked about instructional technology professors, 79% of the responses were positive, while 11% were negative. From these results, which solely targeted the core content areas, it was noted the area of mathematics had more negative responses than positive responses, and it could be concluded this is an area in need of improvement.

While examining the results of the qualitative responses from the question within the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009), it was noted by the researcher some of the participants only answered the question minimally which could possibly indicate an inability to provide the requested information. Of the responses, 15% of the responses were not able to be used to gather the necessary data in order to answer Research Question 2. The remaining 85% of the responses provided different levels of insight into the experience the candidate had while enrolled in the teacher preparation program at the university, the majority of which were positive in nature.

During the focus group, a much greater depth of knowledge was gained from the participants by the researcher being able to ask follow-up questions if the participants only responded with a portion of the answer to the posed question. Since only four of the five participants in the focus group responded, it could be concluded that the fifth person did not perceive him/herself to have experienced the modeling of TPACK effectively during his/her experience in the program. Of the remaining participants, all four of the participants were able to discuss in an in-depth manner the extent to which their instructors were able to model TPACK during their program experience, and several quoted examples were noted in Chapter 4.

Overall, the researcher combined the results gathered from her mixed-methods approach to answer Research Question 2 and found the modeling of TPACK provided by the instructors within the education department provided sound examples of how technology could be effectively integrated in the classroom as a way of enhancing instruction as well as gathering information pertaining to what the students learned throughout the planned lesson; however, the researcher noted a commonality among the responses of the participants. Several of the responses had the instructors modeling the use of technology to assess the students rather than to provide an enhanced atmosphere in which to teach. Leaving the researcher to question, even though modeling occurred and the participants perceived the modeling was effective technology integration, was it truly effective technology integration? Technology integration was defined in Chapter 1 as the infusion of technology as a tool to enhance the learning in a content area or multidisciplinary setting; therefore, effective technology integration would be successful when fusing technology into the teaching strategies and learning environment.

Earlier research by Bandura (1997) on social learning theory stated, "most human behavior is learned observationally through modeling: by observing others, one forms and idea of how new behaviors are performed, and on later occasions this coded information serves as a guide for action" (p. 22). Based on Bandura (2003) and the results gathered in this study, the researcher concluded preservice teachers' perceptions of their professor's ability to model technology integration effectively will affect their perceived ability to be able to effectively integrate technology in their own classroom. According to Stubbs (2007), a professor's ability/inability to model TPACK will influence the preservice teacher's disposition towards technology integration. CAEP Standards (2013) defined disposition to be the values, commitments, and professional

ethics that influence behaviors towards students, families, colleagues, and communities that affect student learning, motivation, and development as well as the educator's own professional growth. Additionally, Schulte, Edick, Edwards, and Mackiel (2004) determined dispositions include a pattern of behaviors displayed recurrently in the absence of criterion.

Brown et al. (1989) offered further insight into teacher preparation validating the need for preservice teachers to be immersed in the learning environment during the apprenticeship state of their preparation, during which time they acquire the skills and knowledge about teaching to transfer into future classroom practice. If, according to Lortie (1975), teachers teach as they were taught, the environment in which they are situated (Brown et al., 1989) will affect their personal efficacy to motivate and promote learning with technology (Bandura, 2003). In other words, preservice teachers who have been exposed to Models of TPACK which have effectively integrated technology will theoretically develop a disposition where they perceive themselves to also be able to effectively integrate technology. Based on the results of this study and previous research, thoughtful preparation should emphasize the construction of knowledge and dispositions towards technology in an immersive educational setting whereby preservice teachers experience Models of TPACK by professors integrating technology with fidelity (Greher, 2011; Niess, 2005; Stubbs, 2007).

Summary of Research Question 3 Results

Research Question 3 sought to determine whether or not a preservice teacher's perceived technology knowledge plays a role in their confidence towards technology integration. The Survey of Pre-service Teacher's Knowledge of Teaching and Technology (Schmidt et al., 2009) addressed the participant's perceived level of

technology knowledge in isolation. This section of the survey contains seven questions aimed at measuring the overall perceived technology knowledge of participants. Previously, the researcher hypothesized that the more technology knowledge preservice teachers perceived themselves to have would result in more confidence towards using technology in their classroom.

After analyzing the results presented in Chapter 4, the researcher concluded these preservice teachers believed they have technology knowledge as well as the ability to learn technology. The results indicated preservice teachers believe they could learn new technology easily, and they have the necessary skills needed to use technology with between 85-90% of the responses to these two questions being positive. When preservice teachers were asked about their ability to solve their own technical problems and keep up with important new technologies, the number of positive responses fell between 65-70%. Additionally in this section, preservice teachers were asked whether they perceived themselves to frequently play around with different technology and whether or not they know a lot of different technologies; the number of positive responses again declined for these questions with between 40-60% of the responses being positive. Finally, located in this section of questions, the preservice teacher candidates were asked whether or not they had sufficient opportunities to work with different technologies. Even though this question did not have the least number of positive responses (55%), it did have the highest percentage of negative responses with 20%.

Based on the quantitative data gathered through this section of the Survey of Pre-service Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009), the researcher sought to gain additional information qualitatively during the focus group. While meeting with the focus-group participants, the researcher asked whether or not

their knowledge of technology gained while enrolled in the teacher preparation program contributed toward their confidence when integrating technology into classroom lessons. Participants responded 100% of the time during the focus group in a positive manner, even going as far as to say their experience in the teacher preparation program "made me more open to explore and experiment with technology" (focus group participant, male, personal communication).

It was assumed that preservice teachers enrolled in teacher education programs after the year 2000 would be more prepared to use technology and thereby be more willing to integrate technology in the classroom (Hall, 2006). By understanding the preservice teachers' technology knowledge, the researcher understood how the participants in this study comprehend technology for their personal use, not as a specialized tool to enhance instruction (Caruso & Kvavik, 2005). Collectively, the quantitative and qualitative results showed the preservice teachers in this study had a positive perception of their technology knowledge level due to the minimal number of negative responses. Bandura (1993) articulated confidence in one's own ability has an effect on future actions. The preservice teachers' attitudes and beliefs towards using technology in their classroom could, according to Norton et al. (2000), create resistance towards using technology in their classroom.

However, Strudler and Wetzel (1999) and Vannatta and Beyerbach (2000) have shown that preservice teacher technology knowledge alone is not enough to facilitate effective technology integration; preservice teachers need opportunities to construct their own knowledge of technology's place in the classroom as part of the pedagogical process (Anderson & Dexter, 2003). Previous studies have estimated the learning curve for technology to double about every 18 months; therefore, teacher preparation should

provide opportunities for preservice teachers to practice using technology to support learning with the mindset of remaining lifelong learners (Reed-Swale, 2009).

Limitations of this Study

This study was limited to the individuals either enrolled or previously enrolled within the last 5 years in one undergraduate teacher preparation program at one university in rural western North Carolina. The data sample is only relatable to the university where the data were gathered. In addition, the study was limited by the willingness of both past and current preservice teachers to voluntarily participate in the study and truthfully share their experiences while enrolled in the teacher preparation program. The researcher sought assistance in motivating the preservice teachers from staff within the program. The primary limitation was all participants were selected nonrandomly, thereby limiting the generalizability of the results to only the targeted audience. A portion of the potential participants were not currently enrolled in the program; therefore, there was a limited ability to reach these potential participants, creating a limitation to the study consequently. Additionally, a limitation could have potentially occurred with the extent to which participants gave accurate and thorough information. Finally, the researcher understands quantitative research methods much clearer than qualitative which could have, as a result, led her to place unequal weight on these results in the study. The researcher recognized these limitations; therefore, she was able to work to overcome their ability to effect the results while conducting this research study.

Implications of this Study

This study revealed this teacher preparation program located in rural western North Carolina works to adequately prepare preservice teachers for a future in the education profession. The results of this study, while only applicable to this university,

show the connection between technology knowledge, technological pedagogical knowledge, TPACK, and the preservice teachers' perceived ability to integrate technology. This research adds to the ever-growing body of research on technology integration in teacher preparation because it serves as an acknowledged pedagogical practice used by universities in the process of preparing future teachers and provides descriptive statistical data which can be shared with other institutions of higher education to read, learn, and expand upon. This research also attempted to define a process which is effective in preparing preservice teachers for their future in the classroom.

Recommendations for Future Study

According to the results of this research, the researcher recommends the following: an increase in the number of opportunities preservice teachers have to work with different emerging technologies as well as have time to collaborate with peers and instructors about their potential use in enhancing the instruction of students, the creation of a collaborative atmosphere where instructors share with one another the planned curriculum they are using to prepare their students while effectively modeling the components of TPACK, and a close evaluation of the overall preparation experience to ensure alignment to the CAEP standards for technology integration into the process of teacher preparation. Additionally, surveys should be done at regular intervals to assess for areas of weaknesses to meet developing needs of an ever-changing population of preservice teachers enrolled in the program.

In the area of professional development, there is a permanent need to continue to grow as a professional who is preparing future professionals for an ever-changing population of students. Current technological resources available must also be evaluated to determine whether they are still adequate in meeting preparation needs of preservice

teachers. Finally, leadership within the teacher preparation program should work to combat barriers in preparing preservice teachers to integrate technology such as infrastructure, budgetary concerns, and professional development opportunities.

Recommendations for Future Studies

One area where additional study might be merited is the replication of this study at a different public institution of higher education. This research was conducted at a small, private, rural western North Carolina university; by gathering additional data from other universities with similar size and student enrollment populations, results could then be compared to determine whether preservice teachers are being prepared to integrate technology with fidelity over a larger geographic region.

Additionally, this research was conducted over a short period of time. The researcher believes a longitudinal study could provide additional insight into the preservice teachers' perceptions to effectively integrate technology as the program evolves over time. An example would be to replicate this process and continue to add to the body of data over a much longer period of time such as 2 years, 5 years, or even 10 years. With this longitudinal information, the teacher preparation program would have the ability to examine change over time as it pertains to their ability to prepare preservice teachers to integrate technology and determine if they are matching the needed skills of in-service teachers upon graduation.

Another avenue for research would be to follow the participants over a given amount of time after graduating from the teacher preparation program. During this time, the participants could provide the teacher preparation program with information related to perception changes and potential gaps where they may have previously perceived themselves to be prepared, when in actuality, they were lacking the necessary skills and

knowledge to effectively integrate technology. Based on this information, the teacher preparation program could address gaps in their teacher preparation process and continuously work to better prepare preservice teachers to effectively integrate technology.

Summary

The researcher sought to design this study to address the documented problem of preservice teachers graduating with the perception of being ill-equipped to effectively integrate technology into their future classroom setting. This study, however, shows the opposite result; preservice teachers overall perceive themselves to be able to effectively integrate technology upon completing degree requirements from the university being studied. The university where this study was conducted chose to embed technology into the required content-specific methods courses, further solidifying the need for content-specific instructors to be able to accurately and effectively model TPACK skills for preservice teachers. Lastly, the preservice teachers' confidence in their technology knowledge is related to technology integration, but further research is needed to determine the level to which it is affected.

Since the researcher has spent the previous 13+ years working in the education field as a computer lab manager, classroom teacher, and now a technology integration specialist, this research was closely aligned with current motivations in the K-12 setting to prepare educators to effectively integrate technology into their pedagogical practices for teaching content. From this research, we continue to learn technology is changing more and more rapidly each and every day, and it stands that ongoing research should be conducted in order to continuously improve the process by which preservice teachers are prepared for future classrooms.

Fletcher (1996) stated,

> When you go to the hardware store to buy a drill, you don't actually want a drill, you want a hole, they don't sell holes at the hardware store, but they do sell drills, which are the technology used to make holes. We must not lose sight that technology for the most part is a tool and should be used in applications which address educational concerns. (p. 87)

A positive relationship has been consistently reported linking increased academic achievement with the use of computers (Burns, 2007; Cheung & Slavin, 2013; Krentler & Willis-Flurry, 2005; Lei & Zhao, 2007); therefore, preservice teacher preparation to integrate technology in their classroom practice is a key focus of many teacher preparation programs (Chai, Koh, & Tsai, 2010).

Technology's role in the classroom has shifted dramatically in the last 10 years (Abbas, Lei-Mei, & Ismail, 2013); and teachers are expected to possess the ability to create "Digital Age" learning experiences for their students. Therefore, teacher education programs are charged with providing effective technology instruction to equip technologically proficient teachers. However, Moeller and Reitzes (2011) revealed only 23% of teachers felt prepared to integrate technology into their pedagogy; and Koehler and Mishra (2009) highlighted the ongoing debate about what preservice teachers need to know about technology in education. Additional research continues to be a need in order to address how preservice teachers are supposed to learn the skills needed to intertwine the concepts of content knowledge, pedagogical knowledge, and technological knowledge leading to effective technology integration (Koehler et al., 2007).

To effectively ready technologically proficient educators, a holistic approach must be taken into consideration (Duran, Fossum, & Luera, 2006). The university studied in

this research has already taken steps towards this holistic approach by teaching core methods courses which have technology integration experiences embedded to intentionally create a positive vicarious learning environment where preservice teachers will be able to transfer knowledge from the program into future practice (Brown et al., 1989). Additionally, the ability of instructors within the teacher preparation program to model technology integration which leads to the internalization of technology integration as a tool is pivotal (Stubbs, 2007). Based on the results of this study, there is additional evidence indicating a preservice teacher's perceived ability to effectively integrate technology, his/her teacher preparation program's ability to model TPACK, and their perceived technology knowledge all play a role in whether effective technology integration can actually occur.

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Appendix A

CAEP Standard 1

Standard 1:
CONTENT AND PEDAGOGICAL KNOWLEDGE

The provider ensures that candidates develop a deep understanding of the critical concepts and principles of their discipline and, by completion, are able to use discipline-specific practices flexibly to advance the learning of all students toward attainment of college-and career-readiness standards.

Candidate Knowledge, Skills, and Professional Dispositions
1.1-Candidates demonstrate an understanding of the 10 InTASC standards at the appropriate progression in the following categories: the learner and learning; content; instructional practice; and professional responsibility.

Provider Responsibilities
1.2-Providers ensure that completers use research and evidence to develop an understanding of the teaching profession and use both to measure their P-12 students' progress and their own professional practice.

1.3-Providers ensure that completers apply content and pedagogical knowledge as reflected in outcome assessments in response to standards of Specialized Professional Associations (SPA), the National Board for Professional Teaching Standards (NBPTS), states, or other accrediting bodies (e.g., National Association of Schools of Music-NASM).

1.4-Providers ensure that completers demonstrate skills and commitment that afford all P-12 students access to rigorous college-and career-ready standards (e.g., Next Generation Science Standards, National Career Readiness Certificate, Common Core State Standards).

1.5-Providers ensure that completers model and apply technology standards as they design, implement, and assess learning experiences to engage students and improve learning; and enrich professional practice.

CAEP, 2013

Appendix B

Planned Focus-Group Question Starters

Focus Group Question Starters

Question 1: Has your knowledge of technology gained while attending this university in the education program, contributed towards your confidence to integrate technology in your classroom lessons?

Question 2: Do you feel like your experience while enrolled at this university adequately prepared you to integrate technology effectively in your classroom?

Question 3: Can you tell me about how instructors modeled the integration of technology while you were in the education department?

Appendix C

Letter to Participants

"If we teach today, as we taught yesterday, we rob out children of tomorrow" ~ John Dewey

Dear Teacher Candidates:

I am a doctoral student at Gardner-Webb University seeking your participation in my study that focuses on the use of technology in the classroom. I am interested in this topic in order to be able to describe the extent to which teacher preparation programs are preparing teacher candidates to use technology in the classroom. I plan to publish the results of this study in the winter of 2016 based on the data provided by your results. It is the hope that this survey will benefit you as a practitioner as it will inform educators and the public about specific practices of teacher education programs concerning the use of technology.

I would greatly appreciate your participation in this process. By completing this survey, which questions you about your experience with technology in the Elementary Education program, you will help aide in research for the future benefit of our profession. This survey will take approximately 5-10 minutes to complete. By clicking the link listed below you indicate your consent to participate in this study. Please be assured that your responses will be kept confidential; your results will only be accessed by myself. Your participation in this study is completely voluntary and will not affect your grade nor influence your application for graduation. There is no expected risk associated with your participation and you may stop the survey at any time without penalty.

Survey Link:
https://docs.google.com/forms/d/1duGfT7QfIJeNhzwUn3K9hunuhy7CDL10TzgDDS1-Xc0/edit?usp=drive_web

Contact Information
If you have any questions about this study, you may use the contact information listed below:

Dr. Douglas A. Eury
Gardner-Webb University
xxxxxxxxxxxxxx

Erin B. Davis
Gardner-Webb University
xxxxxxxxxxxxxxxxxxx

This study has been reviewed and approved by Gardner-Webb University's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and university policies. If you have any questions about the subject's rights or have a research-related complaint, please contact _____.

I anticipate that you will be able to participate in this study to further our understanding about the use of technology in teacher preparation programs for the benefit of the profession in the future. If you would like the results of these findings, please contact the researcher, Erin B. Davis, at xxxxxxxxxxxxxx.

Thank you for your time and dedication,

Erin B. Davis

Appendix D

Survey of Pre-service Teachers' Knowledge of Teaching and Technology

Thank you for taking time to complete this questionnaire. Please answer each question to the best of your knowledge. Your thoughtfulness and candid responses will be greatly appreciated. Your individual name or identification number will not at any time be associated with your responses. Your responses will be kept ***confidential*** *and will not influence your course grade.*

Demographic Information

1. Your email address
2. Gender
    a. Female
    b. Male
3. Age range
    a. 18-22
    b. 23-26
    c. 27-32
    d. 32+
4. Major
    a. Early Childhood Education
    b. Elementary Education
    c. Other
5. Area of Specialization
    a. Art
    b. Early Childhood Education Unified with Special Education
    c. English and Language Arts
    d. Foreign Language
    e. Health
    f. History
    g. Instructional Strategist: Mild/Moderate (K8) Endorsement
    h. Mathematics
    i. Music
    j. Science-Basic
    k. Social Studies
    l. Speech/Theater
    m. Other
6. Year in College
    a. Freshman
    b. Sophomore
    c. Junior
    d. Senior
7. Are you completing an educational computing minor?
    a. Yes
    b. No
8. Are you currently enrolled or have you completed a practicum experience in a PK-6 classroom?
    a. Yes
    b. No

9. What semester and year (e.g. spring 2012) do you plan to take the following? If you are currently enrolled in or have already taken one of these literacy block, please list semester and year completed.
Literacy Block 1 (CI- 377, 448, 468A,
468C)
Literacy Block 2 (CI 378, 449, 468B,
468D)
Student Teaching

Technology is a broad concept that can mean a lot of different things. For the purpose of this questionnaire, technology is referring to digital technology/technologies- that is, the digital tools we use such as computers, laptops, iPods, handhelds, interactive whiteboards, software programs, etc. Please answer all of the question, and if you are uncertain of or neutral about your response, you may always select "Neither agree nor disagree."

Technology Knowledge (TK)

Technology knowledge refers to the knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the Internet, digital video, interactive whiteboards, and software programs.

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 the technology.
5. I know about a lot of different technologies.
6. I have the technical skills I need to use technology.
7. I have had sufficient opportunities to work with different technologies.

Content Knowledge (CK)

Content knowledge is the knowledge about actual subject matter that is to be learned or taught. Teacher's knowledge about the content they are going to teach and how the nature of knowledge is different for various content areas.

Mathematics
8. I have sufficient knowledge about mathematics.
9. I can use a mathematical way of thinking.
10 I have various ways and strategies of developing my understanding of mathematics.

Social Studies
11. I have sufficient knowledge about social studies.
12. I can use a historical way of thinking.
13. I have various ways and strategies of developing my understanding of social studies.

Science

14. I have sufficient knowledge about science
15. I can use a scientific way of thinking.
16. I have various ways and strategies of developing my understanding of science.

Literacy
17. I have sufficient knowledge about literacy.
18. I can use a literary way of thinking.
19. I have various ways and strategies of developing my understanding of literacy.

Pedagogical Knowledge (PK)

Pedagogical knowledge refers to the methods and processes of teaching and includes knowledge in classroom management, assessment, lesson plan development, and student learning.

20. I know how to assess student performance in a classroom.
21. I can adapt my teaching based upon what students currently understand or do not understand.
22. I can adapt my teaching style to different learners.
23. I can assess student learning in multiple ways.
24. I can use a wide range of teaching approaches in a classroom setting.
25. I am familiar with common student understandings and misconceptions.
26. I know how to organize and maintain classroom management.

Pedagogical Content Knowledge (PCK)

27. I can select effective teaching approaches to guide student thinking and learning in mathematics.
28. I can select effective teaching approaches to guide student thinking and learning in literacy.
29. I can select effective teaching approaches to guide student thinking and learning in science.
30. I can select effective teaching approaches to guide student thinking and learning in social studies.

Technological Content Knowledge (TCK)

Technological content knowledge refers to the knowledge of how technology can create new representations for specific content. It suggests that teachers understand by using specific technology, they can change the way learners practice and understand concepts in a specific content area.

31. I know about technologies that I can use for understanding and doing mathematics.
32. I know about technologies that I can use for understanding and doing literacy.
33. I know about technologies that I can use for understanding and doing science.
34. I know about technologies that I can use for understanding and doing social studies.

Technological Pedagogical Knowledge (TPK)

Technological pedagogical knowledge refers to the knowledge of how various technologies can be used in teaching, and to understanding that using technology may change the way teachers teach.

35. I can choose technologies that enhance the teaching approaches for a lesson.
36. I can choose technologies that enhance students' learning for a lesson.
37. My teacher education program has caused me to think more deeply about how technology could influence the teaching approaches I use in my classroom.
38. I am thinking critically about how to use technology in my classroom.
39. I can adapt the use of the technologies that I am learning about to different teaching activities.

Technological Pedagogical Content Knowledge (TPACK)

Technological pedagogical content knowledge refers to the knowledge required by teachers for integrating technology into their teaching in any content area.

40. I can teach lessons that appropriately combine mathematics, technologies, and teaching approaches.
41. I can teach lessons that appropriately combine literacy, technologies, and teaching approaches.
42. I can teach lessons that appropriately combine science, technologies, and teaching approaches.
43. I can teach lessons that appropriately combine social studies, technologies, and teaching approaches.
44. I can select technologies to use in my classroom that enhance what I teach, how I teach, and what students learn.
45. I can use strategies that combine content, technologies, and teaching approaches that I learned about in my coursework in my classroom.
46. I can provide leadership in helping others to coordinate the use of content, technologies, and teaching approaches at my school and/or district.
47. I can choose technologies that enhance the content for a lesson.

Models of TPACK (Faculty, PK-6 Teachers)

1. My mathematics education professors appropriately model combining content, technologies, and teaching approaches in their teaching.
2. My literacy education professors appropriately model combining content, technologies, and teaching approaches in their teaching.
3. My science education professors appropriately model combining content, technologies, and teaching approaches in their teaching.
4. My social studies professors appropriately model combining content, technologies, and teaching approaches in their teaching.
5. My instructional technology professors appropriately model combining content, technologies, and teaching approaches in their teaching.

6. My educational foundation professors appropriately model combining content, technologies, and teaching approaches in their teaching.
7. My professors outside of education appropriately model combining content, technologies, and teaching approaches in their teaching.
8. My PK-6 cooperating teachers appropriately model combining content, technologies, and teaching approaches in their teaching.

Using the percentage scale below answer the following questions accordingly.

25% or less
26%-50%
51%-75%
76%-100%

9. In general, approximately what percentage of your teacher education professors have provided an effective model of combining content, technologies, and teaching approaches in their teaching?
10. In general, approximately what percentage of your professors outside of teacher education have provided an effective model of combining content, technologies, and teaching approaches in their teaching?
11. In general, approximately what percentage of the PK-6 cooperating teachers have provided an effective model of combining content, technologies, and teaching approaches in their teaching?

Please complete this section by writing your responses in the space provided.

1. Describe a specific episode where a professor or an instructor effectively demonstrated or modeled combining content, technologies, and teaching approaches in a classroom lesson. Please include in your description what content was being taught, what technology was used, and what teaching approach(es) was implemented.
2. Describe a specific episode where PK-6 cooperating teachers effectively demonstrated or modeled combining content, technologies, and teaching approaches in a classroom lesson. Please include in your description what content was being taught, what technology was used, and what teaching approach(es) was implemented. If you have not observed a teacher modeling this, please indicate that you have not.
3. Describe a specific episode where you effectively demonstrated or modeled combining content, technologies, and teaching approaches in a classroom lesson. Please include in your description what content was being taught, what technology was used, and what teaching approach(es) was implemented. If you have not had the opportunity to teach a lesson please indicate that you have not.