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The Preparation of Preservice Teachers for Integrative Technology Use

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by

Brieahna Malia Weatherford

Committee in charge:

University of California, San Diego

Amanda Datnow
Chris Halter

California State University, San Marcos

Carol VanVooren, Chair
Manuel Vargas

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The Dissertation of Brieahna Malia Weatherford is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

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DEDICATION

I dedicate this dissertation work to my husband, Marshal, for his unwavering support and love throughout this entire process; to my wonderful parents for so many dinners I didn't have to cook and for instilling in me the drive, dedication, and focus to follow my goals and dreams; to my brother and sister for their never-ending "status checks" on life and my progress and for being my biggest fans; to my grandparents for raising my parents and our family with a passion for education and knowledge that hard work makes anything possible; to my amazing committee for their countless hours of feedback and dedication toward my success; and to my dissertation chair, Carol, for her support, friendship, positivity, and involvement in every step of this process.

It truly takes a village to accomplish something this monumental, and I am forever grateful for the love and support you each provided in your own special ways.

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2006	Bachelor of Arts, University of California, Santa Barbara
2006-2008	College Admissions Counselor/Director, National University, San Diego
2009	Master of Education in Cross Cultural Teaching and Single Subject Teaching Credential, National University, San Diego
2009-2013	High School Teacher, San Diego County
2013-current	High School Administrator, San Diego County
2015	Doctor of Education, University of California, San Diego and California State University, San Marcos

ABSTRACT OF THE DISSERTATION

The Preparation of Preservice Teachers
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by

Brieahna Malia Weatherford

Doctor of Education in Educational Leadership

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Professor Carol Van Vooren, Chair

Technology use continues to be an integral component of 21st-century education. Educational leaders and teachers are tasked with using technology as an approach to forge new ways of thinking, effectively connecting educational content with real-world understanding. This new era of technology-driven teaching and learning includes new skill development and applications of 21st-century technology concepts. The use of technology within educational practice is critical, and understanding how to best prepare future educators for effective technology use will impact future generations of learners.

The technological, pedagogical, and content knowledge (TPACK) framework supports educators with effectively integrating technology into their teaching as a way to deepen understanding and mastery of the subject matter. Teacher education programs need to adequately prepare future teachers for effective technology integration into the classroom, as well as to address the gap that exists between future teachers and 21st-century teaching and learning practices. The literature supporting this study examined 21st-century skills and learning, the TPACK framework, and actions currently taking place within teacher education programs supporting technology integration into the teaching and learning environment. This study was a mixed-methods design, including survey responses and focus group interviews. Data were collected from one university and analyzed via the lens of the literature and the theoretical framework of phenomenology. Research findings included preservice teacher candidates feeling adequately prepared for technology integration, based on a combination of preservice teachers' prior knowledge and the preparation and organization of the university faculty. The use of informal mentoring proved important for validation and support of technology use in the teaching and learning environment, and the value of face-to-face instruction for the learning, acquisition, and use of digital tools and resources surpassed digital instruction. Areas for future research include longitudinal studies at multiple universities, the use of the TPACK framework within university-level programs for the instruction of pedagogy and methods courses, single standalone technology course versus an integrative approach to teaching and instruction at the university level, and university partnerships for facilitating and supporting best practices toward technology use for effective 21st-century teaching and learning.

INTRODUCTION

The use of digital tools, such as the Internet, mobile devices, and Web 2.0 tools such as Google Apps for Education, is changing the process of teaching and learning. Over 50% of kindergarten through 12th-grade students report using the Internet for homework, 75% of kindergarten through second-grade students are using computers and mobile devices in their classrooms, and 80% of students in Grades 9-12 use their mobile devices daily to access the Internet for educational content (Project Tomorrow, 2013). Group projects and peer collaboration are being completed via Facebook and Twitter, and over 44% of students want to read books in school using a digital reader (Project Tomorrow, 2013). Technology use for effective teaching and learning continues to be an invaluable component of 21st-century education. Educators are being tasked with using technology within the teaching and learning process as an approach to forge new ways of thinking, offering more effective ways of connecting educational content with real-world understanding. This transition is focusing educational leaders, teachers, and students into a new era of technology-driven teaching and learning. However, with the continued development of new technologies comes the learning and understanding of new skills, definitions and applications of 21st-century technology concepts, devices, technology tools, teaching and learning theories, and new practices for both educators and learners. The partnership between technology and learning is critical, and understanding how to best prepare future teachers for successful and effective technology use in the classroom is vital to future generations of learners.

CHAPTER 1

The concepts of 21st-century learning continue to emerge within the educational context. Students are expected to acquire a specific skill set, often referred to as digital literacies, in order to be successful in the rapidly changing educational environment (Hockly, 2012). The understanding and application of Web 2.0 tools is becoming expected, and students are being tasked with creating educational content in ways never before associated with learning (Albion, 2008). Skills for the future workforce of 2020 include proficiencies in adaptive and computational thinking, new-media literacy, and virtual collaboration, all components of technology-rich learning (Beers, 2011; Davies, Fidler, & Gorbis, 2011; Mills, 2010). Additionally, future teachers are being tasked with merging their knowledge of common technologies with teaching and learning in a content-driven environment (Bennett, Maton, & Kervin, 2008). The successful preparation of future teachers will ensure that all students are exposed to the technology concepts and tools expected for their futures.

The technological, pedagogical, and content knowledge (TPACK) framework and concerns-based adoption model (CBAM) dominate the literature supporting the successful integration of technology into both the preservice and practicing educational environments. Integration typically follows one of these major frameworks (N. E. Davis & Roblyer, 2005). The TPACK framework supports many research studies, grant projects, and theoretical frameworks surrounding technology integration for teaching and learning. TPACK is also viewed as a framework supporting educators in using technology as an effective educational device for the process of teaching and learning academic content in ways that make it comprehensible and accessible to all students

(Dilworth et al., 2012; Polly, Mims, Shepard, & Inan, 2010). This framework, and the research supporting its impact on educational technology integration, continues to lay the foundation for research and investigation on the preparation of future teachers for technology use in the classroom. Therefore, the TPACK framework provided the focus for this literature review (Polly et al., 2010).

The use of technology for the advancement of learning and mastery of future skills is imperative. Future generations of students will be required to have skills for the workforce focused on technology use and application and will be expected to collaborate, contribute, and participate in technology-driven work environments (Davies et al., 2011; Lambert & Gong, 2010). There are jobs that exist today that did not exist 5 years ago, and this is just the beginning. Future students will be the individuals expected to create and/or succeed in these new technology-driven careers. Meanwhile, future teachers are entering preparation programs with knowledge of technology use but lacking an understanding of how to connect digital tools toward effective teaching and learning. Teacher education programs continue to fall behind the curve with technology application and integration into their own teaching and learning model, leaving future teachers lacking essential skills for technology use in the classroom upon graduation (Chen, 2010; Ottenbreit-Leftwich et al., 2012). The disparities that exist between what teacher education programs deem as necessary technology skills for educators and what students actually require for future advancement in education and the workforce have created a disconnect between teaching and learning and actual student needs (Ottenbreit-Leftwich et al., 2012). Aspiring teachers imagine their classrooms as collaborative, creative, and innovative learning environments. Teacher education programs need to adequately

prepare and empower future teachers to become active members of 21st-century teaching and learning and to make their positive visions of education a reality.

The current state of teacher education programs is best understood by the assessment of where current preservice education programs and future teachers stand. This includes the analysis of the current state of technology use in preservice education courses, how college professors and instructors are utilizing technology for teaching and learning, how preservice education candidates are experiencing technology use for teaching and learning, and how these practices transfer into the student teaching or classroom experience, as well as an assessment of policy changes at a national level (Donovan, Green, & Hansen, 2011; Pavlova, 2012; Tondeur et al., 2012). Many of the challenges with the current state of preservice education programs lie in the vast disparities that exist between preservice teaching candidates' and instructors' knowledge of technology use and application for teaching and learning.

A majority of the current candidates within teacher education programs are considered part of the net generation or digital natives, individuals who have grown up with technology, mastering technology use on a personal level (Bennett et al., 2008; Kumar & Vigil, 2011). However, these candidates do not have the knowledge or experience to transfer this mastery of technology use into the teaching and learning process. Simultaneously, many professors and university instructors lack skills for using technology within the teaching and learning process. Instructors are typically classified into two categories: those who are technology experts teaching standalone technology courses and those who are not as proficient in technology use, teaching preservice methods courses with limited technology integration (Hoffer & Grandgenett, 2012;

Tondeur et al., 2012). Depending on the instructor(s) whom a preservice teaching candidate experiences throughout his or her coursework, the candidate may have a very different experience with technology use for teaching and learning, the modeling of technology use within instruction, and technology use for assessments. This range of experience and focused interactions with technology use results in many future teachers reporting not being well prepared for using technology for teaching and learning (Donovan et al., 2011; Tondeur et al., 2012).

In order to make sustainable changes to preservice teacher education programs, policy at the institutional level must change. Currently, significant differences exist from program to program, relating to technology requirements, access, instructors' technology use for teaching and learning, and belief in the importance of technology use for education (Donovan et al., 2011; Tondeur et al., 2012). In order to unify preservice teacher education programs throughout the nation, the development of a technology plan for policy change is crucial. This requires cooperation and collaboration within and between institutions for consistent technology use, as well as a clear and consistent plan for integration into the instruction and preparation of future teachers (Niess, 2011). While policy changes at a national and institutional level are often daunting, changes as a systemic effort can be sustainable and are often an appropriate method for beginning the change process (Tondeur et al., 2012). This effort includes future teachers as a part of the systemic change process, providing them with opportunities to collaborate and to have experiences with technology use so that technology use is not seen as special but merely a piece of their curriculum (Tondeur et al., 2012). With continued, focused research efforts, systemic and systematic policy changes toward unifying teacher education are a

possibility. This in turn will provide equitable educational opportunities to future teachers for teaching and learning, including technology use in their future classrooms.

The review of literature, Chapter 2, addresses the research surrounding 21st-century technology concepts, as presented in both an educational and real-world context. This discussion provides definitions and understanding of what technology skills are required of both educators and students for teaching and learning in this technology-driven world. The literature review provides a foundation of understanding and urgency toward the use of technology within the classroom and how it provides future generations with crucial skills and knowledge to be competitive, productive members of society. The literature review includes an in-depth discussion on the TPACK framework, one of two conceptual frameworks that serve as the foundation for most technology integration initiatives. Additionally, the literature review covers the actions that are currently taking place to prepare future teachers for effective technology use in the classroom, as well as the current state of teacher education programs and technology use. The gap that exists between the current knowledge of future teachers and technology-based teaching and learning practices is identified, as well as the need for future research.

Chapter 3 describes the research methods established to begin to fill the void in the current literature by examining future teachers' levels of readiness for technology use in the classroom and within the teaching and learning process. Additionally, this study provided possible recommendations of best practices for institutes of higher education, focused on the preparation of future teachers to successfully facilitate technology use in the classroom and learning environment. This mixed-methods research study examined the following research questions:

1. How do preservice teachers perceive their teacher preparation program for purposeful technology use in the teaching/learning environment?
2. What do preservice teachers perceive as their digital readiness needs for purposeful technology use in the teaching and learning environment?
3. What do preservice teachers perceive as strengths within their teacher preparation program in support of purposeful technology use?

Information on how the site and population were selected is covered in Chapter 3, as are data collection methods, instruments, and data analysis. Issues of validity, reliability, and trustworthiness are discussed, as are ethical issues, roles of the researcher, and limitations to the study.

Definitions of Terms

21st-century skills. Changes in technology and culture are leading to changing demands in the workplace, and so the skills that are required in today's workplace and the future workplace are different from those required in the past (Kyllonen, 2012). Examples include creativity and innovation, critical thinking and problem solving, communication, collaboration, information management, effective use of technology, career and life skills, and cultural awareness (Beers, 2011; Ravitz, Hixson, English, & Mergendoller, 2012).

Common technologies. Common technologies include Google Apps for Education, iPads, Apple TV, Chromebooks, PowerPoint, Blackboard, laptop computers, portable zip drives for file transfers, digital cameras, video cameras, microphones, and CD burners (Lisowski, Lisowski, & Nicolia, 2007).

Digital tools. Technology-driven tools used for educating diverse student learners include the Internet, mobile devices, Web 2.0 tools like Google Apps for Education, and electronic teaching aids such as lesson plans, interventions, assessment software, online databases (e.g., census data, education statistics), game-based environments, animations and simulations, video clips, podcasts, and so forth (Hockly, 2012; Kumar & Vigil, 2011; Linik, 2012; Mills, 2010; Project Tomorrow, 2013).

Future teachers. Future teachers are individuals who are currently enrolled in university-level teacher education programs, who have the intent to become credentialed teachers.

Preservice. Preservice refers to the time before earning or receiving a teaching credential, during a future teacher's enrollment and participation in his or her credential program.

Technology integration. Technology integration is the idea of viewing technology as a part of the curriculum, teaching, and learning process and not just a special tool for use.

Technology use. Technology use refers to utilizing technology as a tool with which to deliver curriculum and content in a meaningful and purposeful way, focused on teaching and learning.

TPACK. TPACK is technological, pedagogical, and content knowledge referred to as a framework in this study.

CHAPTER 2

21st-Century Skills and Learning

Never before has technology so greatly impacted the way people learn, work, and live. Tasks that once took days or even years to accomplish are now being completed instantly via collaborative, technology-driven environments (Davies et al., 2011). As new technologies are developed, old ways of thinking and learning are rapidly being replaced at a rate that is increasingly difficult to embrace (Gulbahar, 2005). These changes require a different skill set and way of interacting with learning, as collaboration, participation, and contribution are beginning to take more technology-driven forms (Davies et al., 2011; Lambert & Gong, 2010). Future teachers and students will need to acquire these skills in order to have the tools for success needed in the technology-driven world in which they live (Kyllonen, 2012; Mills, 2010). Numerous research studies have begun to address these changes and newly defined skill set, and while each study differs in how the skills are interpreted, there exist many common definitions of what 21st-century skills include. The common skills most frequently identified across most studies are creativity and innovation, critical thinking and problem solving, communication, collaboration, information management, effective use of technology, career and life skills, and cultural awareness (Beers, 2011; Ravitz et al., 2012). While these skills are not necessarily new, the use of technology will drastically affect the way in which students learn and educators teach, as well as how these skills are connected to the educational environment (Beers, 2011; Linik, 2012; Mills, 2010; Niess, 2011).

Several organizations have attempted to research and define these 21st-century skills with specific meanings and outcomes. The Partnership for 21st Century Skills (P21,

2011) was one such group, working in collaboration with AOL, Cisco, Microsoft, and the U.S. Department of Education. Together they created the idea that along with the traditional three *R*s—reading, writing, and arithmetic—21st-century skills encompass the four *C*s: collaboration, communication, critical thinking, and creativity (P21, 2011). Additionally, technology-driven skills are acquired through the concepts of innovation, information, media, and technology skills, as well as life career skills (Kyllonen, 2012; Mills, 2010). Many claim that communication is changing drastically and new technologies are bringing about the need for a new understanding of how to communicate effectively in the digital world (Davies et al., 2011). Concurrently, as businesses take on more technology-driven forms of collaboration, the need for information, media, and technology skills becomes even more pressing (Mills, 2010). While these collaborative and connective technologies make it easier than ever to share and produce information, new competencies must be learned, practiced, and applied in order to experience success in this technology-rich environment (Davies et al., 2011; Lambert & Gong, 2010).

Technology skills have become the avenue for fostering collaboration and competencies, preparing students for their futures and success in the workforce. An understanding and application of these tools and knowledge is imperative for students and demands that the education system take action. The unification of these requirements with new pedagogical education issues will shape how educational leaders, teacher education programs, future educators, and students face these rapidly changing demands and expectations. Through the use of appropriate technologies, students will be armed with the skills necessary to address real-life problems in a collaborative and effective manner (Beers, 2011; Kyllonen, 2012). German psychologist Herman Ebbinhaus, an

expert on learning retention, concluded that learning retention is very low when learning is done through the acquisition of content and without application (Beers, 2011). The challenge therefore lies in the school systems developing effective methods in which to teach and prepare students for their futures while using technology as an effective tool for application of content (Linik, 2012). Change occurs by integrating technology literacy content and skills into education programs, as well as by placing added emphasis on the development of critical thinking, communication, collaboration, and creativity skills (Beers, 2011; Davies et al., 2011; Ravitz et al., 2012). While the United States has been deemed as being well behind the curve with the integration of technology and 21st-century skills into the classroom, the overlap between the importance of these skills for learning and for success in the future workforce cannot be ignored (Ottenbreit-Leftwich et al., 2012). It is necessary to push toward making this integration a top priority in today's education system in order to provide students with the best opportunities possible for a successful future (Kyllonen, 2012; Linik, 2012).

Addressing how to integrate these 21st-century skills into teaching and learning, as well as the measurement and assessment of students' levels of mastery of these skills, continues to develop. While some of these skills can be measured via more traditional summative assessments, other proficiencies, such as those focusing on the ideas of innovation, collaboration, and technology skills, may not be as easily assessed (Kyllonen, 2012). The U.S. Department of Education and the Partnership for 21st Century Learning began to address the issues of integration and assessment in the classroom with the creation of the Common Core State Standards Initiative and P21 framework. The standards were written as a way to provide students with a quality education, as well as to

provide educators with a set of standards that represent success in every school across the nation (Common Core State Standards Initiative, n.d.).

Written within these standards are the 21st-century skills relating to technology proficiencies. This includes the use of technology tools, actions, collaboration, and effective communication toward learning with technology. When the technology standards within the Common Core State Standards document are isolated, the types of 21st-century proficiencies for students become very clear, as do the methods for assessment of these skills (Kyllonen, 2012). The P21 framework is an additional resource for educators, which again clearly represents the integration of these 21st-century skills into the educational environment for optimal student success (P21, 2011). Over the past few years, the skills required for the successful use of technology or digital tools for teaching and learning have begun to take on a new definition for both students and educators. While the traditional definition of literacy still refers to one's ability to read and write, the definition in terms of 21st-century skills has begun to include the idea of digital literacy (Hockly, 2012; Linik, 2012). It is the understanding and application of these digital literacies that educators and students must embrace, especially as technology becomes more present in their daily lives, communities, and classrooms (Lambert & Gong, 2010).

The definition and understanding of digital literacies provides much of the framework for the current shift in education, how students are learning, and ways in which educators can connect technology tools with content. Digital literacies can be described as a specific skill set that students need to acquire in order to be 21st-century learners and contributing members of society (Hockly, 2012). These skills can be further

described as proficiencies that will continue to grow, develop, and be challenged as technology morphs and advances, not items that are checked off once they are learned and accomplished (Hockly, 2012). Closely connected is the knowledge and understanding surrounding Web 2.0 tools. Web 2.0 tools can be defined as technology tools that provide opportunities for users to generate and create content and data while sharing these creations with others in a collaborative manner (Albion, 2008). The knowledge of Web 2.0 tools and the mastery of digital literacy skills are proficiencies employers will expect of the new generation of students (Albion, 2008; Hockly, 2012). Inadvertently, this assumption makes the stakes even higher for future educators to properly equip their students with the technology literacies expected for a successful future.

Simultaneously, a specific 21st-century population has begun to emerge, defining a new type of individual entering the workforce. This population has been deemed the digital natives, individuals born between the years of 1980 and 1994, who have grown up in a technology-driven era (Bennett et al., 2008). They expect learning to be current, interactive, and engaging due to their knowledge and understanding of using technology on a day-to-day basis (Beers, 2011). These same individuals have also been defined as the net generation, based on their continued interactions with information and communication technologies (ICTs), as well as a defined skill set with technology for personal use (Kumar & Vigil, 2011). As more and more digital natives and net generation individuals enter the workforce, researchers are focusing on this population as they begin their journey as future teachers (Lei, 2009). Research thus far has included university-level participants in the first year of their teacher education programs (Bennett et al.,

2008; Kumar & Vigil, 2011). The current research has concluded largely the same ideas: Digital natives and the net generation express very positive attitudes and beliefs about technology and have high comfort levels with technology for personal use. However, these same individuals/future teachers have very limited understandings of and experience using Web 2.0 tools, creating online content, and connecting technology use within the classroom for teaching and learning purposes (Kumar & Vigil, 2011; Lei, 2009; Niess, 2011).

Social justice and equity implications for digital natives and the net generation are also connected to the mastery and knowledge of 21st-century skills and technology tools (Bennett et al., 2008). Past research has included thousands of students from universities across the nation to assess the learning differences of digital natives and the net generation. While Bennett et al.'s (2008) study did not specifically target those individuals within a preservice teacher education program, the findings were consistent with the related studies (Kumar & Vigil, 2011; Lei, 2009). Disparities do exist within the digital native and net generation populations, specifically for those from different socioeconomic backgrounds (Bennett et al., 2008). Digital natives from lower socioeconomic backgrounds with limited access to technology demonstrate less frequent use and skill development. Those from higher socioeconomic backgrounds have more opportunities for use and higher levels of interactions with the Internet, social communications via technology, and academic-related experiences with technology tools. As digital natives and the net generation continue to enter the workforce as educators, the importance of providing tech-savvy future teachers with positive and meaningful interactions, focused on learning with technology, continues to be a critical issue.

Additionally, the need for technological equity is an integral component of this learning process, ensuring that all educators are provided with the same opportunities for success and mastery of technology-based skills and tools. This idea is further explored within a framework that supports educators in using technology for effective teaching and learning experiences while encouraging equitable learning opportunities for all (Niess, 2011).

Technological, Pedagogical, and Content Knowledge (TPACK) Framework

In order for technology to be used as an effective teaching and learning tool, future teachers must learn how to apply their technology skills toward positive, focused educational experiences. These experiences must include opportunities for students to increase learning and mastery of content simultaneously with the application of technology tools and 21st-century skills (Hoffer & Grandgenett, 2012). It is not what the teacher knows about teaching with technology but *how* the technology is used that truly makes a difference to the learner (Mishra & Koehler, 2006). The relationship between an educator's knowledge of content and pedagogy has been addressed through the specific investigation of a concept known as pedagogical content knowledge (PCK; Shulman, 1986). Shulman's (1986) research created the foundation for the technological, pedagogical, and content knowledge (TPACK) framework, which describes a way for educators to develop a new knowledge base, essential for the best teaching and learning practices involving technology (Pamuk, 2011).

The definition of teaching knowledge initially consisted of one's ability to know the content in which he or she is teaching, as well as the pedagogy connected with good teacher practices (Koh & Divaharan, 2011). These were the components that defined

teaching and learning practices, centering on an educator's ability to promote mastery of specific subject matter and content within his or her classroom (Pamuk, 2011). However, an essential but unidentified concept was missing, linking these notions toward knowledge for teaching. It was determined that the missing component was one that actually overlapped with the prior context of content knowledge and pedagogy (Jaipal & Figg, 2010). This missing overlap was defined as PCK, or one's knowledge of the subject matter, specific pedagogical knowledge surrounding the content, and knowledge of the curriculum (Shulman, 1986). PCK also referred to an educator's ability to gauge the difficulty of specific topics, as well as the refinement of the tools and most useful forms of representation of content for learning (Shulman, 1986). This belief formed the foundation for educator practices focusing on pedagogy and content knowledge. The emergence of 21st-century technologies, and the inclusion of these technologies in the learning process, requires educators to reevaluate existing pedagogical beliefs and to reestablish teaching and learning practices.

As 21st-century technologies became more present in the classroom, a reevaluation of the PCK framework began to take place. The thinking changed from knowledge focused on pedagogy for teaching practices and content, to teachers' knowledge of technology use in their teaching and content pedagogy (Mishra & Koehler, 2006). From this reevaluation, three essential types of knowledge were defined: technological knowledge, pedagogical knowledge, and content knowledge (Dilworth et al., 2012; Graham, 2011). Today, these concepts are known as the TPACK framework, an updated version of Shulman's (1986) PCK framework. The focus of the TPACK framework is not the what but the *how* of technology use in the educational context

(Mishra & Koehler, 2006). Teachers need to be educated on how to use technology effectively, specifically for student improvement and learning in schools (Graham, 2011; Polly et al., 2010). Within the TPACK framework, the complex process of technology use is supported. Additionally, the subject matter, technology tools, and methods of teaching and evaluation all focus toward the most powerful and effective principles of successful technology integration (Pamuk, 2011).

The TPACK framework supports many research studies, grant projects, and theoretical frameworks. One of these projects was the U.S. Department of Education's Preparing Tomorrow's Teachers to Use Technology (PT3) grants (Polly et al., 2010). The PT3 grants were available from 1999 to 2003, funding over 400 projects designed to acknowledge the need for technology integration into the primary and secondary school settings. From these projects, universal TPACK definitions emerged. Content was defined as the subject matter being taught, technology referred to the tools used to present information in multiple modalities, and pedagogy related to the process, practice, and methods of teaching and learning (Mishra & Koehler, 2006). The TPACK framework was viewed in numerous aspects of the research as a means to support educators in using technology as an effective educational device, supporting the process of learning, and toward teaching a subject in ways that make content comprehensible and accessible to all (Dilworth et al., 2012; Polly et al., 2010). The PT3 grants were the first systematic and nationwide effort intended to increase the knowledge and skills of classroom teachers in using technology as a teaching and learning tool.

As new technologies continue to emerge, teachers will be encouraged to reflect on their pedagogical beliefs and teaching activities, observing how these new technologies

may or may not fit into their current practice (Pamuk, 2011). According to Polly et al. (2010),

> Teachers must be knowledgeable about the relationship between technology and content—how technology can be used to support the learning of specific content, technology and pedagogy—how specific pedagogies best support the use of technology, and content and pedagogy—how specific pedagogies facilitate learning of specific content. (p. 864)

This awareness allows educators the opportunity to see the ways in which technology integration can be an integral part of the teaching and learning experience, as well as how the TPACK framework can impact equity for learning. Two studies highlighted equitable educational experiences for all students via the use of technology. The Banister and Vannatta Reinhart (2011) study focused on the examination of the relationships between teachers' experiences with conveying academic content, providing a democratic classroom setting, and effectively integrating technology into the teaching and learning process. The Marino, Sameshima, and Beecher (2009) study focused specifically on the use of adaptive technologies in order to maximize the educational and future employment opportunities for students with disabilities.

The data from the Banister and Vannatta Reinhart (2011) study, examining teachers' relationships with technology, provided insight on technology integration for learning and content mastery, guided by the TPACK framework. Social justice within these classrooms was positively impacted by the creation of an educational environment that was respectful, student centered, and a place where participants actively searched for knowledge and where the student voice was honored (Banister & Vannatta Reinhart, 2011). Inadvertently, these same teachers saw an impact on the digital divide at the

school by providing access to digital technologies that were otherwise unavailable to students (Banister & Vannatta Reinhart, 2011). Teachers who committed to empowering their students with technology tools for learning while using principles of teaching for social justice and democracy saw better student achievement results on standardized tests. These successes continue to prompt a commitment toward following the TPACK framework for further technology use in the classroom. The systematic integration of technology continues to provide opportunities for the analysis of data, driven by technology use, for the monitoring, assessment, and evaluation of student progress for increased student achievement (Earle, 2002; Ottenbreit-Leftwich et al., 2012; Project Tomorrow, 2013).

The research surrounding the Marino et al. (2009) study on the use of adaptive technologies stressed the importance of the inclusion of these technologies in the TPACK framework. With the help of these technologies, students with disabilities are able to experience a process of lifelong learning while having added success for both educational and future employment opportunities (Marino et al., 2009). Adaptive technologies provide all students with access to education and allow the teachers to better support the needs of students with disabilities. However, this process must begin within the teacher education program. Future teachers need opportunities for understanding the TPACK framework, as well as how all technologies can be used toward providing opportunities for educational equity (Marino et al., 2009). Providing learning experiences that include exposure to the TPACK framework and the use of technology early on allows for confidence with content mastery via technology use, thus creating stronger, more equitable learning experiences for students who often have less than positive educational

encounters. This shift marks progress toward addressing educational equity via the use of technology, the digital divide, and how technology use can support student performance (Banister & Vannatta Reinhart, 2011; Earle, 2002; Ottenbreit-Leftwich et al., 2012). However, it is not the quantity of technology used but the quality of technology use with content that results in a clear indicator of success (Lei & Zhao, 2005).

The TPACK framework indicates a positive impact on learning through skilled use of technology in the classroom. Future teachers need to be equipped with the necessary knowledge and skills in order to feel comfortable, confident, and effective in using technology tools in the classroom (Banister & Vannatta Reinhart, 2011; Baran, Chuang, & Thompson, 2011; Mishra & Koehler, 2006). Specifically, this would provide an opportunity for future teachers to be in a position to use technology as an educational tool, supporting progress toward closing the digital divide and beginning to provide a pathway over the widening achievement gap. Many preservice teacher education programs have implemented strategies toward integrating technology tools into the teaching and learning process. As the education of future teachers directly correlates with the success of 21st-century student learning, technology integration strategies for preservice teachers must be effective, equitable, and research based in order to make an impact in future classrooms.

Actions Supporting Integration in Preservice Teacher Education Programs

As technology continues to develop at a rapid pace, technology use as recommended by the TPACK framework in preservice teacher education programs continues to fall behind the curve (Ottenbreit-Leftwich et al., 2012; Pamuk, 2011). Typically, teacher education programs offer one standalone or isolated technology course

in order to prepare future teachers to use technology in the classroom (Baran et al., 2011; Lambert & Gong, 2010). While this course may introduce teachers to technology tools they are not familiar with, teachers need modeling and opportunities to apply technology use in order for translation of these skills to be effective, authentic, and successful in their future classrooms (Banister & Vannatta Reinhart, 2011). Some future teachers consider technology use to consist of using word-processing programs and Internet browsers, when in actuality, technology use for 21st-century education is much different (Chen, 2010). Additionally, many future teachers lack skills when required to use tools such as PowerPoint, Blackboard, laptop computers, portable zip drives for file transfers, digital cameras, video cameras, microphones, and CD burners for teaching and learning—skills and devices that 21st-century learners are typically aware of (Lisowski et al., 2007). Furthermore, newer technologies include iPads, Apple TV, Chromebooks, and educational applications for both Apple and Android operating systems. The knowledge and skills to successfully use these tools are important for educators to have and hold immense power to enhance the educational experience; however, practice and use of these tools are limited within preservice teacher education programs outside of standalone technology courses (Chen, 2010; Lisowski et al., 2007).

According to the Speak Up for Aspiring Teachers survey, conducted by Project Tomorrow (2013), aspiring teachers imagine their future classrooms as collaborative, creative, and innovative learning environments, with technology at the core of these positive educational interactions. However, proficiency with 21st-century technology tools and devices, as well as fostering an innovative mindset, requires that both students and educators master a new set of skills for technology use and application. This requires

students and educators to become active members in what is commonly known as 21st-century learning (Hockly, 2012). In order for this technology integration transition to occur, moving toward the effective use of current technology tools, the factors of efficacy, training, and value must be addressed within preservice teacher education programs (Chen, 2010). It is this transition that presents an "opportunity to ensure that the next generation of teachers are well-prepared to not only leverage emerging technologies within instruction, but to play a pivotal role in the development of new capacities for learning with technology" (Project Tomorrow, 2013, p. 9).

While a disconnect exists between what future teachers are being taught and what current technologies are available for use in the classroom, many teacher education programs are beginning to implement components of the TPACK framework into the preparation process. In some programs, future teachers are taught to plan and design for content instruction via technology use, as the TPACK framework supports (Baran et al., 2011; Mishra & Koehler, 2006; Shulman, 1986). Additionally, other programs are beginning to ask future educators to look at content and how certain technologies may fit with the way in which the learning is presented. For example, a history teacher may consider using historical documents as the basis for a history project. Under the TPACK framework, this requires the teacher to understand the content and pedagogy in order to first find resources through which to access historical documents and determine how to use these documents for the teaching and learning process. The teacher must then identify specific strategies for student use and collaboration, such as via the use of Google Docs, as well as how students are going to make sense of using the technology toward mastery of the content (Hoffer & Grandgenett, 2012). For this example, making sense could

include the use of country codes when searching in Google for historical documents from other countries. The TPACK framework comes to life in this example, proving the importance of adoption of the framework and integration of learning with technology throughout the teacher preparation process. Technology integration cannot be learned through one technology course but must be presented, tested, modeled, and applied throughout the preservice education program. This must happen via interactions with both technology and content courses, providing future teachers with the opportunity to build the necessary skills in order to meet the needs of their 21st-century students (Hoffer & Grandgenett, 2012; Ottenbreit-Leftwich et al., 2012; Pamuk, 2011).

Teacher education programs are beginning to value the importance of the TPACK framework, as well as the need for technology use experiences to appear in more than just one technology course. However, action must be taken in order to close the gap that still exists between how future teachers are being taught and the way in which future students will learn (Ottenbreit-Leftwich et al., 2012). A more concrete understanding surrounding the ideas of best practices for technology integration for effective teaching and learning needs to be defined (Dilworth et al., 2012; Ottenbreit-Leftwich et al., 2012; Polly et al., 2010). Since these standards do not currently exist, many faculty members at institutes of higher education do not model technology use in their teaching, and it is not a well-practiced standard (Pamuk, 2011). Concurrently, most future teachers do not use technology within their student teaching experiences because they have had little to no instruction and/or interaction with technology use and tools as a mode of delivering educational content (Pamuk, 2011). A major shift at the higher education level must begin, supported by the TPACK framework, in order to adequately prepare future

educators to think and act in a way that includes technology use in the learning process (Cohen, Pelligrino, Schmidt, & Schultz, 2007). Future teachers, specifically digital natives and the net generation, believe in the merit of technology integration (Beers, 2011; Bennett et al., 2008; Cohen et al., 2007; Lei, 2009). However, due to the lack of technology training, modeling, and application within teacher preparation programs, many lack the skills needed to use technology for teaching and learning. In order for these teachers to meet the needs of their 21st-century learners, who are already ahead of the technology curve, technology education must be fused with the content and pedagogy components within teacher preparation programs (H. Davis, Hartshorne, & Ring, 2010).

Current State of Teacher Education Programs

Assessing the current state of teacher education programs is a necessary step as the United States moves forward with additional research and policy changes toward technology integration into the preparation process of future teachers. In order to best understand where current preservice education programs and future teachers stand, this analysis should include the current state of technology use in preservice education courses, how college professors and instructors are utilizing technology for teaching and learning, how future teachers are experiencing technology use for teaching and learning, and how these practices transfer into the student teaching or classroom experience, as well as an assessment of policy changes at a national level (Donovan et al., 2011; Pavlova, 2012; Tondeur et al., 2012). Additionally, research has shown that when looking at how teachers are being influenced for technology use and adoption into the teaching and learning process, quantity and quality of technology experiences throughout preservice teacher education programs truly have an impact (McGrail, Tinker Sachs,

Many, Myrick, & Sackor, 2011; Tondeur et al., 2012). Technology is significantly underused by future teachers, and a gap exists between what future teachers are currently being taught in their courses and the expectations for technology use in the classroom (Ottenbreit-Leftwich et al., 2012; Pamuk, 2011).

Currently, preservice teacher education programs include many candidates from the net generation, or those referred to as digital natives. These teaching candidates are individuals who have grown up with technology, mastering technology use on a personal level (Bennett et al., 2008; Kumar & Vigil, 2011). While they are competent with technology and technology tools, these individuals have limited knowledge of and proficiency with using technology for teaching and learning (Donovan et al., 2011). Therefore, when they enter teacher education programs, it is often expected that they are proficient with technology use and integration, when in fact they are missing the knowledge on how to apply these skills to the teaching and learning process (Kumar & Vigil, 2011; Tondeur et al., 2012). Additionally, many students in preservice teacher education programs report having insufficient access to technology throughout their preservice teaching experience that is focused on using technology for teaching and learning (Kopcha, 2012; Tondeur et al., 2012). Finally, professors of these preservice education courses, while masters of the content, are not always masters of technology themselves. The combination of limited access, inexperienced professors, and a lack of application of technology proficiencies for purposeful teaching and learning experiences provides the landscape for the current state of teacher education programs and technology use in the classroom.

When assessing the current state of faculty within preservice teacher education programs, researchers look at two different types of individuals: those who are technology experts teaching standalone technology courses and those who are not as proficient in technology use, teaching preservice methods courses with limited technology integration (Hoffer & Grandgenett, 2012; Tondeur et al., 2012). Faculty members at most colleges and universities typically want to see the benefits of changing their teaching style—for example, incorporating technology use—prior to making these tools a more natural component of their teaching, content, and courses (Donovan et al., 2011). However, research within preservice education programs has shown that many educators are beginning to acknowledge the importance of technology use for teaching and learning and are beginning to incorporate technology as a teaching and learning tool within the preservice education experience. Faculty members are beginning to see the importance and impact of fostering skills such as critical thinking, problem solving, and literacy development, especially digital literacy development (McGrail et al., 2011). Additionally, preservice teacher candidates benefit when their teachers act as role models for technology use. For example, if an instructor asks a student to purchase a graphing calculator or specific software for a course, the student expects that teacher or professor to know not only how to use the technology tool but how to teach with it as well (Tondeur et al., 2012). Research continues to show that students who observe their teachers integrating and modeling technology use have more positive and beneficial experiences with their own technology use (Koc & Bakir, 2010; Kopcha, 2012). The relationship between technology use and assessments also needs to be modeled and practiced for future teachers as another skill and component to technology use within the

teaching and learning process. While many of the current candidates within teacher education programs are proficient with personal technology use, they lack skills, knowledge, and experience with using technology for teaching and learning, much of which could be enhanced by the simple act of modeling by their instructors within their teacher education programs (Tondeur et al., 2012).

Preservice teaching candidates are leaving their college- and university-level programs to enter classrooms as student teachers. While they may be prepared for teaching and learning, many preservice teaching candidates report not being well prepared or having limited access and exposure to technology use for teaching and learning (Donovan et al., 2011; Tondeur et al., 2012). Many programs rely on a standalone technology course for the mastery of technology use in the classroom. While this course can be beneficial for the "how-to" component of the use of certain types of technology tools and devices, it does not support the transition of learning with technology into the classroom (Lambert & Gong, 2010; Mishra & Koehler, 2006). In a recent survey, future teachers requested more support focused on how to use technology for teaching and learning and not just on how to use the technology (Tondeur et al., 2012).

As preservice education programs begin to revise their pedagogy for technology use, the TPACK framework should be considered for integration support. TPACK provides a clear, researched method for linking theory with practice for technology use (Baran et al., 2011; Hoffer & Grandgenett, 2012; Koh & Divaharan, 2011). Additionally, preservice educators report wanting and needing more time for reflection about their personal technology use within the educational environment. The idea surrounding

reflection time is to provide opportunities to address negative attitudes relating to technology use. In theory, the luxury of reflection time for preservice candidates would provide opportunities for more interactions and experiences with technology, with hopes of having positive outcomes in order to change their mindset, comfort levels, and attitudes about technology use. However, time is something that most programs do not have in excess. Future teachers express the need for time and experience to prepare for technology use with different content, technology tools, and access to different modalities for learning. These experiences were reported to be most beneficial when working collaboratively in groups, sharing ideas, and receiving feedback on what worked for individuals within their teaching experiences (Dilworth et al., 2012). Finally, stronger connections need to be made between technology use and assessments. As mentioned with the instructors of preservice education courses, preservice teacher candidates need opportunities to practice and model this in their own teaching. Additionally, as statewide standardized tests continue to take the shape of technology-driven modes of assessment, the connection between technology use and assessments must continue to be strengthened (Ottenbreit-Leftwich et al., 2012).

In order to make sustainable changes to preservice teacher education programs, policy at the institutional level must change. Currently, significant differences exist from program to program as related to technology use for teaching and learning (Donovan et al., 2011; Tondeur et al., 2012). Requirements differ, with some programs implementing a standalone technology course while others infuse technology use and modeling throughout their methods courses. Some programs have professors and core teachers who are masters of not only their content but modeling technology use as well. Other

programs have instructors who are only masters of their content, while those who are comfortable and proficient with technology use are left to teach the standalone technology course. Programs differ in access, technology tools available for student use, technology requirements for students, and belief in the importance of technology use throughout the preparation process (Donovan et al., 2011; Ottenbreit-Leftwich et al., 2012; Tondeur et al., 2012). These are just a few of the significant differences that exist within teacher preparation programs, but each and every one of these differences produces a different kind of teacher, especially when it comes to the component of technology use for teaching and learning in the classroom.

In order to unify preservice teacher education programs throughout the nation, the development of a technology plan for policy changes is crucial. This requires cooperation and collaboration within and between institutions for consistent technology use, as well as a clear and consistent plan for technology integration into the instruction and preparation of future teachers (Niess, 2011). While policy changes at a national and institutional level are often daunting, Tondeur et al. (2012) described these changes as a systemic effort. This effort focuses on preservice education programs including preservice teachers as a part of the systemic change process, providing them with opportunities to collaborate and to have experiences with technology use so that it is seen as a piece of their curriculum and not something out of the ordinary.

With this idea, preservice education programs can focus on policy that introduces technology use for teaching and learning incrementally. A synthesized qualitative data (SQD) model for change, as presented by Tondeur et al. (2012), begins with the idea of preparing future teachers for technology use. From this concept, the model branches out

to include the ideas and importance of role models; reflection time; instructional design of teaching and learning times; collaboration opportunities; authentic experiences with technology use for teaching, learning, and assessments; and opportunities for feedback. This extends to a program level with a focus on cooperation with and between institutions, the training of staff members (especially those who teach non-technology-focused courses), access to resources, and technology planning and leadership. Finally, the outer circle of the model includes systemic and systematic change efforts, as well as aligning theory and practice with technology use. For policy changes to occur and to be sustained at a national level, a holistic approach, as mentioned with the SQD model, can be the catalyst for great impact. It would then be necessary to study how teacher education programs across the nation respond to the prescribed national factors and how this impacts future educators.

CHAPTER 3

Problem and Purpose

As technology continues to become an integral element of the teaching and learning process, the preparation of future teachers to effectively use technology in the classroom is crucial. However, current preparation programs, as well as instructors and faculty members within these higher education programs, may not be adequately prepared to meet the technology needs of future teachers. In order for these future teachers to meet the needs of the K-12 student population, they must be comfortable, confident, knowledgeable, and experienced with the use of technology as a component of the teaching and learning process. The literature supports the technological, pedagogical, and content knowledge (TPACK) framework as a focused and researched method to support the use and integration of technology in the classroom, as well as to understand methods in which future teachers can develop best practices for successful technology preparation, use, and integration (Mishra & Koehler, 2006; Shulman, 1986). Support from the educational research community, a focus on technology use for teaching and learning, and the importance of preparing both teachers and students toward acquiring 21st-century skills has resulted in developing partnerships to support technology use in the classroom (Chen, 2010; Cohen et al., 2007; Kumar & Vigil, 2011; Pamuk, 2011; Polly et al., 2010). Additional literature supporting the preparation of future teachers for technology use and integration, with a focus on the need for and the establishment of best practices, continues to make this topic an area of needed focus and research (Dilworth et al., 2012; Ottenbreit-Leftwich et al., 2012).

This study began to fill the void in the current literature by examining future teachers' levels of readiness for technology use in the classroom and within the teaching and learning process. Additionally, this study provided possible recommendations for best practices for institutes of higher education, focused on the preparation of future teachers to successfully facilitate technology use in the classroom and learning environment. The present study addressed the following research questions:

1. How do preservice teachers perceive their teacher preparation program for purposeful technology use in the teaching/learning environment?
2. What do preservice teachers perceive as their digital readiness needs for purposeful technology use in the teaching and learning environment?
3. What do preservice teachers perceive as strengths within their teacher preparation program in support of purposeful technology use?

Research Design

A mixed-methods research design supported this research study. Creswell (2012) noted that a mixed-methods approach is best suited for research studies that include the potential for both quantitative and qualitative data collection in order to best understand a research question or questions. Additionally, this approach utilized the strengths of both data collection techniques in order to gain the strongest possible understanding of the research questions. The explanatory sequential design was utilized for this mixed-methods study, beginning with a strong emphasis on the quantitative methodological approach, referred to as Phase 1 (Plano Clark & Creswell, 2010). This approach began a process of identification of the research problems based on trends in the field and/or the need to explain why something occurs. This approach was the best fit to begin this

mixed-methods design based on the literature focusing on research problems that include the need to explore unidentified or unknown variables.

With quantitative research, there are specific research designs focused on different outcomes and purposes for research, data collection, and findings. For the purpose of this study, the survey research design was utilized for the quantitative data collection and analysis in order to survey a sample population of individuals to most accurately capture their specific attitudes, opinions, behaviors, and/or characteristics (Creswell, 2012). More specifically, this research study included a cross-sectional survey design. This allowed for a subgroup of the overall research population to be surveyed in order to observe and analyze their attitudes, practices, beliefs, and opinions at a given point in time (Creswell, 2012). The purpose of using the cross-sectional survey design was to allow for a snapshot of the current levels of digital readiness of future teachers, for teaching and learning, within a preservice teacher education program.

Phase 2 of the mixed-methods research design included a smaller qualitative component, exploring individual cases in more detail. This was driven by the quantitative survey results and provided a continued opportunity for qualitative data collection and analysis in order to develop a deeper understanding of the research questions. This second phase of data collection included focus group interviews with survey participants, selected by convenience from the target participants, and provided a better assessment of the perceived digital readiness of future teachers. This additional data collection and analysis also provided an opportunity to recognize best practices for technology use and integration into the classroom, focused on preparing K-12 students for real-world applications and experiences (Ottenbreit-Leftwich et al., 2012).

Theoretical Framework

While the TPACK framework supported the technology use and integration aspects of this study and is often referred to as a theoretical framework, the theoretical framework of phenomenology assisted with supporting the social phenomenon and/or constructs that can often be discovered through qualitative data collection and analysis (Ornek, 2008). Additionally, a study conducted in 2008 discovered 83 different definitions of the TPACK framework, identifying more than minor differences, supporting the continued need for the development of a concrete TPACK theoretical framework (Graham, 2011). Phenomenology, also known as phenomenography, is having knowledge acquired by being a subject of the study and aims "to discover the qualitatively different ways in which people experience, conceptualize, realize and understand various aspects of phenomena in the world around them" (Ornek, 2008, p. 2). Due to the qualitative data collection and analysis component of this study, this theoretical framework supported this study primarily based on the idea that the knowledge shared with the researcher was based on the preservice teachers' knowledge and experiences within their preparation program. Another study by Mills (2010) connected the theoretical framework of phenomenology with the TPACK framework in order to study the perceptions of students in the study regarding technology within mathematics education. As this study researched preservice teachers' perceived experiences, needs, and program successes as related to technology use, the phenomenology theoretical framework, combined with the TPACK framework, framed the theoretical lens for this study.

Sample and Population

Site selection. The site selected for this study was General University. At the time of the study, this university served more than 10,000 students and consisted of a combination of full-time tenured or tenure-track faculty members. Among the top 10 undergraduate majors were business administration, psychology, and nursing. Over half of the student population received financial aid, and many members of the student population were the first in their family to earn and receive a bachelor's degree. General University was selected for this study based on its diverse student population, enrollment, students' ethnic diversity, number of students who accepted financial aid, and the number of students who were first-generation college graduates. Additionally, the offerings of education-related programs, credentials, and certifications at both the undergraduate and graduate levels were an important consideration in the selection of General University for this research study.

Population selection. Participant selection included preservice teaching candidates at General University, enrolled in both undergraduate and graduate-level credential programs, pursuing multiple-subject or single-subject teaching credentials. These preservice teaching candidates were invited to participate based on their enrollment in preservice teacher education courses, including student teaching or field experience. The possible number of respondents was roughly 100 students, based on the total enrollment within the preservice teacher credential programs at General University. The target number of respondents for the Phase 1 survey and quantitative data collection was 50 preservice teachers, roughly 50% of the target population, in order to best represent the data across all credential programs and for generalizability purposes.

Additionally, Phase 2 of the data collection process included focus group interviews with five to seven individuals from each credential program (multiple subject and single subject), selected based on convenience, for further data collection and analysis on the perceived digital readiness of future teachers at General University.

The target respondents for Phase 1 of the data collection process first received an initial email 1 week before the survey was administered. This email included a personal introduction; a description of the purpose of the study and of the survey tool; information on when to expect the survey, how it would be delivered, and how long it would take to complete; and information on the option for participants to receive a personal report listing their digital readiness upon completion of the survey (Appendix A). Target respondents were officially invited to participate in the survey via an email invitation, which again described the purpose of the survey and provided the survey link (Appendix B). The survey included a consent disclaimer on the first page, with an option for participants to give consent for participation by moving forward with the survey (Appendix C). Participants had the right to stop the survey at any time. Once the survey link was released to the target respondents, three to four reminder emails were sent in order to elicit participation (Appendix D). After the fourth reminder, no additional emails were sent.

The survey was administered to participants enrolled in all credential programs (multiple subject and single subject) at the beginning of the Spring 2015 semester. The survey administration window was open from January through March 2015. After the survey window closed, an invitation and a consent form were sent to all credential candidates, asking for their involvement in the focus group interviews (Appendices E and

F). This invitation and consent form were sent out during students' spring break, and the focus group interviews were scheduled upon students' return to school at the beginning of April 2015.

Data Collection Methods

Phase 1 of the data collection process with the survey instrument took place from January 2015 to March 2015, in alignment with the Spring 2015 semester at General University. This time period allowed for data collection during the spring courses prior to spring break, as aligned with the General University 2014-2015 academic calendar. During this time, the university target population was asked to participate in the survey at the beginning of the semester, with the survey window closing during spring break (see Appendix G for a copy of the survey instrument). The data included survey responses from participants enrolled in all credential courses, including individuals who were involved in their student teaching or field experience during this time frame.

All Phase 1 data collection using the survey instrument was completed via the use of Survey Monkey and with the complete consent of the participants (Appendix C). Additionally, all data collection procedures followed the guidelines and protocols set forth by the California State University, San Marcos Institutional Review Board (IRB). The collected data were secured within a Survey Monkey account, requiring a login and password. No participants accessed a paper survey.

Phase 2 of the data collection process via the focus group interviews took place beginning in April 2015. These data were collected during a 45- to 60-minute interview session for each credential program (multiple subject and single subject). The focus group interviews were recorded, notes were taken, and data were analyzed using the six

steps of qualitative data analysis including the preparation and organization of the data, coding, development of description and themes, representation and reporting of findings, interpretation of findings, and validation of the accuracy of the findings (Creswell, 2012). All analyses and notes were scanned and/or saved on a personal password-protected laptop.

Instruments

The main instrument for data collection in Phase 1 was the Teachers' Readiness to Adopt and Adapt Content (TRAAC) Digital Readiness Survey instrument. For use of this tool, a request was submitted to Project Tomorrow for attribution. The permissions for the use of the TRAAC Digital Readiness Survey allowed for and supported the repurposing of this assessment tool on behalf of the National Science Foundation Grant 1044501, under the Department of Undergraduate Education, as awarded to Project Tomorrow. A request for use of the TRAAC assessment tool and survey was submitted on September 21, 2014, to Project Tomorrow in order to receive permission for the outputs of this grant for use in this study. Additionally, a personal Survey Monkey account was created for the exportation of the survey instrument, as well as for a secure method in which to collect and store the data from the survey responses.

The purpose of the TRAAC Digital Readiness Survey was to gather preservice educators' thoughts, perceptions, and use of digital resources for instructional practices. Digital resources were defined as any type of freely accessible digital content used for education. This included podcasts, video clips, online databases, and/or assessment software such as Illuminate. The survey was 12 questions in length, with the first three questions having multiple response opportunities, and took roughly 10 minutes to

complete. Of these 12 questions, six were related to demographics (e.g., gender, years teaching, subjects taught, etc.), while the other five questions were directly related to the respondents' thoughts and perceptions on the use of digital resources for instructional practices. The final question (Survey Question 12) provided respondents with the opportunity to receive their results, based on their responses, as to where they fell on the Digital Readiness Spectrum. These results were only provided to respondents per their request.

The Digital Readiness Spectrum was a tool that provided survey participants with an explanation of their levels of readiness to adopt and use digital resources based on their responses to the survey questions. This tool also offered strategies to help survey respondents more effectively incorporate the successful use of digital resources into the teaching and learning process, as well as into their practice of serving as effective educators. An example of the Digital Readiness Spectrum, provided to respondents upon their request (Appendix G), and an example of the description of where a respondent fell on the spectrum (Appendix H) are included in the appendices.

For the Phase 2 qualitative data collection, focus group interviews were conducted with five to seven participants from each credential program (multiple subject and single subject), who were selected based on convenience sampling. If a larger number of target participants was available, a random selection sample, equally representing each credential program, would have been taken for the focus group interviews. The interview questions focused on the participants' views, perceptions, experiences, and plans for technology and/or digital tools use. The focus group interview protocol and questions are located in Appendix I. The interviews were scheduled based on participants' availability

and were conducted in focus groups with individuals from the same credential program (multiple subject and single subject). The interviews were scheduled for 45-60 minutes and included eight interview questions, with room for clarifying questions as needed.

Data Analysis

For Phase 1 of the analysis, the quantitative survey data were first exported from the Survey Monkey account into an Excel spreadsheet. The data were then scored, cleaned, and coded, per the created codebook, in preparation for upload into PSPP, a software application used for statistical analysis of sampled data. Codes represented answers in numeric form. Survey responses corresponding to a positive response, such as *strongly agree* (4), *usually or always* (4), *agree* (3), and/or *often* (3), were coded as a 4 or a 3. Answers corresponding to a negative response, such as *strongly disagree* (1), *never or rarely* (1), *disagree* (2), and/or *sometimes* (2), were coded as a 1 or a 2. Next, the data were organized and coded by the following themes, corresponding to specific focuses on the perceived readiness for technology use and integration throughout the survey instrument: skills, resources, experiences, and efficacy. These themes were then applied to each survey question as a labeled category within PSPP, further dividing each survey question into a larger group for analysis.

Descriptive statistics were run for Survey Questions 1 through 3 in order to best understand the nature of the data and to determine any other tendencies that the data may present. Using PSPP, the variables for the first three survey questions were analyzed for mean, standard deviation, variance, kurtosis, skewness, range, minimum, maximum, and sum. Visual representations of these analyses for each question were created in the form of histograms, using a feature in PSPP. Next, the groupings of questions were analyzed in

order to determine if there was any significant difference between how the preservice teacher candidates responded to the questions by theme. In order to determine significance, a group mean was calculated using the descriptive statistics for each coded group of questions, and an analysis of variance (ANOVA) was run for each grouping of questions. Table 1 is a portion of Appendix K, providing a visual representation of the statistical analyses performed. Please refer to Appendix K for more details.

Table 1: Visual Representation of Statistical Analyses Performed

Research question	Survey question related to research	Analysis (independent samples *t* test, paired samples *t* test, ANOVA, ANCOVA)	Variables (IV, DV, covariates)
1, 2, 3	1-3	Descriptive statistics: mean, standard deviation, variance, kurtosis, skewness, range, minimum, maximum, sum (including visual charts/histograms)	All variables for Survey Questions 1-3
1, 2, 3	1-3 and 9	Skills group mean/ANOVA	IV: Survey Question 9 (position or title) DV: Survey Questions 1C,D,E,G 2A,B,C,H,I 3E,F
1, 2, 3	1-3 and 9	Resources group mean/ANOVA	IV: Survey Question 9 (position or title) DV: Survey Questions 1A 2D,E,F,G,J 3A,B,C,D,G,H,J
1, 2, 3	1-3 and 9	Experiences group mean/ANOVA	IV: Survey Question 9 (position or title) DV: Survey Questions 1F 2K 3I,K
1, 2, 3	1-3 and 9	Efficacy group mean/ANOVA	IV: Survey Question 9 (position or title) DV: Survey Questions 1B,H,I,J,K

For Phase 2 of data analysis, the focus group interview transcripts and notes were analyzed using the six steps of qualitative data analysis (Creswell, 2012). The data were first prepared and organized by single-subject and multiple-subject interview notes and transcripts. These transcripts were provided from the Rev recording service used during the interviews. The data were then read three times prior to coding. Once coding began, transcripts and notes were highlighted with different color highlighters to determine similarities among the data. This process was repeated multiple times until all noted comments, quotes, ideas, and so forth were accounted for. Next, these highlighted ideas were organized and described by similar themes as mentioned in Phase 1 of the analysis, to determine if similarities existed. Finally, once the descriptions and themes were well organized, a reporting of findings, interpretation of findings, and validation of the accuracy of the findings was created in order to best organize the data. This organization also supported the final stage of analysis, when the quantitative and qualitative data results were compared and combined for a discussion of the results.

As mentioned, an integration of the quantitative and qualitative data took place as the final step in the analysis. All patterns and findings from the qualitative data analysis were examined to determine how they supported and assisted in the explanations received from Phase 1, or the quantitative data collected via the TRAAC Digital Readiness Survey instrument. The results from all data collection and analysis were connected and compared via the lens of the current literature and theoretical framework in order to examine the relationship between both types of data. The goal of this integration of data, as well as pursuing a mixed-methods approach, was to provide the most in-depth understanding of the research questions and to add value and strength to the findings.

Issues of Validity, Reliability, and Trustworthiness

The TRAAC Digital Readiness Survey instrument, assessment tool, and spectrum were created, tested, and validated by the National Science Foundation Grant for use by Project Tomorrow. Both organizations continually test their survey instruments at the national level in order to provide credible research and grant opportunities for researchers and educational institutions.

Ethical Issues and Role of the Researcher

As the researcher, I must acknowledge my positionality in my current leadership role, as someone who is very involved with technology use and integration on my school site. I feel very strongly about the positive effects that technology use can have on the teaching and learning process and believe that future teachers must be adequately prepared within their preservice teacher education programs in order to be successful with technology use in their classrooms. Additionally, due to my dissertation chair's position within my selection site, I had access to future teachers as well as instructors who taught within the credential programs.

Limitations of the Study

The major limitations of this study include the data being collected from only one university, within one teacher education program. In order to make the results more generalizable, additional data from multiple university-level teacher education programs would need to be collected, analyzed, and compared. Additionally, as the researcher, I am very involved in the successful use and integration of technology into the teaching and learning environment, supporting both current and future teachers with positive growth,

experiences, and integration of technology into their practice. This had potential to lead to a bias in the data analysis.

Summary and Conclusion

Technology integration and development continues to be an urgent and pressing component of 21st-century education. A stronger focus on the relationship between the use of digital tools—such as the Internet, mobile devices, and Web 2.0 tools like Google Apps for Education—and the process of teaching and learning needs to take precedence. With these technologies come 21st-century skills, including a new form of communication known as digital literacies for both teachers and students to develop (Hockly, 2012; Kumar & Vigil, 2011; Linik, 2012; Mills, 2010). These new proficiencies support a continuous learning process, enabling teachers and students to prepare for participation within a digital society. Simultaneously, new generations of teachers are entering the workforce, known as digital natives or the net generation (Beers, 2011; Bennett et al., 2008; Lei, 2009). While these individuals grew up with exposure to technology use on a personal level, they have very limited understanding and application of technology tools, creating online content, and connecting technology use within the K-12 classroom for teaching and learning purposes (Kumar & Vigil, 2011; Lei, 2009; Niess, 2011).

The need for an educational framework to support technology use within the educational context resulted in the creation of the TPACK framework (Mishra & Koehler, 2006; Shulman, 1986). This framework continues to act as an integral connection between technology, content, pedagogy, and effective teaching and learning practices. The TPACK framework has supported many pioneering projects and research

opportunities, via the U.S. Department of Education's Preparing Tomorrow's Teachers to Use Technology (PT3) grants, focusing on key components of successful technology integration for effective teaching and learning (Polly et al., 2010). This framework also encourages integration of technology to support equitable learning opportunities for all (Niess, 2011). As this framework continues to gain momentum and show successful integration processes, more and more institutes of higher education are beginning to adopt the TPACK framework for integration into preservice teacher education programs.

The TPACK framework, in combination with current research and understanding of technology use within preservice teacher education programs, has resulted in the conclusion that teaching and learning with technology proves most effective for the attainment of digital literacy and technology use skills (Chen, 2010). Currently, many preservice teacher education programs limit technology education to one standalone technology course (Lambert & Gong, 2010; Pamuk, 2011). However, other programs are beginning to ask future educators to look at how certain technologies may fit within the educational content. This practice, as supported by the TPACK framework, provides educators with the knowledge of using technology to find resources in support of the content, using these tools and resources for teaching and learning, understanding and identifying strategies for student use and collaboration, and understanding how students will make sense of using the technology toward mastery of the content (Hoffer & Grandgenett, 2012). The importance of adoption of the framework and integration of learning with technology throughout teacher education programs is critical. Future educators must have interactions with both technology and content courses throughout

their learning experiences in order to meet the needs of 21st-century K-12 learners (Hoffer & Grandgenett, 2012; Ottenbreit-Leftwich et al., 2012; Pamuk, 2011).

While progress is being made within preservice teacher education programs, a gap still exists between how to best prepare future teachers for technology use in their classrooms and what skills K-12 students need in order to be successful, contributing members of society (Davies et al., 2011). A lack of research in the area of best practices for technology implementation, as well as how to make the integration experience holistic for future educators, currently exists (Ottenbreit-Leftwich et al., 2012). In order for institutes of higher education to successfully prepare future educators for using technology toward effective teaching and learning, additional research must be conducted.

Implications for Leadership

Leadership plays an integral role in closing the digital divide, meeting the needs of all learners, preparing 21st-century students for their futures, and ensuring that teachers are prepared to effectively connect technology with academic content and pedagogy. Leaders in teacher preparation programs, at school sites, and in the classroom must work to advance the effective use of technology in the teaching and learning environment. This will require leaders within teacher education programs to take risks toward researching sustainable practices and experiences that will lead to a model and format for technology use for future teachers to follow (Ottenbreit-Leftwich et al., 2012). School site leaders must overcome challenges related to limited resources, access to technology, and supporting practicing teachers who lack training with merging technology and content for effective instruction. Additionally, teacher leaders who are

willing to attempt technology use, even though they lack the training and experience, must be willing to fail, make mistakes, and learn from their K-12 students. It is the leaders who are willing to adopt new practices, research methods, and best practices for teaching and learning who will play an integral role in connecting research with real-life practices, ultimately impacting future students.

Implications for Social Justice

The concepts of technology use for 21st-century learning have specific implications for social justice and educational equity. A new skill set is required for teachers and students as technology continues to become an integral part of the learning process (Hockly, 2012; Lambert & Gong, 2010). K-12 students provided with learning opportunities toward mastering these new proficiencies have an advantage for developing as learners with access to participate in this technology-based society. Students without these learning opportunities could potentially be at a disadvantage when it comes to educational experiences and future employment opportunities (Marino et al., 2009). Additionally, disparities exist between digital natives from different socioeconomic backgrounds as they enter the workforce as teachers (Bennett et al., 2008; Kumar & Vigil, 2011; Lei, 2009). Consistent learning opportunities and experiences for all teachers and students are necessary in order to bridge the technology gap, known as the digital divide. Students should not be subject to learning inequities because their teachers never experienced technology tools or integration opportunities within their teacher preparation programs (Banister & Vannatta Reinhart, 2011). Links exist between pedagogy and technology use in the classroom, making it more imperative than ever for preservice teacher education programs to provide learning experiences and methods that integrate

both of these concepts. Continued support for future teachers, in the form of positive educational experiences with technology, will begin to provide an equitable learning environment with technology access opportunities for many learners. This is where closing the digital divide begins.

CHAPTER 4

Current literature states that teacher education programs need to adequately prepare future teachers, also known as preservice teachers, for effective technology integration into the classroom, as well as to address the gap that exists between future teachers' knowledge and 21st-century teaching and learning practices (Chen, 2010; Davies et al., 2011; Ottenbreit-Leftwich et al., 2012). The following research questions guided the study, focused on future teachers' perceived experiences with and readiness for purposeful technology use:

1. How do preservice teachers perceive their teacher preparation program for purposeful technology use in the teaching/learning environment?
2. What do preservice teachers perceive as their digital readiness needs for purposeful technology use in the teaching and learning environment?
3. What do preservice teachers perceive as strengths within their teacher preparation program in support of purposeful technology use?

These questions, along with the quantitative and qualitative data collected, provided a better understanding of future teachers' perceptions of their university-level preparation program, their perceived needs for digital readiness, and their perceptions of the strengths of the preparation program in support of purposeful technology use in the teaching and learning environment.

The literature review supporting this study focused on four areas of research: 21st-century skills and learning; the technological, pedagogical, and content knowledge (TPACK) framework; actions supporting technology integration in preservice teacher education programs; and the current state of teacher education programs. Additionally,

the theoretical framework supporting this study and the TPACK framework was phenomenology. This chapter includes data analysis and interpretation for each of the following data categories: skills, resources, experiences, and efficacy. Additionally, each category is supported by an integration of both quantitative data analysis, including visuals, and qualitative analysis quotes and discoveries in order to enrich the findings.

Skills

Skills can be defined as action verbs relating to teaching and instruction. Survey Questions 1C (ReinforceConcepts), 1D (SkilledAtUsing), 1E (EditResources), 1G (TroubleFinding), 2A (DirectClassroomInstruction), 2B (OnlineDigitalLibraries), 2C (OnlineNetworking), 2H (NewConcetps), 2I (AdaptResources), 3E (TeacherDirectedApproach), and 3F (StudentGroups) were coded as skills questions (Appendix K). Answers corresponding to a positive response (i.e., *strongly agree*, *usually or always*, *agree*, and/or *often*) were coded as numeric 4s and 3s. The answers to these questions were believed to best correlate with Research Question 3, focusing on preservice teachers' perceptions of the successes of the preparation program supporting purposeful technology use. Answers to questions corresponding to a negative response (i.e., *strongly disagree*, *never or rarely*, *disagree*, and/or *sometimes*) were coded as numeric 1s and 2s. These answers were believed to best correlate with Research Question 2, which assessed preservice teachers' perceived digital readiness needs for purposeful technology use in the teaching and learning environment. Responses to Survey Question 1J (AdequateTraining) primarily contributed to Research Question 1, or how preservice teachers perceived their teacher preparation program for purposeful technology use in the teaching/learning environment.

It should also be noted that the survey contained five questions that were worded as false positives. For these questions, a low numeric score represented a positive response. Survey Question 1G (TroubleFinding) was a false positive question and was included in the skills responses and analysis. Table 2 represents the descriptive statistics for all skills-related questions and responses. These questions are listed in order as Survey Questions 1C (ReinforceConcepts), 1D (SkilledAtUsing), 1E (EditResources), 1G (TroubleFinding), 2A (DirectClassroomInstruction), 2B (OnlineDigitalLibraries), 2C (OnlineNetworking), 2H (NewConcetps), 2I (AdaptResources), 3E (TeacherDirectedApproach), and 3F (StudentGroups).

Table 2, as well as those that follow, contains descriptive statistics for an entire grouping of questions and responses, providing the following information: the number of responses for each specific question, the mean or average response score for each question, the standard deviation or the calculation representing the numeric deviation from the mean, the minimum and maximum numeric response, and the sum of all numeric responses for each question. The mean, standard deviation, and sum provide a quick snapshot of how the participants responded to specific questions. For example, the table illustrates that for Survey Question 1C (ReinforceConcepts), 100 participants responded; the mean or average response was 3.08 on a 1-to-4 scale; the standard deviation was 0.63, meaning responses were generally closely clustered around the mean; and the sum of all of the responses was 308.

Table 2: Skills Descriptive Statistics

Variable	*N*	Mean	Std. dev.	Min	Max	Sum
1C. ReinforceConcepts	100	3.08	0.63	1.00	4.00	308.00
1D. SkilledAtUsing	100	3.20	0.62	2.00	4.00	320.00
1E. EditResources	100	2.88	0.71	1.00	4.00	288.00
1G. TroubleFinding	100	2.79	0.74	1.00	4.00	279.00
2A. DirectClassroomInst	92	2.66	0.82	1.00	4.00	245.00
2B. OnlineDigitalLibraries	92	2.46	0.99	1.00	4.00	226.00
2C. OnlineNetworking	92	2.42	0.95	1.00	4.00	223.00
2H. NewConcepts	92	2.53	0.73	1.00	4.00	233.00
2I. AdaptResources	92	2.48	0.79	1.00	4.00	228.00
3E. TeacherDirectedApproach	85	2.69	0.82	1.00	4.00	229.00
3F. StudentGroups	86	2.09	0.86	1.00	4.00	180.00

The descriptive statistical analysis of the responses categorized by skills resulted in the identification of mean variation with six of the 11 questions. The questions identified by a lower mean and higher standard deviation were Survey Questions 1E (EditResources), 2B (OnlineDigitalLibraries), 2C (OnlineNetworking), 2H (NewConcepts), 2I (AdaptResources), and 3F (StudentGroups). These questions were selected in order to potentially identify preservice teacher candidates' perceived digital readiness needs to answer Research Question 2. Out of these six questions, two were identified as having the most variance in mean and largest standard deviation: Survey Questions 2B (OnlineDigitalLibraries) and 2C (OnlineNetworking).

Skills: Online digital libraries. Survey Question 2B (OnlineDigitalLibraries) asked the respondents if they *usually or always*, *often*, *sometimes*, or *never or rarely* used online digital libraries to search for digital resources. The descriptive statistics and histogram for this specific question are shown in Table 3 and Figure 1.

Table 3: Survey Question 2B (OnlineDigitalLibraries) Descriptive Statistics

Value	Frequency	%	Valid %	Cum. %
1	18	18.00	19.57	19.57
2	29	29.00	31.52	51.09
3	30	30.00	32.61	83.70
4	15	15.00	16.30	100.00
.	8	8.00	Missing	
Total	100	100.00	100.00	

Note. *N* (valid) = 92.00, *N* (missing) = 8.00; *M* = 2.46; *SEM* = 0.10; mode = 3.00; *SD* = 0.99; variance = 0.98; kurtosis = -1.01; *SE* kurt. = 0.50; skewness = 0.02; *SE* skew. = 0.25; range = 3.00; minimum = 1.00; maximum = 4.00; sum = 226.00; percentiles 50 (median) = 2.

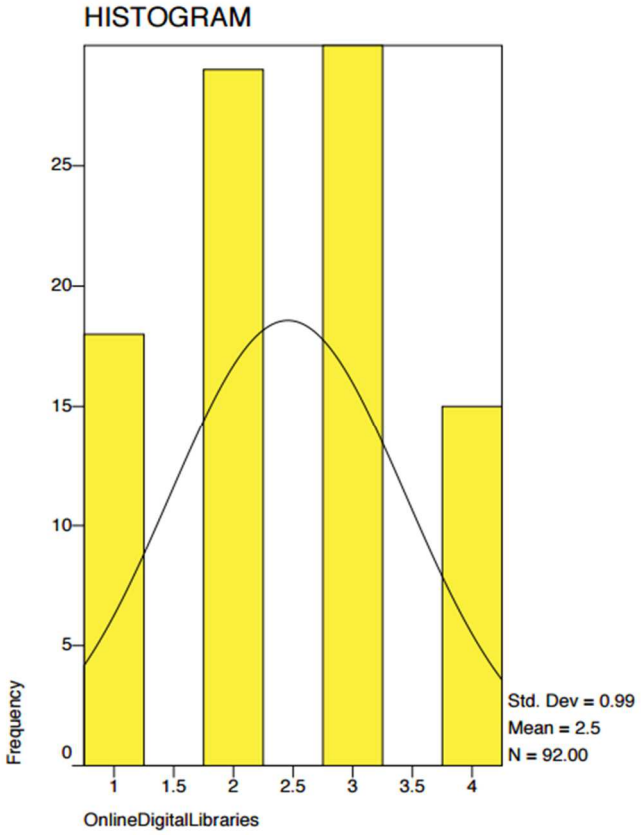


Figure 1: Survey Question 2B (OnlineDigitalLibraries) Descriptive Statistics Histogram

As represented in Table 3 and Figure 1, Survey Question 2B (OnlineDigitalLibraries) showed a response rate frequency mean that was lower and more closely related to a negative response and a standard deviation indicating a larger spread of responses away from the mean ($M = 2.46$, $SD = 0.99$). Therefore, preservice teachers who answered this survey question most often answered in a way that indicated they sometimes used online digital libraries to search for resources to support 21st-century classroom instruction. During the focus group interviews, Participant A, a social science teacher candidate, commented on his experiences with technology and/or digital libraries thus far within the preservice preparation program by stating, "We have enough tools in our toolkit that we can make due" (personal communication, April 27, 2015). In response, Participant E, a preservice teacher candidate working on a mathematics credential, commented by stating that professors should be "teaching us how to be lifelong learners in the program and then also about how to apply [technology] with our students" (personal communication, April 27, 2015). Participant B, also pursuing a mathematics credential, responded by stating that these digital libraries and resources support "simulations and online learning that cannot be done without technology" (personal communication, April 27, 2015).

The discussion continued, and Participant A and Participant G, an engineer pursuing a math and physics credential, began to discuss the "fire hose" analogy, as related to digital tools, skills, and online digital libraries for resources. Participant A began by saying,

> Given the number of time constraints we have, it can be overwhelming and lead to the metaphor that gets thrown around a lot. It's like drinking from a fire hose where you're getting so much information and interacting

> with so many things that you're just going to miss a lot of it. (personal communication, April 27, 2015)

Participant G responded by saying,

> The drinking out of a fire hose thing is that metaphor normally is used when there is too much too fast or all of a sudden. But I think, in this case . . . it's more like the fire hose is filling you up and you're drowning. There is a question about exposure versus practice. (personal communication, April 27, 2015)

Based on the focus group responses, the potential reasoning behind a low response rate for this survey question can be better understood. It appeared that there was not a lack of resources making it clear as to why the use of online digital libraries might be low, but rather there was a need for time to explore, learn, and teach with these resources in a real-world environment. Preservice educators reported finding and/or receiving the tools to use; however, they identified a need for time to use them.

Skills: Online networking. Survey Question 2C (OnlineNetworking) asked the respondents if they *usually or always*, *often*, *sometimes*, or *never or rarely* used online networking sites (e.g., Facebook, wikis, etc.) to find digital resources. The descriptive statistics and histogram for this specific question are shown in Table 4 and Figure 2.

Table 4: Survey Question 2C (OnlineNetworking) Descriptive Statistics

Value	Frequency	%	Valid %	Cum. %
1	16	16.00	17.39	17.39
2	35	35.00	38.04	55.43
3	27	27.00	29.35	84.78
4	14	14.00	15.22	100.00
.	8	8.00	Missing	
Total	100	100.00	100.00	

Note. *N* (valid) = 92.00; *N* (missing) = 8.00; *M* = 2.42; *SEM* = 0.10; mode = 2.00; *SD* = 0.95; variance = 0.91; kurtosis = -0.87; *SE* kurt. = 0.50; skewness = 0.14; *SE* skew. = 0.25; range = 3.00; minimum = 1.00; maximum = 4.00; sum = 223.00; percentiles 50 (median) = 2.

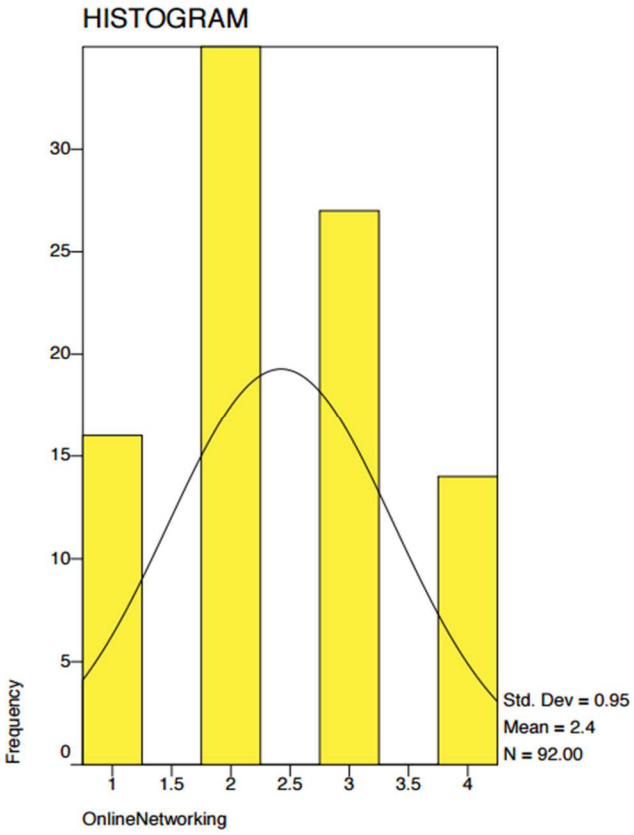


Figure 2: Survey Question 2C (OnlineNetworking) Descriptive Statistics Histogram

As represented in Table 4 and Figure 2, Survey Question 2C (OnlineNetworking) showed a response rate that was lower and more closely related to a negative response and a standard deviation indicating a larger spread of responses away from the mean ($M = 2.42$, $SD = 0.95$). Therefore, preservice teachers who answered this survey question most often answered in a way that indicated they sometimes used online networking sites to find digital resources. Throughout the focus group interviews, multiple participants mentioned the use of blogs, Google Classroom, Moodle, Twitter, and Instagram as tools with which to deliver and/or share content. However, it became apparent that preservice teachers were using one another constantly as networking tools, both within their preservice credential program and within their classrooms. Participant F, a social science teaching candidate, commented by saying,

> I want to say the thing that's stuck with me is the sense of community . . . just creating some platform for [K-12 students] to all be able to discuss; it will get kids talking to each other or communicating to each other that probably would never have spoken to each other otherwise. (personal communication, April 27, 2015)

Participant K, a preservice teaching candidate pursuing an educational specialist credential, commented on networking by stating,

> Like basically from Day 1, we all brought laptops to school. Like one girl, poor thing, spilled coffee on hers, and it was just like catastrophe because everybody else had a laptop. We also use [Google Drive] regularly for class collaboration, so on group projects, group lesson plans, we were all on Google Drive, all working on the same document simultaneously. It was extremely helpful. (personal communication, May 4, 2015)

While the survey responses for this question were low, the focus group interviews clearly represented a strong use of networking throughout the preservice teachers' program and experiences, via a mix of digital tools like Google Docs and peer-to-peer

collaboration. The data from the focus group interviews represented direct networking in a more student-driven way, but nonetheless, online networking tools were also mentioned and reportedly used both in the program and in the preservice teachers' classrooms.

Resources

Resources can be defined as tools, time, and/or quantity versus quality of something. Survey Questions 1A (PlanningTime), 2D (AskColleagues), 2E (TechnologyCoach), 2F (StudentsToHelp), 2G (EncourageStudents), 2J (OnlineTutorials), 3A (OnlineReviews), 3B (SurfInternet), 3C (OnlineWebinars), 3D (PlanLessons), 3G (PersonalLife), 3H (PreRecordedPresentations), and 3J (DigitalResourceConferences) were coded as resource questions (Appendix K). Answers corresponding to a positive response (i.e., *strongly agree*, *usually or always*, *agree*, and/or *often*) were coded as numeric 4s and 3s. The answers to these questions were believed to best correlate with Research Question 3, focusing on preservice teachers' perceptions of the successes of the preparation program supporting purposeful technology use. Answers to questions corresponding to a negative response (i.e., *strongly disagree*, *never or rarely*, *disagree*, and/or *sometimes*) were coded as numeric 1s and 2s. These answers were believed to best correlate with Research Question 2, which assessed preservice teachers' perceived digital readiness needs for purposeful technology use in the teaching and learning environment. Responses to Survey Question 1J (AdequateTraining) primarily contributed to Research Question 1, or how preservice teachers perceived their teacher preparation program for purposeful technology use in the teaching/learning environment.

It should also be noted that the survey contained five questions that were worded as false positives. For these questions, a low numeric score represented a positive response. No false positive questions were included in the resource responses and analysis. Table 5 represents the descriptive statistics for all resource-related questions and responses. These questions are listed in order as Survey Questions 1A (PlanningTime), 2D (AskColleagues), 2E (TechnologyCoach), 2F (StudentsToHelp), 2G (EncourageStudents), 2J (OnlineTutorials), 3A (OnlineReviews), 3B (SurfInternet), 3C (OnlineWebinars), 3D (PlanLessons), 3G (PersonalLife), 3H (PreRecordedPresentations), and 3J (DigitalResourceConferences).

Table 5: Resources Descriptive Statistics

Variable	*N*	Mean	Std. dev.	Min	Max	Sum
1A. PlanningTime	100	2.83	0.70	1.00	4.00	283.00
2D. AskColleagues	92	2.55	0.86	1.00	4.00	235.00
2E. TechnologyCoach	92	1.57	0.72	1.00	3.00	144.00
2F. StudentsToHelp	92	1.65	0.79	1.00	4.00	152.00
2G. EncourageStudents	92	2.62	0.90	1.00	4.00	241.00
2J. OnlineTutorials	92	2.39	0.84	1.00	4.00	220.00
3A. OnlineReviews	87	2.18	0.93	1.00	4.00	190.00
3B. SurfInternet	87	3.02	0.83	1.00	4.00	263.00
3C. OnlineWebinars	87	1.46	0.63	1.00	4.00	127.00
3D. PlanLessons	87	2.84	0.86	1.00	4.00	247.00
3G. PersonalLife	86	3.55	0.63	2.00	4.00	305.00
3H. PreRecordedPresent	87	2.08	0.96	1.00	4.00	181.00
3J. DigitalResConferences	87	1.49	0.68	1.00	4.00	130.00

The descriptive statistical analysis of the responses categorized by resources resulted in the identification of mean variation with five of the 13 questions. The questions identified by these variances were Survey Questions 2E (TechnologyCoach),

2F (StudentsToHelp), 3C (OnlineWebinars), 3G (PersonalLife), and 3J (DigitalResourceConferences). Out of these five questions, two were identified as having the largest mean variance; however, the standard deviation was the same. These questions were Survey Questions 3C (OnlineWebinars) and 3G (PersonalLife). Again, these questions were selected for further analysis in order to identify perceived needs (Research Question 2) and perceived program successes (Research Question 3).

Resources: Online webinars. Survey Question 3C (OnlineWebinars) asked the respondents if they *usually or always*, *often*, *sometimes*, or *never or rarely* participated in online webinars (seminars) about digital resources. The descriptive statistics and histogram for this specific question are shown in Table 6 and Figure 3.

Table 6: Survey Question 3C (OnlineWebinars) Descriptive Statistics

Value	Frequency	%	Valid %	Cum. %
1	52	52.00	59.77	59.77
2	31	31.00	35.63	95.40
3	3	3.00	3.45	98.85
4	1	1.00	1.15	100.00
.	13	13.00	Missing	
Total	100	100.00	100.00	

Note. N (valid) = 87.00; *N* (missing) = 13.00; *M* = 1.46; *SEM* = 0.07; mode = 1.00; *SD* = 0.63; variance = 0.39; kurtosis = 2.08; *SE* kurt. = 0.51; skewness = 1.32; *SE* skew. = 0.26; range = 3.00; minimum = 1.00; maximum = 4.00; sum = 127.00; percentiles 50 (median) = 1.

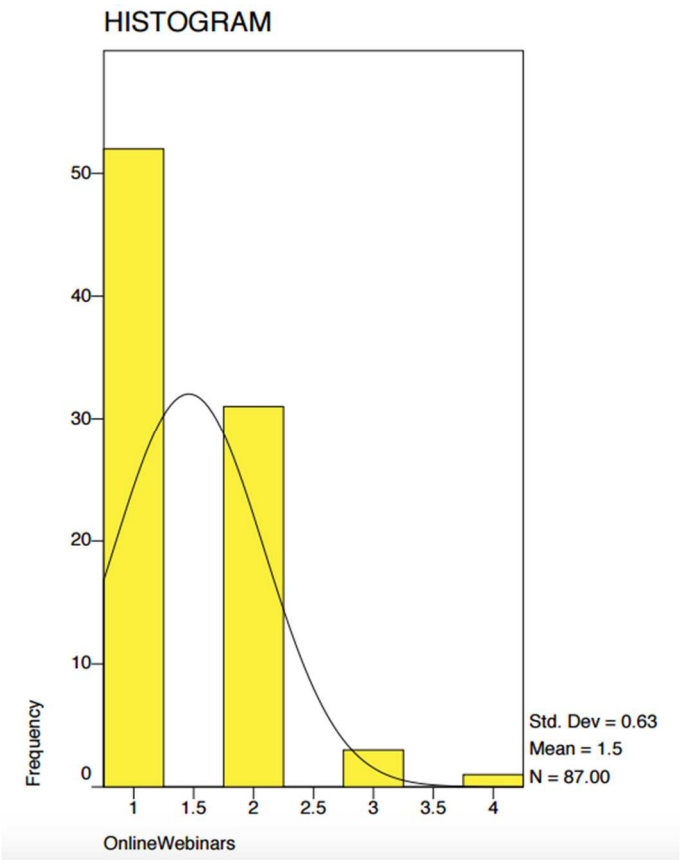


Figure 3: Survey Question 3C (OnlineWebinars) Descriptive Statistics Histogram

As represented in Table 6 and Figure 3, Survey Question 3C (OnlineWebinars) showed a response rate frequency mean that was lower and more closely related to a negative response ($M = 1.50$, $SD = 0.63$). However, the standard deviation indicated a smaller spread of responses away from the mean. Therefore, preservice teachers who answered this question most often answered in a way that indicated they never or rarely participated in online webinars to learn about and/or locate digital resources, and most of these responses were central to the mean response. During the focus group interviews, participants constantly mentioned resources. These included Twitter, Instagram, Snapchat, Google Docs, Google Chrome, Chromebooks, Google Slides, Moodle, Cahoot,

Blackboard, Prezi, iPads, laptops, MacBook, Remind 101, and SkyView Free. When asked about how these resources were discovered, Participant J commented by saying,

> I think that was more [preservice teacher] driven, and a part of the reason I think that is because there was a massive jump in it from the first semester to the second. There was no change in who our professors were or how they showed us [to locate digital resources]. In fact, there was less technology done by professors in the second semester and far more done by the students. (personal communication, May 4, 2015)

Participant K then responded by stating,

> I agree, like I think that the students kind of picked up and ran with it. Like we found this app that's like a reminder app, and so we assigned each other for classes. I think it's called Remind. I was in charge of the Monday class, and so I'd be like, "All right guys, this is due . . . or do the assignment tonight, or don't forget to submit this." (personal communication, May 4, 2015)

Participant F also added,

> Instead of having to do all the work and find 10 million resources that are useful for everyone, we all had to go out and do research . . . and then we got to see everybody else's as well. It brought a lot of immediate resources where I was like, "I can use that tomorrow if I wanted to." (personal communication, April 27, 2015)

While the survey response mean was low (negative) for this question, again, the focus group interviews alluded to preservice teaching candidates' learning and acquiring digital resources and tools by using their peers, colleagues, and classmates, not by using online resources like webinars or online tutorials. Additionally, as with Survey Question 2C (OnlineNetworking), it appeared that preservice teaching candidates were networking and acquiring digital tools and skills, but they were doing so in a collaborative, face-to-face manner as opposed to using social media and online webinars. The acquisition of resources and digital tools was happening, but not in the way in which the survey instrument predicted or assumed.

Resources: Personal life. Survey Question 3G (PersonalLife) asked the respondents if they *usually or always*, *often*, *sometimes*, or *never or rarely* used digital resources in their personal lives outside of the classroom. The descriptive statistics and histogram for this specific question are shown in Table 7 and Figure 4.

Table 7: Survey Question 3G (PersonalLife) Descriptive Statistics

Value	Frequency	%	Valid %	Cum. %
2	6	6.00	6.98	6.98
3	27	27.00	31.40	38.37
4	53	53.00	61.63	100.00
.	14	14.00	Missing	
Total	100	100.00	100.00	

Note. N (valid) = 86.00; N (missing) = 14.00; M = 3.55; S.E. M = 0.07; mode = 4.00; SD = 0.63; variance = 0.39; kurtosis = 0.09; S.E. kurt. = 0.51; skewness = -1.06; S.E. skew. = 0.26; range = 2.00; minimum = 2.00; maximum = 4.00; sum = 305.00; percentiles 50 (median) = 4.

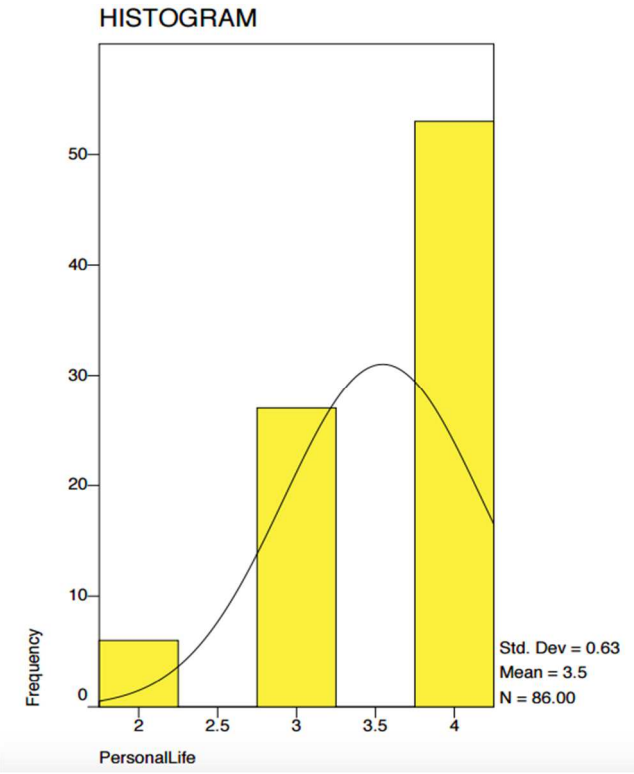


Figure 4: Survey Question 3G (PersonalLife) Descriptive Statistics Histogram

As represented in Table 7 and Figure 4, Survey Question 3G (PersonalLife) showed a response rate frequency mean that was higher and more closely related to a positive response ($M = 3.50$, $SD = 0.63$). Additionally, the standard deviation indicated a smaller spread of responses away from the mean. Therefore, preservice teachers who answered this question most often answered in a way that indicated they usually or always used digital resources in their personal lives outside of the classroom, and most responses were central to the mean. This was the highest mean of all of the responses gathered for the entire survey. During the focus group interviews, Participant E discussed technology use in her personal life, as related to future employment opportunities: "We are putting out things that the employers can see about how we feel about the curriculum, and so the point of it is that they're building our profile. . . . It's all about creating a

presence" (personal communication, April 27, 2015). Participant F then added to the discussion by stating that when building a profile, "you're going to revise it because other people are reading it" (personal communication, April 27, 2015). Participant A added that "if I ask a question, there is a chance to get a deeper perspective from someone who has more context, and so I think there has been a lot more emphasis on this sharing it with the world" (personal communication, April 27, 2015). Participant D, a former financial advisor turned teacher, ended the discussion with a story, reflecting on his personal Twitter use and how this crossed over into his classroom:

> I asked them [students in his classroom] what they were talking about and they said, "Oh, do you do this?" I go, "No, I don't do that, but I do Twitter." And they go, "Oh boy!" Just list them all up, and I said, "Yeah, sure. I'll show you my Twitter account." My Twitter account is weird. It's *******. They're like, "What the heck is up with this?" I've got a story behind it, and I tell them. One of the kids takes a picture of me giving the Twitter thing and Tweets it out to the world, and I end up with 20 followers. (personal communication, April 27, 2015)

Both the survey results and the focus group interviews alluded to strong confidence and use of digital resources and tools in preservice candidates' personal lives. They appeared to use technology and digital tools for professional growth, in the form of online publications, in order to create and/or widen their digital footprint. Additionally, per the story above, preservice candidates found opportunities for their personal technology use to cross over into the educational environment, prompting meaningful interactions and engagement with their students. However, ensuring that preservice teaching candidates, oftentimes classified as "digital natives," receive the training and education in order to transition technology use from personal life into the classroom,

"being able to use technology critically, wisely, or meaningfully," continues to be a challenge (Lei, 2009, p. 88).

Experiences

Experiences can be defined as external actions relating to teaching and instruction with technology. Survey Questions 1F (TechnicalProblems), 2K (ObserveColleagues), 3I (InstructionalCoachMeetings), and 3K (ProfessionalDevelopment) were coded as experience questions (Appendix K). Answers corresponding to a positive response (i.e., *strongly agree*, *usually or always*, *agree*, and/or *often*) were coded as numeric 4s and 3s. The answers to these questions were believed to best correlate with Research Question 3, focusing on preservice teachers' perceptions of the successes of the preparation program supporting purposeful technology use. Answers to questions corresponding to a negative response (i.e., *strongly disagree*, *never or rarely*, *disagree*, and/or *sometimes*) were coded as numeric 1s and 2s. These answers were believed to best correlate with Research Question 2, which assessed preservice teachers' perceived digital readiness needs for purposeful technology use in the teaching and learning environment. Responses to Survey Question 1J (AdequateTraining) primarily contributed to Research Question 1, or how preservice teachers perceived their teacher preparation program for purposeful technology use in the teaching/learning environment.

It should also be noted that the survey contained five questions that were worded as false positives. For these questions, a low numeric score represented a positive response. Survey Question 1F (TechnicalProblems), a false positive question, was included in the analyses of this grouping of questions and responses. Table 8 represents the descriptive statistics for all experience-related questions. These questions are listed in

order as Survey Questions 1F (TechnicalProblems), 2K (ObserveColleagues), 3I (InstructionalCoachMeetings), and 3K (ProfessionalDevelopment).

Table 8: Experiences Descriptive Statistics

Variable	*N*	Mean	Std. dev.	Min	Max	Sum
1F. TechnicalProblems	100	2.96	0.71	1.00	4.00	296.00
2K. ObserveColleagues	92	2.26	0.78	1.00	4.00	208.00
3I. InstructionalCoachMeetings	87	1.54	0.79	1.00	4.00	134.00
3K. ProfessionalDevelopment	87	2.09	0.86	1.00	4.00	182.00

The descriptive statistical analysis of the responses categorized by experiences resulted in the identification of mean variation with two of the four questions. The questions identified by a lower mean, or a higher mean for the false positive question, and higher standard deviation were Survey Questions 1F (TechnicalProblems) and 3I (InstructionalCoachMeetings). These questions were selected for further analysis in order to better understand Research Question 2, relating to the perceived digital readiness needs of the preservice teacher candidates.

Experiences: Technical problems. Survey Question 1F (TechnicalProblems) asked the respondents if they *strongly agree*, *agree*, *disagree*, or *strongly disagree* that they often had technical problems with trying to use digital resources. The descriptive statistics and histogram for this specific question are shown in Table 9 and Figure 5.

Table 9: Survey Question 1F (TechnicalProblems) Descriptive Statistics

Value	Frequency	%	Valid %	Cum. %
1	3	3.00	3.00	3.00
2	18	18.00	18.00	21.00
3	59	59.00	59.00	80.00
4	20	20.00	20.00	100.00
Total	100	100.00	100.00	

Note. *N* (valid) = 100.00; *N* (missing) = 0.00; *M* = 2.96; *SEM* = 0.07; mode = 3.00; *SD* = 0.71; variance = 0.50; kurtosis = 0.42; *SE* kurt. = 0.48; skewness = -0.46; *SE* skew. = 0.24; range = 3.00; minimum = 1.00; maximum = 4.00; sum = 296.00; percentiles 50 (median) = 3.

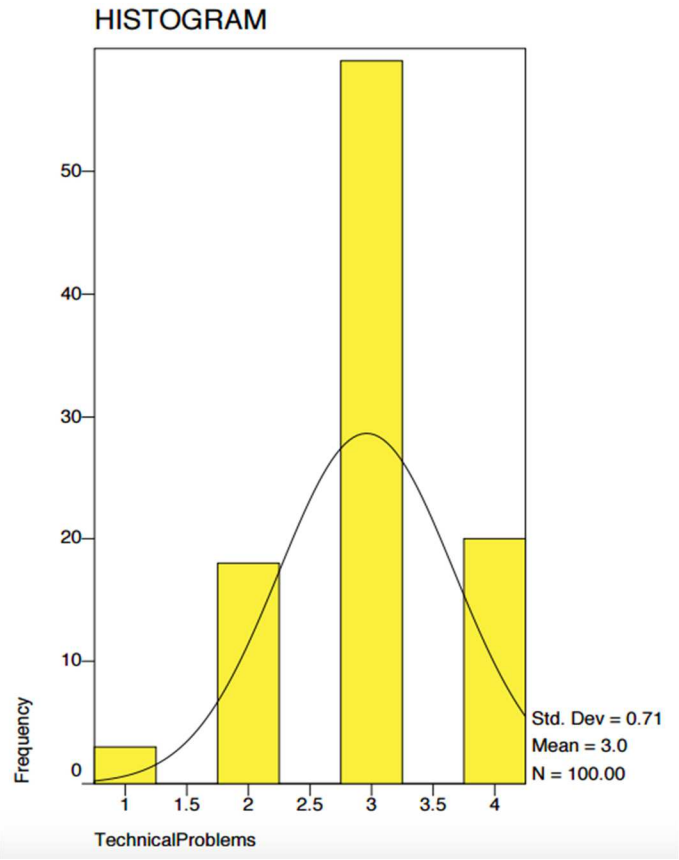


Figure 5: Survey Question 1F (TechnicalProblems) Descriptive Statistics Histogram

As represented in Table 9 and Figure 5, Survey Question 1F (TechnicalProblems) showed a response rate frequency mean that was higher (false positive question) and

more closely related to a negative response ($M = 2.96$, $SD = 0.71$). Therefore, preservice teachers who answered this question most often answered in a way that indicated they disagreed with the statement that they had technical problems when using digital resources. During the focus group interviews, when talking about technical problems with technology and digital tools use, participants continued to discuss the impact that their professors made on them throughout their program. Participants discussed the importance of their professors' willingness to take risks with technology use and openly showcasing their public failures and/or problems with the use of digital resources and tools in their instruction. Participant F commented on this discussion saying, "I've been pretty impressed. . . . Professor *** talks about how she was afraid of technology, but she has really come around and is trying" (personal communication, April 27, 2015). Participant E added to this comment with the following:

> Yeah. They're willing to try, and you've seen them try and fail or try and succeed, and so I think it's good for us to see how we handle that type of thing in the classroom because it's inevitably going to happen to us too, so I've been really impressed. (personal communication, April 27, 2015)

Participant G added,

> I think with what [Participant F] said also, it's really important that they're letting us see them struggle. Our instructors let us see them struggle with the technology and recognize that you can adjust mid-lesson without it being the end of the world. . . . Because of that, I had a lesson a few weeks ago where I was showing a PowerPoint, and with the way we learned, when I was making it on the monitor, it looked fine. Then on the projector, the text was almost invisible. For a minute, I was worried like, "Oh, God, what am I going to do? No one can read this." I stopped. I was like, "Hold on. That's impossible to read. I'll change the color," and was able to move forward. I think seeing that model, that's not something I would have ever thought really to get ready for. What if I can't read the test and have to change it in the middle of the lesson? I would have thought I'd be prepared beforehand, but seeing adjusting on the fly from our professors has been really helpful. (personal communication, April 27, 2015)

Both the survey responses and the focus group interviews reflected that preservice teacher candidates disagreed with the statement that they had technical problems when using digital tools. The focus group interview responses centered on the power of preservice teacher candidates' observing and experiencing their professors' learning, growing, struggling, failing, and succeeding with technology use. This appeared to have provided an environment of safe failure and proactive problem solving for technology use in the classroom. While preservice teachers appeared to have a grasp on the use of technology tools, these experiences appeared to have contributed to their success with the integration of technology and digital tools into the classroom, especially when lessons did not go as planned.

Experiences: Instructional coach meetings. Survey Question 3I (InstructionalCoachMeetings) asked the respondents if they *usually or always*, *often*, *sometimes*, or *never or rarely* met with an instructional coach for mentoring or tutoring sessions about how to use digital resources. The descriptive statistics and histogram for this specific question are shown in Table 10 and Figure 6.

Table 10: *Surv*ey Question 3I (InstructionalCoachMeetings) Descriptive Statistics

Value	Frequency	%	Valid %	Cum. %
1	53	53.00	60.92	60.92
2	24	24.00	27.59	88.51
3	7	7.00	8.05	96.55
4	3	3.00	3.45	100.00
.	13	13.00	Missing	
Total	100	100.00	100.00	

Note. *N* (valid) = 87.00; *N* (missing) = 13.00; *M* = 1.54; S.E. *M* = 0.08; mode = 1.00; *SD* = 0.79; variance = 0.62; kurtosis = 1.62; S.E. kurt. = 0.51; skewness = 1.46; S.E. skew. = 0.26; range = 3.00; minimum = 1.00; maximum = 4.00; sum = 134.00; percentiles 50 (median) = 1.

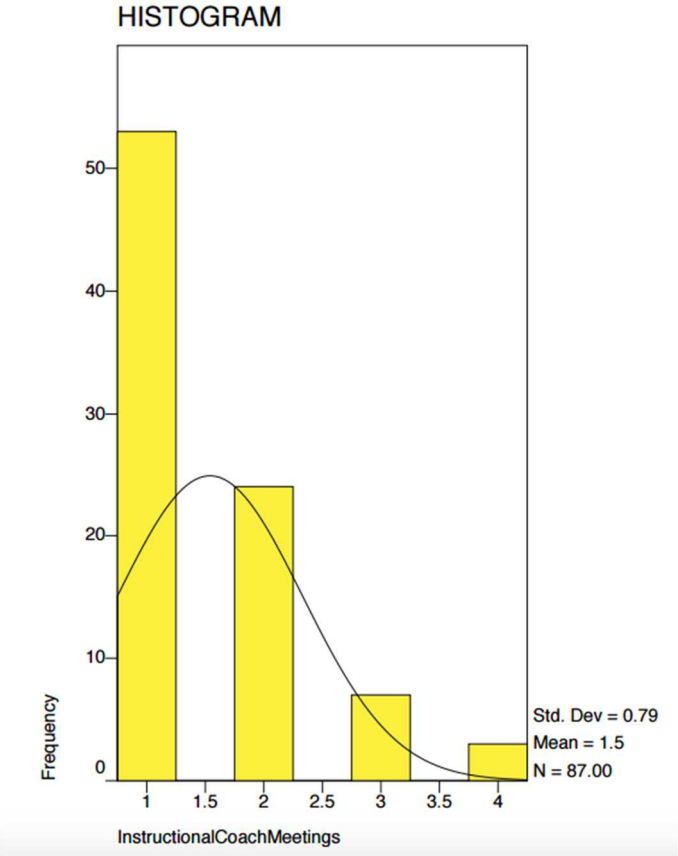


Figure 6: Survey Question 3I (InstructionalCoachMeetings) Descriptive Statistics Histogram

As represented in Table 10 and Figure 6, Survey Question 3I (InstructionalCoachMeetings) showed a response rate that was lower and more closely related to a negative response and a standard deviation indicating a larger spread of responses away from the mean ($M = 1.54$, $SD = 0.79$). Therefore, preservice teachers who answered this question most often answered in a way that indicated they never or rarely met with an instructional coach for mentoring or tutoring on the use of digital resources. Again, throughout the focus group interviews, multiple participants discussed mentoring and/or tutoring for digital tools use, but this was done with one another, not with an instructional coach. Participant J mentioned,

> All the work was centered around [the module]. Then, we as students extended that in that when we were given assignments, we took advantage of being able to use our digital resources to complete those assignments, especially, as she was saying earlier, collaborative. Google Drive, as soon as you get a group, okay I'll share a document. Everybody get on. (personal communication, May 4, 2015)

Participant E then continued, commenting on her feelings and thoughts on mentoring and/or tutoring for digital tools use:

> It's also a lot about collaboration . . . and so I like the way our program talks about technology as a community and as a collaboration. Like we are all about building our PLC [professional learning community] online. I think that's important for the way that a program trains us so that we can train our students. (personal communication, April 27, 2015)

Participant F responded by saying that she has "definitely seen how [technology] can be used to communicate amongst teachers in Twitter chats" (personal communication, April 27, 2015).

This led to a further discussion on collaboration and mentoring, especially during the practicum stages of the program. When discussing support in the program during the

student teaching experience, Participant J mentioned, “I get help where I need it. The two teachers that I was in rooms with, they were so helpful with everything” (personal communication, May 4, 2015). Participant C, a student who had a negative experience in school with math and wanted to give back positive learning experiences by pursuing a credential in math, spoke more on collaboration and mentoring from “cooperating teachers and people in your department who see the use for [digital tools] and will help you bring those in” (personal communication, April 27, 2015). Participant F then mentioned that her experience with professors, as related to digital tools use, was that they often said, “We’re going to use it with you, and then it’s up to you guys to figure out” (personal communication, April 27, 2015). Lastly, the mention of community and building community through online resources and digital tools was a common theme in both focus group interview sessions. Participant E ended the first interview session by stating, “To create community, you have to be a part of the community” (personal communication, April 27, 2015).

While survey responses were low in relation to meeting with an instructional coach for mentoring and/or tutoring on the use of digital tools, the focus group interview data showed that mentoring and/or tutoring was happening. This was in a different and more informal form than what the survey predicted, but peer-to-peer mentoring was occurring on school sites, within the preservice education program, and even via the use of networking tools such as Twitter.

Efficacy

Efficacy can be defined as the feeling(s) associated with technology use and preparation. Survey Questions 1B (ConfidenceMatching), 1H (LikeUsing), 1I

(ConcernedAboutUsing), 1J (AdequateTraining), and 1K (ConcernedAboutCreativity) were coded as efficacy questions (Appendix K). Answers corresponding to a positive response (i.e., *strongly agree*, *usually or always*, *agree*, and/or *often*) were coded as numeric 4s and 3s. The answers to these questions were believed to best correlate with Research Question 3, focusing on preservice teachers' perceptions of the successes of the preparation program supporting purposeful technology use. Answers to questions corresponding to a negative response (i.e., *strongly disagree*, *never or rarely*, *disagree*, and/or *sometimes*) were coded as numeric 1s and 2s. These answers were believed to best correlate with Research Question 2, which assessed preservice teachers' perceived digital readiness needs for purposeful technology use in the teaching and learning environment. Responses to Survey Question 1J (AdequateTraining) primarily contributed to Research Question 1, or how preservice teachers perceived their teacher preparation program for purposeful technology use in the teaching/learning environment.

It should also be noted that the survey contained five questions that were worded as false positives. For these questions, a low numeric score represented a positive response. Survey Questions 1J (AdequateTraining) and 1K (ConcernedAboutCreativity) were false positive questions and were included in the analyses of this grouping. Table 11 represents the descriptive statistics for all efficacy-related questions. These questions are listed in order as Survey Questions 1B (ConfidenceMatching), 1H (LikeUsing), 1I (ConcernedAboutUsing), 1J (AdequateTraining), and 1K (ConcernedAboutCreativity).

Table 11: Efficacy Descriptive Statistics

Variable	*N*	Mean	Std. dev.	Min	Max	Sum
1B. ConfidenceMatching	100	3.02	0.71	1.00	4.00	302.00
1H. LikeUsing	100	3.43	0.59	1.00	4.00	343.00
1I. ConcernedAboutUsing	100	2.82	0.77	1.00	4.00	282.00
1J. AdequateTraining	100	2.81	0.69	1.00	4.00	281.00
1K. ConcernedAboutCreativity	100	2.40	0.90	1.00	4.00	240.00

The descriptive statistical analysis of the responses categorized by efficacy resulted in the identification of mean variation with two of the five questions. These questions were identified by having the highest mean in this data set and the lowest mean in this data set, and were most focused on providing insight to the research questions. These questions were Survey Questions 1H (LikeUsing) and 1J (AdequateTraining).

Efficacy: Like using. Survey Question 1H (LikeUsing) asked the respondents if they *strongly agree*, *agree*, *disagree*, or *strongly disagree* that they liked using digital resources. The descriptive statistics and histogram for this specific question are shown in Table 12 and Figure 7.

Table 12: Survey Question 1H (LikeUsing) Descriptive Statistics

Value	Frequency	%	Valid %	Cum. %
1	1	1.00	1.00	1.00
2	2	2.00	2.00	3.00
3	50	50.00	50.00	53.00
4	47	47.00	47.00	100.00
Total	100	100.00	100.00	

Note. *N* (valid) = 100.00; *N* (missing) = 0.00; *M* = 3.43; *SEM* = 0.06; mode = 3.00; *SD* = 0.59; variance = 0.35; kurtosis = 1.31; *SE* kurt. = 0.48; skewness = -0.77; *SE* skew. = 0.24; range = 3.00; minimum = 1.00; maximum = 4.00; sum = 343.00; percentiles 50 (median) = 3.

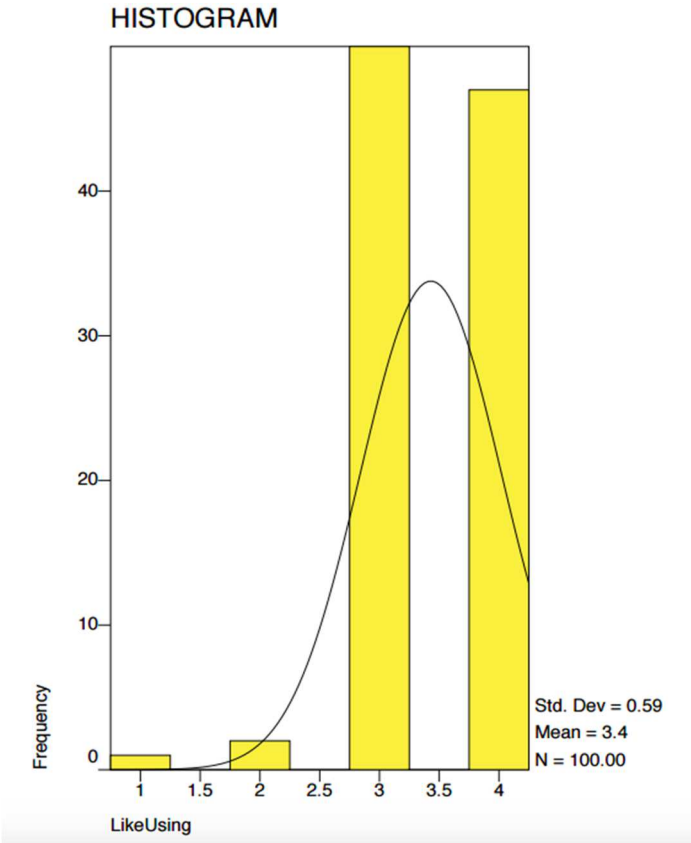


Figure 7: Survey Question 1H (LikeUsing) Descriptive Statistics Histogram

As represented in Table 12 and Figure 7, Survey Question 1H (LikeUsing) showed a response rate frequency mean that was higher, the second highest mean in the

entire data set, and most closely related to a positive response ($M = 3.43$, $SD = 0.59$). Additionally, the lower standard deviation represented a minimal spread with the responses as related to the mean. Therefore, preservice teachers who answered this question most often answered in a way that indicated they agreed/strongly agreed that they liked using digital resources. During the focus group interviews, when discussing the use of digital resources, participants told many stories about their experiences. The majority of these stories were success stories, while some were learning experiences that turned into successes. Participant K shared,

> They're (my students) doing final projects right now for *Bridge to Terabithia*, and one of the options was to create your own kingdom. They're on Minecraft creating their own little digital kingdoms. These are things that I wouldn't have thought of, but it's something that is engaging to them. If you have the right activity and it really grabs them, I don't really catch them off task that much, because they are so interested in what they are doing, and they are involved. It's really cool! (personal communication, May 4, 2015)

When asked about her feelings on technology and digital tools use, Participant J responded,

> It has been so cool to see because I feel like, in my undergrad, I heard about how to be prepared for how to use technology, and to prepare that you are going to use technology in your classroom, and that's kind of it. It's like, "You are going to do it." It wasn't a, "This is how or this is what you'll do." And so, in using my iPads with first graders and using any device at all with everyone else at the Design Thirty Nine campus, I learned. It really has shown me like, (a) the importance of being flexible, especially at the Design Thirty Nine campus because every student had their own device. It's not, "I can show you on my screen," and say, "Click this button, then click this, then do this." It's like, "I think you all know how to get onto Google Drive now, so get on." The first couple of weeks were very slow because you had to work through hiccups of everyone. . . . It was controlled chaos from my perspective, but every week when I went in, there was like so much change with how the classroom was run and everyone's attitudes, but it was awesome from Day 1. I loved it. I'm really glad I got to see it start. (personal communication, May 4, 2015)

Participants J and K continued to swap stories of digital tools use, talking about "projects where [students] could take pictures inside of their book and record their voice while retelling the story in their own words" (personal communication, May 4, 2015) and an astronomy lesson utilizing iPads and the app SkyView Free.

Participant D shared about a lesson he created using a self-recorded YouTube video of him walking, step by step. The question he posed to his students was related to how long they thought it would take him to walk a mile at the rate in the video:

> This activity offered complete open exploration. [My students] loved it. It was engaging. The only piece of input that I gave them was the size of my shoe, and they were able to figure out unit rate, create graphs, all this kind of stuff just from the technology, and so I'm obsessed with this idea now. Writing down the curriculum, using an image or video in the beginning to hook them . . . the videos they love. (Participant D, personal communication, April 27, 2015)

Participant E then excitedly responded,

> I'm going to jump in on that because I did the same thing with a video. It was me shooting a basketball to open our quadratics unit and it was, "Do I make the shot?" I had students arguing, standing up yelling at each other about the vertex and the axis, so what really stuck for me is engagement, because whether it's showing videos about triangle parties and getting them to ask questions about trigonometry or doing the Dan Meyer 3X lessons or any other type of thing like having them give us numbers on Desmos so that we can explore what happens with graphs when we change things . . . technology for me has always been a way to get my students engaged in what was going on. (personal communication, April 24, 2015)

This survey question yielded the second highest mean of the entire data set and was strongly supported by the focus group interview responses. Preservice teachers reported that they liked using technology and found inspiring and exciting ways to incorporate technology into their classrooms. Many of the focus group interview participants discussed the use of technology and/or digital tools to enhance engagement.

Others saw technology use as a way for students to complete tasks and experience learning that would normally not be possible inside the walls of a classroom.

Efficacy: Adequate training. Survey Question 1J (AdequateTraining) asked the respondents if they *strongly agree*, *agree*, *disagree*, or *strongly disagree* that they received adequate training on the use of digital resources in the precertification training program. The descriptive statistics and histogram for this specific question are shown in Table 13 and Figure 8.

Table 13: Survey Question 1J (AdequateTraining) Descriptive Statistics

Value	Frequency	%	Valid %	Cum. %
1	3	3.00	3.00	3.00
2	26	26.00	26.00	29.00
3	58	58.00	58.00	87.00
4	13	13.00	13.00	100.00
Total	100	100.00	100.00	

Note. N (valid) = 100.00; N (missing) = 0.00; M = 2.81; S.E. M = 0.07; mode = 3.00; SD = 0.69; variance = 0.48; kurtosis = 0.16; S.E. kurt. = 0.48; skewness = -0.29; S.E. skew. = 0.24; range = 3.00; minimum = 1.00; maximum = 4.00; sum = 281.00; percentiles 50 (median) = 3.

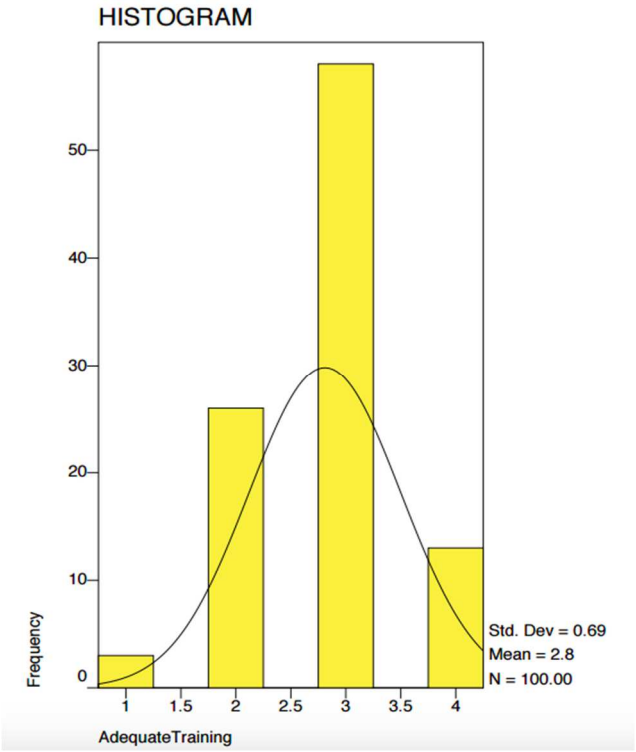


Figure 8: Survey Question 1J (AdequateTraining) Descriptive Statistics Histogram

As represented in Table 13 and Figure 8, Survey Question 1J (AdequateTraining) showed a response rate that was close to the middle range, resulting in a neutral response ($M = 2.80$, $SD = 0.69$). Therefore, preservice teachers who answered this question most often answered in a way that indicated they both disagreed and agreed that they received adequate training in their preservice teacher education program for technology and digital tools use. This was a central focus of the focus group interview discussions as well. Participant A commented by stating,

> I have more of a grasp of it now, but I still feel a bit overwhelmed with all of it, and how to access it, when to access it, what to access it for. I think maybe a little bit more of a focus on organizing . . . resources effectively and gathering resources and sharing those resources versus, "Let me post a 300-word reflection." (personal communication, April 27, 2015)

Participant D added,

> I feel confident about where I'm at and becoming a teacher. I don't think I'm going to be just smoking everything. I'm going to struggle, I'm sure, but I feel like I've been well prepared, and I think that the technology piece . . . it's not everything. It's nice to have. It can add a lot of features and stuff, and I think we've been well prepared with that aspect of it. (personal communication, April 27, 2015)

Participant F commented specifically on pedagogy and technology integration for mathematics, saying, "We didn't get a lot of digital resources, and that would have been nice" (personal communication, April 27, 2015). Additionally, many participants commented on the inconsistencies with the technology preparation course, a required prerequisite class for program entrance. Participant A stated,

> Depending on which professor you had, it was either this great class where you learned a lot about technology or it was 8 weeks of, "Here is how you use Microsoft Word." It felt like there wasn't much consistency going into the program. (personal communication, April 27, 2015)

Participant E addressed the other focus group members, asking, "I don't know if that was your experience. . . . I thought it was a useless class. It was all about Excel, your basic, super basic programming technology" (personal communication, April 27, 2015). Participant A, who enrolled in the technology prerequisite course twice, with two different professors, due to the inability to complete the course the first time he enrolled, added,

> The first time was very much like 8 weeks of having to use the word processor, and then they moved into, "Here is the Internet." When I took it over the summer, the professor was more like, "Here are a bunch of different tools you can use in your class and use professionally, and we're going to move through this really quick, but we're actually getting you tools that you haven't seen before." (personal communication, April 27, 2015)

Other candidates reported a slightly more positive experience with feeling adequately prepared for technology and digital tools use, but there were still some suggestions and recommendations that arose from the focus group discussions. Participant J stated,

> For the most part, I would say it was done well, because the focus of our experience wasn't on how you used technology in the classroom. It was like pedagogy and how to teach this and how to teach that, and so it was conducted through the use of technology, for the most part. In that sense, I think it was done well. There were a couple professors who I think could have used it more and not suppressed it as much, like for example, we weren't allowed to use laptops in one class. That was a little bit frustrating because we had grown so accustomed to taking our notes on our laptops and things like that. It wasn't that people were being disrespectful and we lost the privilege or anything. It was just . . . he [the professor] decided that, I think he read something [that said] you learn better without it or something. But, he didn't give us the opportunity to use it at all. . . . That was a little bit more challenging just because I didn't come to class with paper to take notes on. I'd been very accustomed to doing it all. There was no warning, so just things like that, that were a little bit not as wonderful. (personal communication, May 4, 2015)

Participant K then added,

> I absolutely agree. Just by teaching the class through technology we got to see what it's like to learn using technology and how to teach with technology. We did have that prerequisite class, but beyond that, I don't remember explicitly learning like, oh, there are good ways to use technology in the classroom appropriately. I don't feel like I got any of that. Maybe if there was one area of improvement, it could be that. (personal communication, May 4, 2015)

The focus group interview responses varied, as did the survey responses, from positive (*agree*) to negative (*disagree*), in relation to being adequately prepared for technology and digital tools use. Some preservice candidates reported a positive experience in the technology prerequisite course, but many reported that the course was basic and not advanced enough for their prior understanding of technology and digital

tools use. Additionally, some preservice candidates reported having a blended approach to their coursework, where technology and pedagogy were taught hand in hand. Others reported that technology tools were or were not presented and then were left out of the teaching and learning process. It appeared that there were some inconsistencies in how courses were taught, in preservice candidates' experiences with learning pedagogy and technology, and with technology use within their university courses.

Group Comparisons

The last statistical analysis conducted was an analysis of variance (ANOVA) for each grouping of questions and responses in order to determine if there was a significant difference in how each grouping of questions was answered by the preservice teacher participants. Additionally, a response mean was listed for each grouping of questions in order to determine what grouping had the highest mean response rate. For this analysis, the dependent variables were all survey questions/responses, grouped by category. These groupings were analyzed against the factor of the position or title question, where survey participants had the option to choose their position or title. Most participants selected the "preservice teacher candidate" option. However, a small number of participants identified themselves as classroom teachers (pre-K through Grade 12) or selected "other" as their title. While all survey participants were enrolled in a preservice credential program, some may have identified themselves as classroom teachers based on their status or progress in the program.

Table 14 represents the ANOVA results for the skills questions and responses, ordered by Survey Question 1C (ReinforceConcepts), 1D (SkilledAtUsing), 1E (EditResources), 1G (TroubleFinding), 2A (DirectClassroomInstruction), 2B

(OnlineDigitalLibraries), 2C (OnlineNetworking), 2H (NewConcepts), 2I (AdaptResources), 3E (TeacherDirectedApproach), and 3F (StudentGroups).

Table 14: Skills ANOVA

Variable	Source	*df*	*SS*	*MS*	*F*	*p*
ReinforceConcepts	Between groups	3	1.42	0.47	1.20	.313
	Within groups	96	37.94	0.40		
	Total	99	39.36			
SkilledAtUsing	Between groups	3	0.34	0.11	0.28	.836
	Within groups	96	37.66	0.39		
	Total	99	38.00			
EditResources	Between groups	3	2.57	0.86	1.71	.170
	Within groups	96	47.99	0.50		
	Total	99	50.56			
TroubleFinding	Between groups	3	1.12	0.37	0.67	.572
	Within groups	96	53.47	0.56		
	Total	99	54.59			
DirectClassroomInstruction	Between groups	3	1.47	0.49	0.73	.537
	Within groups	88	59.08	0.67		
	Total	91	60.55			
OnlineDigitalLibraries	Between groups	3	1.48	0.49	0.50	.686
	Within groups	88	87.35	0.99		
	Total	91	88.83			
OnlineNetworking	Between groups	3	4.74	1.58	1.79	.155
	Within groups	88	77.73	0.88		
	Total	91	82.47			
NewConcepts	Between groups	3	0.30	0.10	0.18	.911
	Within groups	88	48.61	0.55		
	Total	91	48.90			
AdaptResources	Between groups	3	0.39	0.13	0.20	.896
	Within groups	88	56.57	0.64		
	Total	91	56.96			
TeacherDirectedApproach	Between groups	3	2.70	0.90	1.37	.258
	Within groups	81	53.34	0.66		
	Total	84	56.05			
StudentGroups	Between groups	3	5.40	1.80	2.55	.061
	Within groups	82	57.86	0.71		
	Total	85	63.26			

Equal variance could be assumed for all skills questions. Therefore, it was determined that there was no significant difference in how preservice teacher participants responded to the skills questions. The mean response rate for all skills questions was 2.66, the second highest response mean out of the four categories.

Table 15 represents the ANOVA results for the resource questions and responses, ordered by Survey Question 1A (PlanningTime), 2D (AskColleagues), 2E (TechnologyCoach), 2F (StudentsToHelp), 2G (EncourageStudents), 2J (OnlineTutorials), 3A (OnlineReviews), 3B (SurfInternet), 3C (OnlineWebinars), 3D (PlanLessons), 3G (PersonalLife), 3H (PreRecordedPresentations), and 3J (DigitalResourceConferences).

Table 15: Resources ANOVA

Variable	Source	*df*	*SS*	*MS*	*F*	*p*
PlanningTime	Between groups	3	1.19	0.40	0.81	.491
	Within groups	96	46.92	0.49		
	Total	99	48.11			
AskColleagues	Between groups	3	3.15	1.05	1.45	.233
	Within groups	88	63.58	0.72		
	Total	91	66.73			
TechnologyCoach	Between groups	3	4.08	1.36	2.82	.044
	Within groups	88	42.52	0.64		
	Total	91	46.61			
StudentsToHelp	Between groups	3	0.48	0.16	0.25	.862
	Within groups	88	56.39	0.48		
	Total	91	56.87			
EncourageStudents	Between groups	3	0.56	0.19	0.22	.880
	Within groups	88	73.13	0.83		
	Total	91	73.68			
OnlineTutorials	Between groups	3	2.00	0.67	0.95	.422
	Within groups	88	61.92	0.70		
	Total	91	63.91			
OnlineReviews	Between groups	3	1.83	0.61	0.69	.559
	Within groups	83	73.22	0.88		
	Total	86	75.06			
SurfInternet	Between groups	3	0.81	0.27	0.38	.769
	Within groups	83	59.15	0.73		
	Total	86	59.95			
OnlineWebinars	Between groups	3	3.01	1.00	2.72	.049
	Within groups	83	30.60	0.37		
	Total	86	33.61			
PlanLessons	Between groups	3	2.84	0.95	1.29	.283
	Within groups	83	60.91	0.73		
	Total	86	63.75			
PersonalLife	Between groups	3	1.71	0.57	1.48	.225
	Within groups	82	31.60	0.39		
	Total	85	33.31			
PreRecordedPresentations	Between groups	3	4.21	1.40	1.57	.203
	Within groups	83	74.23	0.89		
	Total	86	78.44			
DigitalResourceConferences	Between groups	4	3.67	0.92	2.09	.090
	Within groups	82	36.07	0.44		
	Total	86	39.75			

Equal variances for Survey Questions 3D (PlanLessons) and 3H (PreRecordedPresentations) could not be assumed. Therefore, it was determined that there was a significant difference in how preservice teacher participants responded to these two individual resource survey questions. Looking back at the ANOVA table, it was possible to gather additional information on these questions. For Survey Question 3D (PlanLessons), an ANOVA showed $F(3,85) = 1.29$, $p = .283$. Using these results and the *F* table of critical values, it was determined that the calculated *F* value of 1.29 was less than the critical value of 2.70. Therefore, it was noted that there were no significant differences in the responses to this specific question. For Survey Question 3H (PreRecordedPresentations), an ANOVA showed $F(3,83) = 1.57$, $p = .203$. Using these results and the *F* table of critical values, it was determined that the calculated *F* value of 1.57 was less than the critical value of 2.70. Therefore, it was noted that there was no significant difference in the responses to this specific question. The mean response rate for all resource questions was 2.32, the third lowest response mean out of the four groupings.

Table 16 represents the ANOVA results for the experience questions and responses, ordered by Survey Question 1F (TechnicalProblems), 2K (ObserveColleagues), 3I (InstructionalCoachMeetings), and 3K (ProfessionalDevelopment).

Table 16: Experiences ANOVA

Variable	Source	*df*	*SS*	*MS*	*F*	*p*
TechnicalProblems	Between groups	3	1.71	0.57	1.13	.339
	Within groups	96	48.13	0.50		
	Total	99	49.84			
ObserveColleagues	Between groups	3	2.44	0.81	1.34	.266
	Within groups	88	53.30	0.61		
	Total	91	55.74			
InstructionalCoachMeetings	Between groups	3	4.65	1.55	2.63	.056
	Within groups	83	48.96	0.61		
	Total	86	53.61			
ProfessionalDevelopment	Between groups	3	0.57	0.19	0.25	.860
	Within groups	83	62.70	0.76		
	Total	86	63.26			

Equal variance could be assumed for all experience-related questions. Therefore, it was determined that there was no significant difference in how preservice teacher participants responded to the experience questions. The mean response rate for all experience questions was 2.21, the lowest response mean out of the four groupings.

Table 17 represents the ANOVA results for the efficacy questions and responses, ordered by Survey Question 1B (ConfidenceMatching), 1H (LikeUsing), 1I (ConcernedAboutUsing), 1J (AdequateTraining), and 1K (ConcernedAboutCreativity).

Table 17: Efficacy ANOVA

Variable	Source	*df*	*SS*	*MS*	*F*	*p*
ConfidenceMatching	Between groups	3	1.17	0.39	0.77	.516
	Within groups	96	48.79	0.51		
	Total	99	49.96			
LikeUsing	Between groups	3	0.62	0.21	0.58	.627
	Within groups	96	33.89	0.35		
	Total	99	34.51			
ConcernedAboutUsing	Between groups	3	8.65	2.88	5.52	.002
	Within groups	96	50.11	0.52		
	Total	99	58.76			
AdequateTraining	Between groups	3	2.36	0.79	1.68	.177
	Within groups	96	45.03	0.47		
	Total	99	47.39			
ConcernedAboutCreativity	Between groups	3	2.05	0.68	0.84	.475
	Within groups	96	77.95	0.81		
	Total	99	80.00			

Equal variance could not be assumed for Survey Question 1I (ConcernedAboutUsing). Therefore, it was determined that there was a significant difference in how preservice teacher participants responded to this individual efficacy survey question. Looking at the ANOVA table for this same question, it was possible to gather additional information. For Survey Question 1I (ConcernedAboutUsing), an ANOVA showed $F(3,96) = 5.52$, $p = .002$. Using these results and the F table of critical values, it was determined that the calculated F value of 5.52 was greater than the critical value of 2.70. Therefore, it was noted that there were significant differences in the responses to this specific question. The mean response rate for all efficacy questions was 2.89, the highest response mean of all four groupings of questions.

Summary

This study was conducted in order to identify, collect, and analyze the perceived experiences of future teachers regarding readiness for purposeful technology use. With support from the literature stating that teacher education programs need to adequately prepare future teachers, also known as preservice teachers, for effective technology integration into the classroom, this two-phase study began the process of recognizing preservice teachers' perceived needs, as well as preparation program strengths (Chen, 2010; Davies et al., 2011; Ottenbreit-Leftwich et al., 2012). All participants involved in this study were pursuing a teaching credential at the university level. Data analysis included 100 responses to the Teachers' Readiness to Adopt and Adapt Content (TRAAC) Digital Readiness Survey instrument and results from focus group interviews with 11 preservice teacher participants. This mixed-methods study proved to be appropriate for the analysis of the data and the research questions, as there were many instances where the qualitative data either provided additional understanding, contributed depth to the story that the survey results represented, or changed the story completely to something that the survey did not predict.

For the skills survey questions and responses, Survey Questions 2B (OnlineDigitalLibraries) and 2C (OnlineNetworking) were used for further analysis and discussion. While the survey analysis reported that these questions had means of 2.46 (OnlineDigitalLibraries) and 2.42 (OnlineNetworking), both lower or negative response rates, the focus group interviews told a different story. Through the analysis of the qualitative data, it was discovered that preservice teacher candidates were both networking and finding technology tools and digital resources, but not in the manner in

which the survey predicted. Preservice teachers felt that they had the tools they needed to be successful; however, they lacked the time to experience and practice with these tools. Additionally, networking was occurring constantly, in a face-to-face model with their colleagues, peers, and mentors, as opposed to via the use of online networking sites. While preservice teacher candidates were using technology and digital tools for teaching and learning, they craved face-to-face mentoring in the understanding, learning, and use of these tools.

For the resource survey questions and responses, Survey Questions 3C (OnlineWebinars) and 3G (PersonalLife) were used for further analysis and discussion. For Survey Question 3C (OnlineWebinars), the survey responses reported a mean of 1.46, very closely related to a negative response. Again, while the survey response analysis alluded to a negative and low response, the focus group interviews showed that preservice teaching candidates were learning and acquiring digital resources and tools by using their peers, colleagues, and classmates, not by using online resources like webinars or online tutorials. Much like with Survey Question 2C (OnlineNetworking), the learning and collaboration was happening, just in a form different than what the survey predicted. For Survey Question 3G (PersonalLife), the mean was the highest in the entire data set at 3.55. In both the survey responses and focus group interviews, technology and digital tools use in personal life was reported to be very positive and highly regarded. Preservice teacher candidates appeared to use technology and digital tools for professional growth in the form of online publications in order to create and/or widen their digital footprint. Additionally, preservice candidates discussed opportunities for their personal technology

use to cross over into the educational environment, prompting meaningful interactions and engagement with their K-12 students.

For the experience survey questions and responses, Survey Questions 1F (TechnicalProblems) and 3I (InstructionalCoachMeetings) were used for further analysis and discussion. Survey Question 1F (TechnicalProblems) was one of the survey's five false positive response questions, so its mean of 2.96 equated to a more positive response. Interestingly, the focus group discussions elaborated on one of the possible reasons for this positive response. Through numerous discussions related to technical problems with technology use, preservice teacher candidates discussed the power of seeing their professors learn, grow, struggle, fail, and succeed with technology use. This appeared to have created an environment of safe failure and proactive problem solving for technology use in the classroom, providing future teachers with the tools to experience success with the integration of technology and digital tools use into the classroom, especially when lessons do not go as planned. Survey Question 3I (InstructionalCoachMeetings) yielded a mean of 1.54, closely related to a negative response. Again, while the survey responses represented a low or negative response in relation to meeting with an instructional coach for mentoring and/or tutoring on the use of digital tools, the focus group interview data showed that mentoring and/or tutoring was happening. Again, unlike the survey predicted, preservice teacher candidates reported that mentoring was taking a more informal approach, in a peer-to-peer format on school sites, within the preservice education program, and even via the use of networking tools such as Twitter. Mentoring was occurring; however, its informal nature was much different than thought and unlike the methods that many educational institutions currently support.

Lastly, for the efficacy survey questions and responses, Survey Questions 1H (LikeUsing) and 1J (AdequateTraining) were used for further analysis and discussion. Survey Question 1H (LikeUsing) yielded the second highest mean for the entire data set at 3.43. Both the survey results and focus group interviews represented extremely positive responses when discussing that preservice teacher candidates liked using technology and/or digital tools. The focus group interviews provided insight on preservice teachers' finding technology and/or digital tools as an inspiring and exciting addition to their classroom instruction. Additionally, many of the focus group interview participants discussed the use of technology and/or digital tools to enhance engagement. Others saw technology use as a way for students to complete tasks and experience learning that would normally not be possible inside the walls of a classroom. Survey Question 1J (AdequateTraining) was selected for further analysis due to its strong connection to Research Question 1 and based on its average mean of 2.81. This mean needed further analysis via the focus group interviews because it provided both positive and negative result possibilities. Interestingly, the focus group interview responses mirrored the survey results: some positive and some negative. Some preservice candidates reported a positive experience in the technology prerequisite course, but others reported that the course was basic and not advanced enough to meet the needs of their prior understanding of technology and digital tools use, especially as related to teaching and instruction. Additionally, some preservice teacher candidates reported having a blended approach to their coursework, where technology and pedagogy were taught hand in hand. Others reported that technology tools were left out of the teaching and learning process. As with the survey results, the focus group interviews alluded to some

inconsistencies in how courses were taught, in preservice candidates' experiences with learning pedagogy and technology, and with technology use and access within the university courses.

For the group comparisons and ANOVA results, one question showed a significant difference in how preservice teacher participants responded to the specific survey question: Survey Question 1I (ConcenedAboutUsing). The significant response difference with this question provided additional insight into preservice teachers' perceived experiences with their levels of concern about using technology for teaching and learning. It became apparent during the focus group interviews that this same topic was an area of concern for preservice teachers and need and strength with the university-level program. Due to these diverse experiences, preservice teachers may continue to have concerns with using technology in their own teaching and learning process, while others might not have the same concerns. Again, these diverse experiences of the preservice teaching candidates could have resulted in the significant difference in how Survey Question 1I (ConcernedAboutUsing) was answered by the participants. Ultimately, a factor contributing to these significant response differences was the experience these preservice teacher candidates had with their teachers and/or professors. Similar to the impact that K-12 teachers can have on K-12 students, this was a crucial finding focusing on the importance of modeling and instruction of purposeful technology use for a successful and lasting experience for the preservice teacher candidates.

A further analysis, interpretation, and summary of these findings, as related to the research questions and the supporting literature, is presented in Chapter 5. However, it is believed that through this rich collection and analysis of data, a unique opportunity to

better understand and recognize the perceived needs and perceived program strengths for technology use and integration into the classroom, focused on preparing both teachers and students for real-world applications and experiences, has been presented (Ottenbreit-Leftwich et al., 2012).

CHAPTER 5

Technology continues to be an integral component of 21st-century learning and education. Educational leaders and K-12 teachers are being tasked with using technology within the educational environment as an approach to develop new ways of thinking, to deepen the connection between educational content and real-world understanding, and to meet the needs of 21st-century learners (Davies et al., 2011; Lambert & Gong, 2010). This new era of technology-driven teaching and learning includes new skill development and applications of 21st-century technology concepts. The use of technology within one's educational practice is critical, and understanding how to best prepare future teachers for successful and effective technology use will impact future generations of learners (Kyllonen, 2012; Mills, 2010). The technological, pedagogical, and content knowledge (TPACK) framework supports educators in effectively using technology for teaching and learning within the academic context. Teacher education programs at the university level need to adequately prepare future teachers for effective technology integration into the classroom, as well as to address the gap that exists between teachers and 21st-century teaching and learning practices (Chen, 2010; Davies et al., 2011; Ottenbreit-Leftwich et al., 2012).

With support from the literature, this study identified, collected, and analyzed future teachers' perceived experiences with and readiness for purposeful technology use. One hundred participants, pursuing either a single- or multiple-subject teaching credential at the time of the study, responded to the survey instrument, the Teachers' Readiness to Adopt and Adapt Content (TRAAC) Digital Readiness Survey, on their perceptions, thoughts, and use of digital resources for instructional practices. Eleven participants

engaged in focus group interviews, providing more depth on subgroup attitudes, practices, beliefs, and opinions on technology preparation and use (Creswell, 2012). Guided by the following research questions, both the quantitative and qualitative data supported a stronger understanding of future teachers' perceptions of their university-level preparation program, their perceived needs for digital readiness, and their perceived successes, as related to their experiences within the preparation program, for purposeful technology use in the teaching and learning environment. The research questions that guided this study were as follows:

1. How do preservice teachers perceive their teacher preparation program for purposeful technology use in the teaching/learning environment?
2. What do preservice teachers perceive as their digital readiness needs for purposeful technology use in the teaching and learning environment?
3. What do preservice teachers perceive as strengths within their teacher preparation program in support of purposeful technology use?

Skills, Resources, Experiences, and Efficacy

Survey questions were first organized into four categories, based on how they supported and/or aligned with the research questions: skills (action verbs relating to teaching and instruction), resources (tools, time, quantity vs. quality), experiences (external actions), and efficacy (feelings). The survey questions were then analyzed by theme using PSPP, a software application used for statistical analysis of sampled data. The groupings of survey questions and responses were ranked by their mean response rate, based on a Likert scale of 1 to 4. For all questions except the false positive questions, a response of a 3 or a 4 was considered positive. Responses corresponding to a

negative response were coded as a 1 or a 2. For the false positive questions, low numeric scores equated to a positive response. An analysis of group response means was conducted in order to rank which categories of questions and responses received the highest or most positive response rate by preservice teacher participants.

The ranking of the survey groupings was as follows and is listed in order from highest response mean, equating to positive responses, to lowest response mean, equating to negative responses: efficacy, skills, resources, and experiences. The literature showed that "researchers have studied preservice teachers' . . . self-efficacy using technology for teaching and learning, [finding efficacy to be] an instrument for predicting learning from attitudes" (Kumar & Vigil, 2011, p. 146). Additionally, another study showed that when preservice teachers had a strong "belief in the value of using technology to enhance teaching and learning . . . their self-efficacy toward integrating technology in the classroom significantly improved" (Lambert & Gong, 2010, p. 54). Interestingly, the self-efficacy questions and responses as a group had the highest response mean, supporting the assumption that this was a very positive aspect of this preparation program and the training of its participants for purposeful technology integration. High responses and/or feelings of efficacy toward technology use and integration have been fostered and developed with the preservice teachers who participated in this study, making predictions for integration in their future classrooms very positive.

A further discussion relating to the groupings of skills, resources, and experiences is located within the findings and conclusions section for each research question below. This provides more insight into why categories may be ranked in the order indicated

above and how the preservice teacher participants perceived their digital readiness and the support of the program in each of these additional areas.

Research Question Findings

Through quantitative and qualitative data analysis, and via the lens of the literature review and supporting theoretical framework of phenomenology, in order "to discover the qualitatively different ways in which people experience, conceptualize, realize and understand various aspects of phenomena in the world around them," each of the research questions was supported by evidence from the findings of this study (Ornek, 2008, p. 2). Each research question is presented separately with the corresponding conclusions and discussions in order to best validate the findings of this research study.

Research Question 1. Research Question 1 addressed how preservice teachers perceived their teacher preparation program for purposeful technology use in the teaching/learning environment. This research question was answered by both the quantitative and qualitative data corresponding to responses to Survey Question 1J (AdequateTraining). For the survey responses, the mean response rate was average, not clearly articulating a positive or a negative response rate. The focus group interview responses mirrored the quantitative data, with both positive and negative comments about preservice teachers' perceived preparedness for the use of digital resources in the teaching and learning environment. Additionally, the focus group responses alluded to a lack of consistency between and within the prerequisite technology courses. This was perceived as either a positive or a negative experience based on the professors' knowledge of digital tools, resources, technology use, and organization of the course. These

> neutral approaches, [a combination of positive and negative,] are likely to fail because they overemphasize technology skills without developing pedagogical technology knowledge, technological content knowledge, or technological pedagogical content knowledge. In other words, merely knowing how to use technology is not the same as knowing how to teach with it. (Mishra & Koehler, 2006, p. 1033)

Lastly, per the focus group interviews, preservice teachers felt that there were also some inconsistencies in their experiences with pedagogy as related to technology integration as well as technology use by both professors and preservice teachers within their university courses.

Research Question 2. Research Question 2 investigated what preservice teachers perceived as their digital readiness needs for purposeful technology use in the teaching and learning environment. The perceived needs initially appeared in the quantitative data from the survey as low response means but truly came to light throughout the focus group interviews. Preservice teachers had perceived needs related to every category of questions and responses.

For skills, a fire hose analogy was discussed. Preservice teachers felt that related to technology skills, there was an oversaturation of information and not enough time to engage with, learn, and/or implement these skills within their subject matter or teaching practice. There were multiple mentions and discussions of having enough resources to use, but time was the number one concern for effective use and mastery of these technology skills. Additionally, preservice teachers reported seeing a spiral from the first semester to the second semester related to technology skills and use. It was reported that preservice teachers' technology use increased during the second semester, while professors' use declined. Finally, there was the mention of exposure versus practice.

While preservice candidates felt that they were being exposed to plenty of digital skills and tools, they lacked the time to practice integration with these tools for teaching and learning. According to So and Kim (2009), "It has been pointed out that mere exposure to a number of technical tools does not necessarily mean that pre-service teachers can develop abilities to design successful, technology integrated lessons" (pp. 101-102). This aligned with the discussion of more time needed in order to bypass the exposure stages of technology use and integration to reach mastery and use of technology as a critical and "integral component of the overall process [of teaching and learning]" (Cohen et al., 2007, p. 84).

The two critical areas of perceived need as related to resources were organization of resources and face-to-face networking. Preservice teachers reported needing more organization with the resources offered throughout the preparation program, specifically as related to content area and courses. Many preservice teachers felt that they were provided with resources to use, but not in an organized way that made it easy to apply and integrate these tools within their lessons for specific content areas and/or with certain technology platforms. Additionally, the organization of courses as a whole differed, as some university instructors allowed the use of technology, such as laptops, within their courses and others did not. Preservice teachers spoke about the urgent need for consistency and organization of the prerequisite technology course, as well as many of their other courses, for a streamlined approach to technology resources used.

One of the most interesting findings was related to networking. The survey predicted that preservice teachers would use online networking sites, digital libraries, and other online tools in order to collaborate and network about digital resources and

technology use. However, the focus group interviews told a completely different story. Overwhelmingly, preservice teachers spoke about their face-to-face collaboration as opposed to using online networking tools with one another and about those individuals whom they were interacting with on their school sites during their practicum experiences. While preservice teachers used technology tools such as Google Docs and Twitter for collaboration and learning, the preferred method for digital networking, learning about digital tools, and the acquisition of these technology-driven resources was in person.

The preference for face-to-face networking and learning opportunities continued to transfer into other findings related to experiences. Preservice teachers again discussed their preference for learning from one another as opposed to using digital libraries, online videos and tutorials, and other online resources. Additionally, when mentoring was discussed, preservice teachers spoke of the informal mentoring they sought out and acquired constantly. For both of these findings, the survey predicted different responses. It was assumed that preservice teachers would use digital resources for learning as well as formal mentoring with a coach. This finding will be imperative for future research and studies, as many mentoring opportunities in education programs and school districts are formal, such as through the use of coaches and teachers on special assignment (TOSAs). Additionally, past research has shown that technology mentoring within preservice preparation programs "significantly affected technology use and integration throughout the preparation program over time" (Cohen et al., 2007, p. 81). The findings of this research study represent the benefits and high reports of usage of informal mentoring for the acquisition of resources, and the successful implementation and integration of

technology for teaching and learning, laying the groundwork for future research in this area.

Finally, the perceived needs related to efficacy surrounded the need for flexibility in the platform and device in which technology is being utilized. Many preservice teachers who were pursuing their practicum or student teaching experiences at the time of the study mentioned "bring your own device" (BYOD) school settings. As the BYOD model continues to become the norm within K-12 schools, teachers will need to have the training and understanding of how to access digital tools on every device and learning platform. Preservice teachers discussed the importance of not just receiving instruction on how to teach to the iPad, Chromebook, or laptop but also having learning experiences that will prepare them to use technology effectively with any device in any setting.

Research Question 3. Research Question 3 inquired about preservice teachers' perceptions of the strengths within their teacher education program in support of purposeful technology use. First, preservice teachers, often referred to as digital natives, as much of this population grew up with technology, reported that they liked using technology (Lei, 2009). The survey questions that focused on liking technology and the use of technology in one's personal life had the highest mean response rate of the entire data set. In the focus group interviews, participants discussed the seamless transition for technology use from their personal lives to the classroom, and they saw this as a positive experience. However, while the transition of technology resources and skills was mentioned, preservice teachers still needed support in acquiring the understanding of and experience in how to translate personal technology use into technology use focused on

preparing K-12 students for real-world applications and experiences (Ottenbreit-Leftwich et al., 2012).

Preservice teachers also expressed appreciation for their professors' willingness to take risks with technology use. This included openly showcasing their public failures and/or problems with the use of digital resources and tools within their instruction and teaching. This trial-and-error process was discussed throughout the focus group interviews and stated as a point of learning and appreciation from the preservice teacher candidates. Participants mentioned that they felt that many of their professors were willing to try to incorporate technology into their instructional practice, even if their lesson with technology was not a success. They discussed the importance of experiencing this process and how positive it was for many of them as they entered their practicum experiences, where technology trial and error was a common part of the teaching day.

Lastly, during the focus group interviews, candidates all expressed excitement and enthusiasm for how the use of technology had enhanced engagement and positive experiences for their students, oftentimes in ways never before possible. There were stories exchanged of different teaching moments and technology breakthroughs with students, all relating back to the teaching candidates' belief in the power of technology use as a tool for engagement and positive learning experiences. These experiences came from a compilation of personal experiences with technology use and those learned and/or experienced within their preparation program. Therefore, it can be noted that this preparation program had very high rates of success with supporting preservice teachers' beliefs, understandings, and experiences related to the positive impacts of technology use in the classroom for student engagement and positive learning experiences.

Recommendations

Based on the results of this study, the following recommendations can be made to this university-level program and faculty in order to meet the perceived needs of the preservice teachers in this preparation program. First, the organization of resources could greatly benefit the preservice teachers within this program. This includes a clear process and method in which resources are gathered, organized, and shared for use by preservice teachers. Additionally, it is recommended that technology resources and digital content be presented in a way that offers options that meet the needs for specific content areas. The focus group interviews alluded to this need being the strongest in mathematics, but all focus group participants agreed that content-specific resources would be a valuable tool to enhance their practice and the integration of technology within their content areas. Additional time for preservice teachers to experience, experiment with, and learn about resources and digital tools for effective technology use within their content area and teaching environment would also be beneficial.

Second, it is recommended that communication between professors increase in order to gain and develop consistency between the prerequisite technology course and all other courses for standard technology use guidelines. The current inconsistencies that were reported by the focus group participants were seen as an area of growth for this preparation program. However, with changes toward a more developed alignment, it is thought that the experiences of future candidates within the program could be greatly improved. Additionally, when looking at the merging of technology use for content and pedagogy coursework, it is recommended that the TPACK framework be considered for

the development of positive learning experiences with technology for future teachers. Supporting literature stated,

> TPACK has the potential to provide a new framework for developing learning experiences for future teachers. Through developing and using the TPACK instrument, work to operationalize the TPACK concept for teacher educators and preservice teachers is progressing. Using this instrument and related classroom behavior measures, feedback is provided to both students and teacher educators on the impact of teacher education experiences in the development of TPACK. Ultimately, the assessment of TPACK can provide information that will help design TPACK learning experiences throughout teacher education programs. (Baran et al., 2011, p. 373)

In addition to these needs, it is recommended that the university continue to focus on the reported strengths of the program, including preservice teacher candidates' enjoyment of using technology, the professors' willingness to take risks when using technology for teaching and learning, and the positive experiences that preservice candidates reported seeing with technology use in their classrooms and within their teaching and learning opportunities. Building on these strengths and continuing to include these opportunities within this university-level program has the potential to benefit future preservice teacher candidates in this preparation program.

These recommendations and study findings will also be shared with Project Tomorrow, as feedback on the TRAAC Digital Readiness Survey instrument has been requested.

Limitations

The major limitations of this study include the data being collected from only one university, through one teacher education program. In order to make the results more generalizable, additional data from multiple university-level teacher education programs

would need to be collected and analyzed. Additionally, the researcher is very involved in the successful use and integration of technology into the teaching and learning environment, supporting both current and future teachers with positive growth, experiences, and integration of technology into their practice, which may have led to a bias in the data analysis.

Areas for Future Research

The primary areas for future research include additional studies on the components of the TPACK framework and the concept of preparation versus practice, focusing on future teachers' ability to use technology for teaching and learning in their future classrooms. It is suggested that future research continue to take a holistic approach to the concepts of technology integration, instead of a single-course method for mastery of 21st-century skills (Baran et al., 2011; Lambert & Gong, 2010). This approach will require researchers to view the use of technology for teaching and learning as an ongoing process, where the TPACK framework is interwoven throughout teacher preparation courses (Asli Ozgun-Koca, Meagher, & Edwards, 2010).

In order to begin the transition toward teaching and learning in the 21st century, future research should include partnerships facilitating discussions and applications of best practices for technology use in teacher education programs and courses (Ottenbreit-Leftwich et al., 2012). A vital tool in this process will continue to be the TPACK framework, which is used worldwide to assess teachers' knowledge regarding TPACK and their abilities to translate technology use toward teaching and learning (Baran et al., 2011). Additionally, research in the area of best practices needs to include more longitudinal studies at multiple universities, analyzing future teachers as they begin and

progress through their teaching careers, as well as studies where research is based on self-reported performance measurements (Dilworth et al., 2012; Hoffer & Grandgenett, 2012; Ottenbreit-Leftwich et al., 2012; Polly et al., 2010). When considering best practices for integration in both content and pedagogy learning, teacher education program research needs to focus on instructional design and implementation of technology-driven lessons to determine which technologies are most educationally meaningful (Jaipal & Figg, 2010; Lei & Zhao, 2005).

Conclusion

The teacher preparation program at one university is addressing technology use in the K-12 classroom through one standalone prerequisite technology course, as well as through instruction in the credential methodology and pedagogy program coursework. Participants in this study indicated that they had gained skills, resources, experiences, and efficacy related to the use of technology, based on a combination of their prior knowledge and the preparation and organization of the university faculty providing course instruction. Unique to the literature are two findings from the data collected: the value of face-to-face interactions for instruction of and learning with digital tools and resources, and the importance of informal mentoring for validation and support with the use of technology in the teaching and learning environment.

Face-to-face interactions for learning and the acquisition of digital tools surpassed learning via online formats, such as digital libraries, networking sites, and other online platforms. The supporting literature discussed the need for teachers and K-12 students to communicate face-to-face without relying on technology; however, the preference for face-to-face interactions for technology learning and acquisition of skills was not

discussed (Chen, 2010). Additionally, per the focus group participants, mentoring is occurring constantly and informally, but not in the way in which the survey instrument or the supporting literature predicted. These predictions focused on formal mentoring, such as time with coaches or mentoring opportunities with the use of TOSAs and other support positions, which many school districts currently implement. This finding could benefit not only this university preparation program but school districts as well. Opportunities for informal mentoring, such as cohort learning experiences or time for collaboration, appeared to be more often accessed and more favorable to the participants in this study, ultimately benefiting the individual and group learning experience. Again, there was no research focusing on the concepts of informal mentoring in the supporting literature.

Finally, the overarching finding of this study was that of impact. This study supported the power of university faculty and their ability to impact and influence the teaching and learning experiences, as related to the integration of technology and digital tools, of their college-level students within this teacher preparation program. Undoubtedly, this impact transfers to these future teachers and the educational possibilities for their future K-12 students. Therefore, it is critical that university-level preparation programs impact future teachers in a way that ensures future generations of K-12 learners have the opportunity to experience digital tools, 21st-century skills, and integrative technology as a teaching and learning component, providing endless opportunities for rich educational experiences and future learning opportunities for all.

Preparing future teachers for purposeful technology use, focused on the preparation of K-12 students for real-world applications and experiences, is crucial (Ottenbreit-Leftwich et al., 2012). This study, supported by both quantitative and

qualitative data collection and analysis, has begun the investigation into preservice teachers' perceived needs in order for a university-level preparation program to best support technology integration and use into future teachers' classrooms and educational practices.

APPENDICES

Appendix A: Initial Letter/Email to Participants

Dear _____,

I am a student in the Joint Doctoral Program (JDP) in Educational Leadership at CSU San Marcos and UC San Diego. I am conducting research into the preparation of future teachers for the successful use and integration of technology into the classroom. My hope is that this research will help future teachers to be prepared to best use technology in their classrooms, as well as to assist educational leaders to better understand the importance of preparing future teachers for technology use within their preservice teacher education programs. You are being contacted because you are a student currently enrolled in an undergraduate or graduate level credential program at the university site selected for study.

In one week, you will be sent an email with a link to take a brief survey (12 questions). The survey is about your personal thoughts on the use of digital resources for instructional practices in the classroom. The survey will take approximately 10 minutes and can be completed electronically. Should you prefer to take the survey on paper, you can contact me directly for this option. Prior to completion of the survey, you will be provided with the choice to receive a personal results chart detailing where you fall on the Digital Readiness Spectrum, as well as a detailed report regarding your results.

Your confidentiality will be respected throughout this process. Pseudonyms for educational institutions will be used to minimize the risk of identification and responses will not be linked to your name or personal information.

I hope that you will agree to participate in this research project. Please feel free to contact me should you have any questions or concerns and thank you in advance for considering participation.

Sincerely,
Brieahna Weatherford
Doctoral Student
CSU San Marcos & UC San Diego
weathe01@cougars.csusm.edu

Appendix B: Invitation to Participate Letter/Email

Dear _____,

You were contacted one week ago about participation in my research. I am a student in the Joint Doctoral Program (JDP) in Educational Leadership at CSU San Marcos and UC San Diego. I am conducting research into the preparation of future teachers for the successful use and integration of technology into the classroom. My hope is that this research will help future teachers to be prepared to best use technology in their classrooms, as well as to assist educational leaders to better understand the importance of preparing future teachers for technology use within their preservice teacher education programs. You are being contacted again because you are a student currently enrolled in an undergraduate or graduate level credential program at the university selected for study.

Below is the link to a brief survey (12 questions), about your personal thoughts on the use of digital resources for instructional practices in the classroom. The survey will take approximately 10 minutes. Should you prefer to take the survey on paper, you can contact me directly for this option. Pending completion of the survey, you will be provided with the choice to receive a personal results chart, detailing where you fall on the Digital Readiness Spectrum, as well as a detailed report regarding your results.

TRACC Digital Readiness Survey https://www.surveymonkey.com/s/MYWRNHX
https://www.surveymonkey.com/s/MYWRNHX

Your confidentiality will be respected throughout this process. Pseudonyms for educational institutions will be used to minimize the risk of identification and responses will not be linked to your name or personal information. Before you begin the survey, you will see a consent page. By moving forward with the survey, you are agreeing to participation and approving your consent. You may stop the survey at any time, with no penalties or consequence.

Please feel free to contact me should you have any questions or concerns and thank you in advance for your participation.

Sincerely,
Brieahna Weatherford
Doctoral Student
CSU San Marcos & UC San Diego
weathe01@cougars.csusm.edu

Appendix C: Consent Paragraph at Beginning of Survey

Dear Future Teacher Candidates,

You have been invited to participate in a research study. The **purpose** of this research is to assess the preparation of future teachers for the successful use and integration of technology into the classroom, as well as to assist educational leaders to better understand the importance of preparing future teachers for technology use within their preservice teacher education programs. The study involves a 12-question survey, which should take roughly 10-minutes to complete. The California State University San Marcos Institutional Review Board approved this study and its procedures. The study involves no foreseeable **risks** or harm to you as a participant.

You are free to ask **any questions** about the study or about being a participant by emailing me at weathe01@cougars.csusm.edu, both before and/or after participation. Your participation in this study is **voluntary** and you are under no obligation to participate or to complete the survey. You may **withdraw or stop** participation in the survey at any time. By continuing on and submitting a completed survey, you are providing consent for participating in the study. To maintain anonymity, you will not be asked to write your name on any of the survey materials.

Confidentiality will be maintained and all data will be collected and stored in a password-protected Survey Monkey account, created solely for the purpose of this research study.
By continuing on with the survey, you are verifying that you, as a participant, have read this consent information and voluntarily agree to participate in this study.
You may print this page for your records. Thank you for your participation.

Appendix D: Reminder for Participation Letter/Email

Dear _____,

This is just a reminder and request for your participation in my research. I am a student in the Joint Doctoral Program (JDP) in Educational Leadership at CSU San Marcos and UC San Diego. I am conducting research into the preparation of future teachers for the successful use and integration of technology into the classroom. My hope is that this research will help future teachers to be prepared to best use technology in their classrooms, as well as to assist educational leaders to better understand the importance of preparing future teachers for technology use, within their preservice teacher education programs. You are being contacted again because you are a student currently enrolled in an undergraduate or graduate level credential program at the university selected for study.

Below is the link to a brief survey (12 questions), about your personal thoughts on the use of digital resources for instructional practices in the classroom. The survey will take approximately 10 minutes. Should you prefer to take the survey on paper, you can contact me directly for this option. Pending completion of the survey, you will be provided with the option to receive a personal results chart, detailing where you fall on the Digital Readiness Spectrum, as well as a detailed report regarding your results.

TRACC Digital Readiness Survey https://www.surveymonkey.com/s/MYWRNHX
https://www.surveymonkey.com/s/MYWRNHX

Your confidentiality will be respected throughout this process. Pseudonyms for educational institutions will be used to minimize the risk of identification and responses will not be linked to your name or personal information.

Please feel free to contact me should you have any questions or concerns and again, thank you in advance for your participation.

Sincerely,
Brieahna Weatherford
Doctoral Student
CSU San Marcos & UC San Diego
weathe01@cougars.csusm.edu

Appendix E: Letter/Email to Survey Participants for Focus Group Participation and Consent

Dear _____,

Thank you for your participation in TRACC Digital Readiness Survey. Your support of my research into the preparation of future teachers for the successful use and integration of technology into teaching and learning is invaluable. In order to have a deeper understanding of how future teachers are prepared to best use technology in their classrooms, as well as to assist educational leaders to better understand the importance of preparing future teachers for technology use within their preservice teacher education programs, I would like to invite you to participate in a focus group.

If you choose to participate in this focus group, you will be asked to attend a group interview session lasting 45-60 minutes. This interview will be held with other individuals within your credential program and will include questions related to your thoughts, feelings, and ideas on your personal levels of preparation for technology use, as well as the role of your preservice teacher education program in this process. This interview will take place on your university campus, with the time and date to be determined based on participants' availability.

As always, your confidentiality will be respected throughout this process. Pseudonyms for educational institutions will be used to minimize the risk of identification and responses will not be linked to your name or personal information.

I hope that you will agree to participate in this focus group and thank you again for your participation thus far in my research study. Please feel free to contact me should you have any questions or concerns and thank you in advance for considering participation.

Sincerely,
Brieahna Weatherford
Doctoral Student
CSU San Marcos & UC San Diego
weathe01@cougars.csusm.edu

Appendix F: Informed Consent Document

Invitation to Participate

I am a student in the Joint Doctoral Program (JDP) in Educational Leadership at CSU San Marcos and UC San Diego. I am conducting research study on the preparation of future teachers for the successful use and integration of technology into the classroom. My hope is that this research will help future teachers to be prepared to best use technology in their classrooms, as well as to assist educational leaders to better understand the importance of preparing future teachers for technology use within their preservice teacher education programs. You are being contacted because you are a student currently enrolled in an undergraduate or graduate level credential program at the university site selected for this study and you completed the TRACC Digital Readiness Survey.

Requirements of Participation (What you will be asked to do)

If you choose to participate in this focus group, you will be asked to attend a group interview session lasting 45-60 minutes. The researcher will take notes during the interview session. The interview session will be audio recorded. This interview will be held with other individuals within your credential program and will include questions related to your thoughts, feelings, and ideas on your personal levels of preparation for technology use, as well as the role of your preservice teacher education program in this process. This interview will take place on your university campus, with the time and date to be determined based on participants' availability.

Risks

Risks for participation could include:

- Lack of anonymity based on participation in the interview session with other individuals from similar credential programs.

Safeguards

Safeguards to avoid all foreseeable risks include setting up a secure location for the focus group interviews and to have all participants complete a consent form prior to participation. Participation in the interview session is voluntary. You may leave the session at any time, and choose not to answer any questions without penalty. Your responses will be confidential. The researcher will never use your name or the name of your school to maintain confidentiality. Researcher's notes and the audio recording of the session will be stored on a password-protected computer that only the researcher has access to. All data will be destroyed after this research study is concluded.

Incentives for Participation

You will not receive payment for taking part in the study.

Benefits

Although there may not be direct benefits to you, the possible benefits of your participation in this study is the potential to help future teachers to be prepared to purposefully use technology in their classrooms, as well as to assist educational leaders to better understand the importance of preparing future teachers for technology use within their preservice teacher education programs.

Voluntary Participation

Participants can withdraw their participation in this focus group interview at any time without consequences.

Contact Information and Signatures

I hope that you will agree to participate in this focus group and thank you again for your participation thus far in my research study. Please feel free to contact me should you have any questions or concerns and thank you in advance for considering participation.

Sincerely,
Brieahna Weatherford
Doctoral Student
CSU San Marcos & UC San Diego
weathe01@cougars.csusm.edu

"This study has been approved by the California State University San Marcos Institutional Review Board. Questions about your rights as a research participant should be directed to the Institutional Review Board at irb@csusm.edu or (760) 750-4029. You will be given a copy of this form to keep for your records."

By signing below, I give my consent to participate in this focus group and understand the risks involved. I understand that my participation is completely voluntary and that I am free to stop participation at any time, with no consequences. I understand that my confidentiality will be protected as a participant in this focus group, but that the researcher cannot guarantee anonymity due to the focus group interviews being help with other individuals from similar credential programs.

Participant Name Participant Signature Date

Appendix G: TRAAC Digital Readiness Survey

Dear Teacher,

This short survey gathers your thoughts on digital resources for instructional practice. "Digital resources" refer to any sort of freely available digital content for education – some examples include electronic teaching aids such as lesson plans, interventions, assessment software, online databases (such as census data, education statistics), game-based environments, animations and simulations, video clips, podcasts, etc.

The survey should take about 10 minutes to complete. Once you complete the survey, you will be asked to if you would like to receive information about where you fall on the "Digital Readiness Spectrum," and will include tips to help you more effectively incorporate digital content in your practice.

Thank you!

The Project Tomorrow TRAAC Research Team

*

1. Please answer the questions below by selecting: Strongly Agree, Agree, Disagree or Strongly Disagree.

	Strongly Agree	Agree	Disagree	Strongly Disagree
A. I usually have enough time to plan lessons using digital resources.				
B. I feel confident matching digital resources to the learning goals I set for my students.				
C. I use digital resources to reinforce concepts that I've already introduced.				
D. I am skilled at using technology tools to access digital content.				
E. I often edit digital resources to fit my specific classroom context.				

F. I often have technical problems when I try to use digital resources (i.e. computer or connectivity problems).				
G. I have trouble finding the right digital resources to use.				
H. I like using digital resources.				
J. I am concerned about how using digital resources might change my relationships with students.				
K. I received adequate training on the use of digital resources in my pre-certification training program.				
L. I am concerned about how to use digital resources creatively.				

*

2. Please answer the questions below by selecting: Never or Rarely, Sometimes, Often or Usually or Always

	Never or Rarely	Sometimes	Often	Usually or Always
A. I use digital resources in my direct classroom instruction (i.e. incorporating simulations, wikis, videos, etc.).				
B. I use online digital libraries to search for digital resources.				
C. I use online networking sites (i.e. Facebook, wikis, etc.) to find digital resources.				
D. I ask my colleagues about the digital resources they use in their classrooms.				
E. I look to my school's technology coach/department for suggestions on which digital resources to use (if you do not have this at your school, mark "never").				

F. I ask my students to help me find digital resources.				
G. I encourage my students to use digital resources to work independently (i.e. online remediation tools, educational games, etc.).				
H. I use digital resources to introduce new concepts or topics.				
I. I adapt digital resources to meet the specific learning needs of my students.				
J. I use online tutorials to learn more about digital resources.				
K. I observe my colleagues' classrooms to learn about how they use digital resources.				

*

3. Please answer the questions below by selecting: Never or Rarely, Sometimes, Often or Usually or Always

	Never or Rarely	Sometimes	Often	Usually or Always
A. I read online reviews of digital resources.				
B. I surf the Internet for new ideas about how to use digital resources in my instruction.				
C. I participate in online webinars (seminars) about digital resources.				
D. I use digital resources to plan my lessons.				
E. I use a teacher-directed approach to classroom instruction.				
F. I change the way that students are grouped to better incorporate digital resources in my classroom.				
G. I use digital resources in my personal life outside the classroom.				

H. I go online to watch pre-recorded presentations or talks about digital resources.				
I. I meet with my Instructional Coach for mentoring/tutoring sessions about how to use digital resources (if you don't have an instructional coach, select "never").				
J. I attend sessions on digital resource incorporation at local, state or national conferences.				
K. I participate in district or school provided professional development on using digital resources in the classroom.				

Thank for your help so far – you are almost there. We just have a few background questions to ask before you are done.

*

4. How frequently do you use digital resources (i.e. online lesson planning tools, simulations, wikis, social media, etc.) in your classroom?

Never

1-5 times per month

6-10 times per month

More than 10 times per month

*

5. In my school, there is a dedicated instructional coach to help me incorporate digital resources into my practice

True
False

*

6. Gender

Male
Female

*

7. At the end of this school year, how many years of teaching experience will you have?

1-3
4-10
11-5
16 + years

*

8. Age

- 29 and under
- 30-39
- 40-49
- 50-59
- 60-69
- 70 +

*

9. Position or Title

- Classroom Teacher (preK-12)
- IT Support Person/Technology Integration Specialist
- College Faculty
- Preservice Teacher
- Curriculum Coordinator

Researcher Principal/Assistant Principal Informal/Home School Educator Librarian/Media Specialist Agency/Association Professional
Other (please specify)

*

10. What grade level do you teach?

Preschool Primary (K-2) Elementary (3-5) Middle (6-8) High (9-12)
Other (please specify)

*

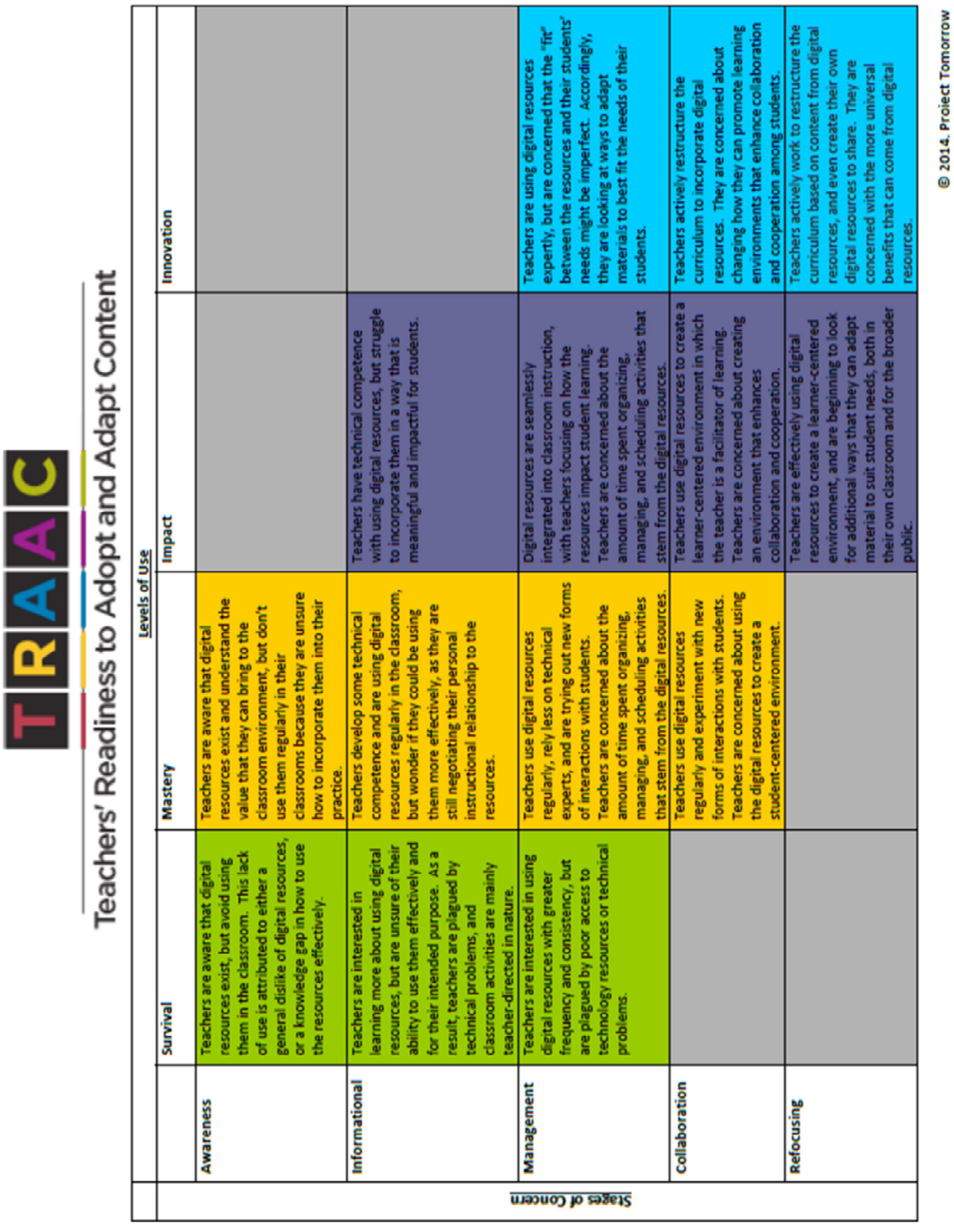
11. What subject do you teach more than any other?

Science
Mathematics
Technology
English Language Arts
Social Studies
Foreign Language
Enrichment
Special Education
Music
Physical Education
Library Sciences
Other (please specify)

12. Would you like to find out where you are on the Digital Readiness Spectrum? The Digital Readiness Spectrum is a tool that explains your level of readiness to adopt digital resources, and includes include tips to help you more effectively

incorporate digital content in your practice. <u>If you would like to find out where you are on the Spectrum, please provide your email address below.</u> (Note: we will not share your email address with anyone – this is only so that we can email you your results.

Appendix H: Example of Digital Readiness Spectrum



Appendix I: Example of Description of Respondents' Placement on Digital Readiness Spectrum

Innovation-Refocusing

You are not simply the end user of digital resources – you are a true innovator. At this final step along the Digital Readiness Spectrum, your goal is to adopt, adapt, and *create* your own digital content. Yes, create! Your classroom is like the test kitchen for tomorrow' great dishes – and you and your students are the chefs. Since you may not have created any original content before, you should look to examples that are freely available and think about how you might restructure them to fit your students' academic, engagement, and emotional levels. Then, you may want to use your collaboration time with your colleagues (for example, your common prep time, if you have it) to brainstorm with your colleagues about what techniques and strategies would work best.

Then, it's time to experiment. Ask your students for feedback on lessons. Additionally, make sure that you give yourself ample time to reflect on your instructional practice – keeping a journal is one great way to help you sort out what worked from what doesn't.

As an innovator of digital resources, we encourage you to share what you learn along with way – to anyone who will listen! Talk with your colleagues, your administrative team, and friends in other districts. Ask your principal if you can go to local or national technology conferences and learn about the latest and greatest technology resources that are available. Participate in webinars, blogs, and online communities to learn more and share your experiences. And most importantly, learn from your students – they will tell you what resources have truly made the difference for them.

As always, your instructional coach is your partner in these efforts. Here are some questions you can ask to improve your interactions:

- When it comes to creating my own digital content, where do I start?
- What are some ways that I can become a more reflective practitioner regarding my use of digital resources?
- How can I share what I've learned regarding digital resource use with my colleagues and the outside world?
- Are there any conferences or outside learning opportunities that I can participate in to learn more about what's on the horizon with digital resources?

Appendix J: Focus Group Interview Protocol/Questions

Interview Protocol - Focus Group

Time of Interview:
Date:
Place:
Name of Interviewer:
Names of Interviewees:
Program of Study of Interviewees:

Introduction to the interview: The purpose of this study is to research the preparation of future teachers for the successful use and integration of technology into the classroom. My hope is that this research will help future teachers to be prepared to best use technology in their classrooms, as well as to assist educational leaders to better understand the importance of preparing future teachers for technology use, within their preservice teacher education programs.

I have collected survey data from the TRAAC Digital Readiness Survey and am now interviewing future teachers from each credential program (single-subject, multiple subject, and special education) to more deeply understand this topic and my proposed research questions. The location of this study and all participants' identities will be made anonymous in the writing of the findings report and all data collected, including this interview. All data collected will be stored in a password-protected computer, for use only by the researcher. This interview will take approximately 45-60 minutes.

[Provide an opportunity for the interviewees to re-read and ask any questions about the signed consent form]
[Turn on and test recording device]
[Begin questions]

Questions:

1. Tell me a little about yourself (i.e. where are you from, why did you choose to enroll in a credential program, what stage are you within your program, what your ideal school, grade level, subject would be, etc.).

2. Can you describe your experience with technology and/or digital resources thus far within your preservice preparation program at the university?

3. What does the use of technology in the classroom mean and look like to you?

4. Tell me about how your preservice teacher education program contributed to your ideas, thoughts, etc. on what technology use looks like and means to you?

5. To what extent has technology and/or digital resources been used within your courses at the university and by your professors/instructors?

6. Can you describe anything you would like to change about how technology and/or the use of digital resources have been used in your preservice teacher preparation experience?

7. Can you describe any experiences you have had with the use of technology and/or digital resources that have "stuck" with you?

8. Tell me about your thoughts for using technology and/or digital resources in your student teaching experience, or in your first "official" year of teaching.

Appendix K: Statistical Analysis Chart

Research Questions:

1. How do preservice teachers perceive their teacher preparation program for purposeful technology use in the teaching/learning environment?
2. What do preservice teachers perceive are their digital readiness needs for purposeful technology use in the teaching and learning environment?
3. What do preservice teachers' perceive as strengths, within their teacher preparation program, in support of purposeful technology use?

*Research questions will be answered based on the Likert scale corresponding to each questions. Positive responses will convert to higher numeric values, while negative responses will correspond to lower numeric values. Positive responses will correlate to research question three, while negative responses will correlate to research question two.

TRAAC Digital Readiness Survey/Focus Group Interview Grouping and Theme Analysis

Defined Group/Theme:

- Skills (action verbs relating to teaching and instruction)
- Resources (time, quantity vs. quality)
- Experiences (external actions)
- Efficacy (feelings and thoughts)

Survey Question #1	**Group/ Theme**
A. I usually have enough time to plan lessons using digital resources.	Resources
B. I feel confident matching digital resources to the learning goals I set for my students.	Efficacy
C. I use digital resources to reinforce concepts that I've already introduced.	Skills
D. I am skilled at using technology tools to access digital content.	Skills
E. I often edit digital resources to fit my specific classroom context.	Skills

F. I often have technical problems when I try to use digital resources (i.e. computer or connectivity problems).	Experiences
G. I have trouble finding the right digital resources to use.	Skills
H. I like using digital resources.	Efficacy
I. I am concerned about how using digital resources might change my relationships with students.	Efficacy
J. I received adequate training on the use of digital resources in my pre-certification training program.	Efficacy
K. I am concerned about how to use digital resources creatively.	Efficacy

Survey Question #2	**Group/ Theme**
A. I use digital resources in my direct classroom instruction (i.e. incorporating simulations, wikis, videos, etc.).	Skills
B. I use online digital libraries to search for digital resources.	Skills
C. I use online networking sites (i.e. Facebook, wikis, etc.) to find digital resources.	Skills
D. I ask my colleagues about the digital resources they use in their classrooms.	Resources
E. I look to my school's technology coach/department for suggestions on which digital resources to use (if you do not have this at your school, mark "never").	Resources
F. I ask my students to help me find digital resources.	Resources
G. I encourage my students to use digital resources to work independently (i.e. online remediation tools, educational games, etc.).	Resources
H. I use digital resources to introduce new concepts or topics.	Skills
I. I adapt digital resources to meet the specific learning needs of my students.	Skills
J. I use online tutorials to learn more about digital resources.	Resources
K. I observe my colleagues' classrooms to learn about how they use digital resources.	Experiences

Survey Question #3	**Group/ Theme**
A. I read online reviews of digital resources.	Resources
B. I surf the Internet for new ideas about how to use digital resources in my instruction.	Resources
C. I participate in online webinars (seminars) about digital resources.	Resources
D. I use digital resources to plan my lessons.	Resources
E. I use a teacher-directed approach to classroom instruction.	Skills
F. I change the way that students are grouped to better incorporate digital resources in my classroom.	Skills
G. I use digital resources in my personal life outside the classroom.	Resources
H. I go online to watch pre-recorded presentations or talks about digital resources.	Resources
I. I meet with my Instructional Coach for mentoring/tutoring sessions about how to use digital resources (if you don't have an instructional coach, select "never").	Experiences
J. I attend sessions on digital resource incorporation at local, state or national conferences.	Resources
K. I participate in district or school provided professional development on using digital resources in the classroom.	Experiences

**Survey questions 1-3 are included below and in this statistical analysis chart. Survey questions 4-12 provide data focused on demographics. These questions have been disaggregated to be identified as components of the analysis, often times in the form of independent variables. The identified groups have come from both the survey and focus group data analysis.

Research question	Survey question related to research	Interview question related to research	Analysis (independent samples *t* test, paired samples t test, ANOVA, ANCOVA)	Variables (IV, DV, covariates)
1, 2, 3	1-3	N/A	Descriptive statistics: mean, standard deviation, variance, Kurtosis, skewness, range, minimum, maximum, sum (including visual charts/histograms)	All variables for Survey Questions 1-3
1, 2, 3	1-3 and 9		Skills group mean/ANOVA	IV: Survey Question 9 (position or title) DV: Survey Questions 1C,D,E,G 2A,B,C,H,I 3E,F
1, 2, 3	1-3 and 9		Resources group mean/ANOVA	IV: Survey Question 9 (position or title) DV: Survey Questions 1A 2D,E,F,G,J 3A,B,C,D,G,H,J
1, 2, 3	1-3 and 9		Experiences group mean/ANOVA	IV: Survey Question 9 (position or title) DV: Survey Questions 1F 2K 3I,K
1, 2, 3	1-3 and 9		Efficacy group mean/ANOVA	IV: Survey Question 9 (position or title) DV: Survey Questions 1B,H,I,J,K

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