TECHNOLOGY INTEGRATION AND SKILLS:

COMPARING THE PERSPECTIVES OF SCHOOL LEADERS

AND COLLEGE OF EDUCATION FACULTY

A Dissertation Presented to the
Faculty of the College of Education
University of Houston

In Partial Fulfillment
of the Requirements for the Degree

Doctor of Education

by

Brian Boyd Baldwin

December 2013

TECHNOLOGY INTEGRATION AND SKILLS: COMPARING THE PERSPECTIVES OF SCHOOL LEADERS AND COLLEGE OF EDUCATION FACULTY

A Dissertation for the Degree

Doctor of Education

by

Brian Boyd Baldwin

Approved by Dissertation Committee:

_____

Dr. Melissa Pierson, Chairperson

_____

Dr. Margaret Watson, Committee Member

_____

Dr. Sara McNeil, Committee Member

_____

Dr. Lee Mountain, Committee Member

_____

Dr. Robert H. McPherson, Dean
College of Education

December 2013

Acknowledgments

My time at the University of Houston has been one of the highlights of my life. It is true that no one gets through the rigor of a doctoral degree alone, so I would like to thank all of the members of the College of Education community, faculty, and staff for their help, support, and guidance throughout this process.

I would also like to thank my dissertation committee; Dr. Pierson, who served as my Academic Advisor and provided the foundation to achieve my goals; Dr. Watson, who had a great impact on my interests, introduced me to statistics and opened my eyes to a new way of thinking; Dr. Mountain, whose publishing class was a delight and instilled within me with a lifelong interest in writing and publishing; and finally, Dr. McNeil, who kindly helped me to learn so much about instructional technology and stirred my interest in the ways people and technology interact.

I would also like to thank my friends and classmates at the University of Houston; Maggie, Katie, Beth, and Ruqqayya (my unofficial mentor). They are among the finest people I have had the honor to work alongside and I look forward to keeping in touch in the future.

I would also like to thank my family, who supported me and put-up with me throughout this process. A special thanks to my parents, who assisted me financially, and to my Mother-in-Law who provided support to my wonderful children, Natalia and Patrick. Most importantly, thanks to my wife Martha, the greatest, most beautiful person in the world and whom I am lucky to have in my life.

TECHNOLOGY INTEGRATION AND SKILLS:

COMPARING THE PERSPECTIVES OF SCHOOL LEADERS AND

COLLEGE OF EDUCATION FACULTY

An Abstract
of A Dissertation Proposal Presented to the
Faculty of the College
of Education

In Partial Fulfillment
of the Requirements for the Degree

Doctor of Education

by

Brian Boyd Baldwin

December 2013

Baldwin, Brian. "Technology Integration and Skills: Comparing the Perspectives of School Leaders and College of Education Faculty" Unpublished Doctor of Education Dissertation, University of Houston, December, 2013.

Abstract

Over the past decade, many colleges and universities have worked to develop stronger models to emphasize technology integration in the classroom. To remain effective it is periodically necessary to ask Faculty and School Leaders what they perceive are technologically important skills of current and future classroom teachers. It is apparent that preservice teacher candidates will ultimately enter a professional teaching environment that is far different from previous generations, seeded with potential to supplement instruction with effective technology applications. Whether these new technologies are implemented in a sustainable integration effort will depend on the skills of teacher candidates entering the profession in conjunction with continued support after employment.

This study was completed to address the surface level and latent attitudes, beliefs, and barriers to successful technology integration in the classroom. Faculty and School Leaders were compared for similarities and differences, and the relationships were explored both quantitatively and qualitatively for whole group and individual perspectives. Aspects of these comparisons have direct implications for technology integration in the classroom, as well for guiding continued training for preservice and inservice teachers.

Table of Contents

List of Tables

Lists of Figures

Chapter I:

Introduction

Introduced by Lee Shulman in his landmark paper, 'Those Who Understand: Knowledge Growth in Teaching' the theoretical model of Pedagogical Content Knowledge (PCK) has become a foundation for continued development (1986). Shulmans' central questions in the development of his theoretical model were "What are the domains and categories of content knowledge in the minds of teachers?" and "How are content knowledge and general pedagogical knowledge related?" (p.9) (Figure 1).

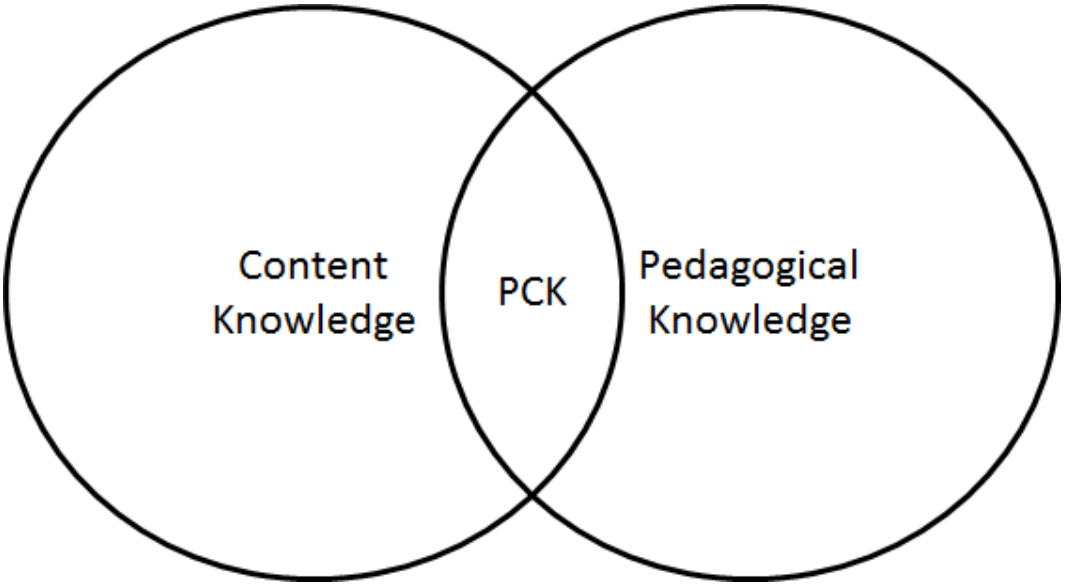

Figure 1. Shulmans' Pedagogical and Content Area Knowledge (PCK)

Shulman's ultimate idea in creating this model was to emphasize what teachers should know about certain hazards that students experience, and secondly the learning roadblocks that they encounter. These barriers to achievement are based in the preconceptions students have developed due to age, experience, and background (Archambault & Crippen, 2009). Shulman suggests that if student preconceptions are misconceptions, as they often are, teachers need the ability and readiness to employ

strategies most likely to engage the learner, rather than reinforce any misconceptions and therefore reinforce their barriers to learning (Archambault & Crippen, 2009; Shulman, 1986). This theory is significant for pre-service teacher training and in-service teacher support alike, to promote rational and professional growth towards the common goal of benefiting student learners regardless of level, past experience, and development, as well as the ultimate success of the teacher.

The Emergence of Technology

With the further influence of technology in the past two decades and the increase in demand of technology skills for preservice teachers, a system of both national and state standards has been created as a guide towards the integration of specific technology skills into the K-12 curriculum. The National Council for Accreditation of Teacher Education (2008) has become the national mandatory minimum standard for technology instruction. Additional resources, such as those from ISTE that publish respected standards and review programs for technology, have created standards called NETS-T (2008) that reinforces technology integration standards. In addition, all preservice teachers in Texas state-approved teacher training courses are held to state standards for technology and are tested for technology skills before graduation and certification (Pierson & Thompson, 2005). The overall purpose of these standards is for preservice teachers to build the preliminary skills necessary for the continued future integration of technology in education, and in turn provide meaningful technology-based learning in their future classrooms (Bai & Ertmer, 2008). Just as the PCK model suggests along with the merging of content and pedagogy, we must also consider how technology fits into the model of PCK with consideration for development, ever expanding technology, skills

acquisition, and ultimately effective integration into the classroom, and most importantly barriers brought on by attitudes and beliefs.

Some Faculty and School Leader attitudes toward technology are sometimes based on preconceptions or misconception, leading to errors in judgment and interfere with teacher training and support (Shulman, 1986). According to Koehler and Mishra (2005) "We view technology as a knowledge system that comes with its own biases, and affordances that make some technologies more applicable in some situations than others" (p. 132). As technology became more affordable, portable, and prolific in the late 1990's through the 2000's, and as the internet has woven itself into the fabric of society, these biases may have become more pronounced as the technology expanded faster than education could train. This trend has created a generation of self-taught technology enthusiasts with varying skills based in individual interests, but perhaps little application for learning environments. In the face of these attitudinal barriers, progressive scholars have gained traction by building upon the PCK foundation, incorporating the relationship of technology to pedagogy and content knowledge to develop a systematic integration model. By basing integration efforts on the PCK, a new model has been developed and just as its predecessor is ultimately constructivist and student-centered (Koehler & Mishra, 2005; Pierson M. , 2001).

TPACK Model

This conceptual relationship between technology and the Pedagogical Content Knowledge (PCK) became known as Technological and Pedagogical Content Knowledge (TPCK) and was later renamed TPACK. This framework creates a new dynamic that demonstrates the complexities between the original two components, pedagogy and

content, and adding a third component being technology (Koehler & Mirsha, 2008; Mishra & Koehler, 2006). TPACK demonstrates the continued evolution of the PCK model to include meeting the progressive technology needs of modern classrooms (Figure 2).

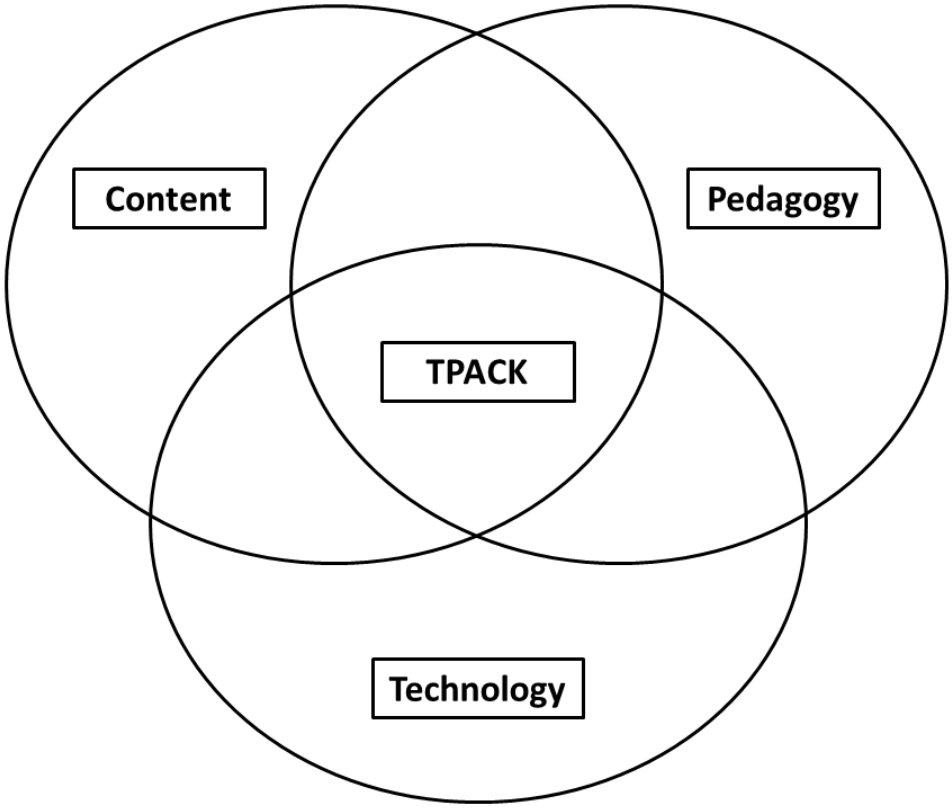

Figure 2. Technology, Pedagogical, and Content Knowledge (TPACK)

Within the three components of TPACK represented as a Venn Diagram, it is at the intersections of the three distinct types of knowledge (Content, Pedagogy, and Technology) that learning is most effective. This is assuming that for the teacher, content is intuitive, and secondly that teaching with sound pedagogical and technological strategies complement the teaching of content (Schmidt, et al., 2009). Likewise, because of the importance of the original PCK framework of TPACK, it is essential that

researchers have an understanding of the PCK framework before it is possible to both understand and effectively measure TPACK constructs together (Graham, 2011).

To emphasize this aspect, if TPACK is to be effective it is imperative to understand that the addition of technology to the current knowledge of teaching content and pedagogy constructs will not improve instruction in and of itself. Rather, it requires sensitivity to a new dynamic between all three components of the TPACK framework. In short, good technology will not help teaching without the knowledge of teaching content or sound pedagogy (Archambault & Crippen, 2009; Koehler & Mishra, 2005). Therefore the technology component of TPACK is supplemental and less about the integration of specific technologies into the PCK model; rather it is a model of how generalized technology 'fits' into the PCK framework. Archambault and Crippen (2009) described TPACK and PCK as having the same limitations regarding technology integration, but emphasized that the framework has practical appeal and provides an analytical structure for further research concerning what teachers should know, be able to do, and how they should employ technology in the context of pedagogy and content (Archambault & Crippen, 2009; Graham, 2011).

Technology Integration

Within the first decade of the 21st century, technology became an ingrained and indispensable part of the lives of educators and students alike. This technology-rich environment has forever altered the school environment and the way that students and teachers interact, educate, and learn (Baran, Chuang, & Thompson, 2011). This trend may slow to some degree due to finances and abrupt unforeseen changes that alter the available technology, but considering the rise of affordable and accessible technological

tools, it is probable that the need for technology applications in the classrooms will increase. Although the TPACK framework alone does not provide the definitiveness needed to adequately address the specifics of technology integration, it may provide a launching pad for future technology integration research and development by demonstrating the need for complementary technology to pedagogy and content (Graham, 2011).

Among these research fields, Information Computer Technology (ICT) is one of several technological research fields that has most influenced instructional technology research, and is generally referred to as the important aspect to technology integration. Many scholars in this field have relied heavily on the TPACK framework, tying it to specific ICT integration research, creating hybrid fields, such as ICT-TPACK focused on general information and communication technologies (Angeli & Valanides, 2009); TPACK-W for web technologies (Lee & Tsai, 2010), and TPACK-G for geospatial technology (Doering, Velesianos, Scharber, & Miller, 2009; Graham, 2011).

Regardless of the specificity or generalness of the technology being researched within the TPACK framework, continued ICT-TPACK research is needed to continue to develop and present rich learning environments. This is where complex phenomena can be studied by catering to individual differences while fostering construction of knowledge in complex learning domains (Godfrey, 2001; Sang, Valcke, Van Braak, & Tondeur, 2009).

Purpose of the Study

The purpose of this study is to compare Faculty and School Leader attitudes regarding technology integration and skills among teacher candidates. By comparing

attitudes, beliefs, and perceived barriers to technology integration, relationships can be observed between and among the groups to identify both positive and negative attributes. These attributes serve influencers and barriers to technology integration in teacher training programs and classrooms where teacher candidates will ultimately be employed. The importance of these attributes on preservice and inservice teachers has a role in whether technology integration will be effective. If technology integration is to be realized, there must be joint roles and responsibilities from Faculty responsible for preservice teacher training and School Leaders that provide support after employment. This study was designed to use a mixed-method approach to gather and analyze group and individual perspectives and attributes for comparison to guide future Faculty and School Leaders interested in continued implementation and integration of technology.

Research Questions

During the development of this study, two questions were posed to guide and set boundaries for the spectrum of this investigation. These related questions were;

- What are the similarities and differences between College of Education Faculty and School Leader perspectives regarding the importance of technology skills of teacher candidates?
- What are the similarities and differences between College of Education Faculty and School Leader perspectives regarding the importance of continued technology integration in schools?

Brief Overview of the Study and Significance

This study was designed to compare and contrast the attitudes and beliefs of Faculty and School Leaders regarding the importance of technology skills and integration

in schools. As technology has already woven itself into the fabric of society, it is essential that meaningful strides towards implementation of technology resources be utilized in the classroom. This study is timely due to the rapid evolution and changing state of technology and the general acceptance of technology in schools, but the question arises of how to use technology to supplement education and what level of integration should be present in schools. Given a proper scaffold or structure to build from, such as ICT-TPACK, there is a vast potential for schools to promote the use of technology, but the direction that School Leaders wish to take should be aligned with the values and beliefs of College of Education Faculty to ensure maximum potential. Identifying these similarities and differences between these two groups is essential to the process so Faculty may more adequately train with the needs of effective School Leaders in mind.

To compare these differences, Faculty and School Leaders will be analyzed through their group and individual perspectives by a mixed-method survey instrument. This instrument was designed to measure the attitudes and beliefs of the participants concerning technology integration. Quantitatively, whole groups will be compared to one another, while qualitative elaboration will assist on illuminating the topic from unique individual perspectives.

Significance of the Researcher

It cannot go without mention the significance of the researcher to this particular topic of study. For ten years, I served as a teacher of history, English as a second language, and special education. During this time I also served as a leader for history and special education. Wanting to make important changes, I decided to return to graduate school to earn my M.Ed in Educational Leadership and Administration, and ultimately

spent one a year in public school administration as an Assistant Principal. Throughout my experiences in public education I began to question the merits behind what they referred to as “progressive education” or “educational reform”. I also began to question my own abilities to lead a school, having been trained in school administration and leadership, but also realizing my deficit in the actual product we were to be creating: college ready, well-rounded and capable students. Being in a room full of administrators like myself, each with a vast amount of knowledge of school finances, leadership, and educational law, but with little knowledge of curriculum or the developmental theories of learning, I was burdened with the responsibility of selecting resources and technology. It became apparent after some time of reflection that major political and cultural battles needed to be fought to bring public education into a new progressive era, where true school leadership needed to be knowledgeable of the primary function of the school, including exemplary teaching, learning, and creating a great product of student achievement.

Education is no different from the whims of other once great American industries, which after World War II had no competition and could once do as they pleased. Ultimately foreign national companies rose abroad, and America did not meet this expectation, allowing ourselves to be spoiled with the memory of a monopoly of industry. This lack of forward thinking caused a dramatic shift in our national economy and culture, where CEO’s of major corporations knew how to make money from money, but nothing of their own products. When the money dried up, their plants shut down and economic recessions ensued. Now, after another decade, it is no longer just nationalized industries that we must rise the challenge to compete, but small regional businesses that use technology to create truly global industries not considered possible in the years post-

World War II that consist of small groups using computers to communicate, collaborate, and ultimately sell products and services around the world. They are doing so from some of the most unlikely places, such as the slums of Mumbai, from which the richest man in India hails, thanks to personal technology applications. Without technology awareness, we cannot compete in the world market.

With my background in history, I understand the risks of resisting change. Likewise, as an Educational Administrator I also understand the risks of promoting change. We must not just manage change but promote it as educators, if for no other reason than because it is simply the right thing to do for our students and our nation. This is why I decided to earn my Doctorate in Curriculum and Instruction with a specialization in Instructional Technology. I am a rarity as a doctoral student in this field with a background in teaching, educational leadership with experience as an administrator, which may indicate that we as a profession are far too complacent in our own training and education. This is a small step, but a significant one if we as school leaders wish to be truly progressive and on the cutting edge. We hold a difficult responsibility, where we must understand the world around us as well as our own primary function of teaching a single student. The priorities must change within public education, and hopefully this research will spur other educational leaders to take the initiative to learn more about the teaching and learning aspects of their relative positions and promote critical reflection, creativity, and constructivist methods within their schools and districts to become truly progressive.

Definition of Terms

There are a number of terms that are used throughout this study. They are defined here as they are operationalized in this study.

Preservice Teachers are students enrolled in a teacher training program at the university level, but who have not yet entered the classroom in the employ of a school.

Inservice Teachers are teachers who are currently employed, or have had experience as a classroom teacher. This comes with a certain amount of real-world classroom experience that will ultimately have an effect on attitudes and beliefs.

Technology refers to all tools involved and used in the process of education. Two types of technology are *Transparent* technology and *Emerging Technology*. Transparent technologies are technologies that may seem as a part of the everyday teaching classroom (pencil, paper, chalk or dry erase boards), while emerging technologies are newer and are usually computer based which require integration into the learning environment.

PCK is Lee Shulman's (1986) theoretical model that demonstrates the relationship between pedagogical knowledge and content knowledge. The visual representation is of a Venn diagram that overlaps between pedagogical knowledge and content knowledge. The overlap is the effective blending of both pedagogy and content knowledge (PCK). Due to the generalness and broadness of this theory, it has become a basic framework for many

effective educational practices and epistemologies involving both pedagogy and andragogy.

TPACK is a later theoretical model credited to Pierson (2001) and later with Mirsha and Koehler (2006), and built on Shulman's prior PCK framework. While the PCK model promoted two overlapping circles in a Venn diagram, this updated and timely version added a technology component, visually represented as a third circle in the diagram. Each of the three components, technology, pedagogy, and content knowledge are important, but just as important is the overlapping nature of each component that emphasizes the blending of knowledge. The central component, where all three concepts merge is called TPACK and is the primary focus of technology integration.

ICT is a general acronym for *Information and Communication Technology*. This term encompasses computer technology in any form (e.g. computers, tablets, interactive whiteboards, smart phones and all the hardware and software that it incorporates). *Technology Integration* refers to the continued development and promotion of technology into education. This primarily focuses on emerging technologies, but is not limited to new ideas or innovations that incorporate different technologies in the learning environment. Although there are multiple methods to promote technology integration, the ICT-TPACK method is the focus of this study.

ICT-TPACK is a method of using the TPACK framework to select and utilize specific technologies and promote technology focused on teaching and education. In essence,

once a preservice or inservice teacher understands both content and pedagogical knowledge, the addition of technological strategies may be introduced according to the TPACK framework.

Overview of Chapters

The purpose of the Review of Literature is to address and understand the complexities of technology in regards to Faculty and School Leaders, while attempting to demonstrate the research-proven ways in which ICT-TPACK integration can be achieved among university teacher training programs and individual schools. It will also indicate the importance of 'personal' technology integration among preservice and inservice teachers, Faculty and School Leaders alike, and the predictors and barriers that are frequent issues.

Chapter 3 discusses the methodology as an explanation of the nature of collecting, analyzing, and reporting relevant data to this study. The chapter will describe the participants of the study, survey instruments utilized, sampling measures, and describe the use of both the quantitative and qualitative data collection and analysis, as well as the results of the survey instrument field testing. This also describes some of the limitations that arose in both the collection and analysis of the data collected.

Results are reported in Chapter 4. All sections, both quantitative and qualitative are presented with detailed findings and an appropriate analysis of both quantitative and qualitative data. Quantitative data derived from Faculty and School Leaders are presented as group data, while Qualitative data incorporated both emerged themes and sub-categorical data to develop. All data is compared between groups for reporting and for analysis.

Chapter five serves as a summary of the previous chapter's results, in addition to a discussion of the implications, cross-validation, ideas for future research, and a summary. This chapter attempts to relate the big picture of this study and provide readers with the results as implications on both technology integration and additional questions that arose during analysis of data.

Chapter II:

Review of Literature

The purpose of this review related literature is to build understanding and a case for appropriate and effective technology integration in teacher training programs and individual schools. A review of past related literature is necessary to provide an established background on the subject and to inform of potential best practices in technology integration. It is not the purpose of this study to not to promote specific technologies, but rather a limited and broad review of general effective technology integration models, predictors, and barriers technology integration.

ICT (Technology) Integration Models

There has been considerable research that documents the benefits of ICT integration in education, but there are varying arguments concerning the methods to integrate ICT into learning environments relative to the prior conditions that exist. Jung (2003) completed a series of four case studies of different integration models to determine its effectiveness on teacher training.

Considering Jung's four models for technology integration (Figure 3), in all cases it is imperative that ample time is provided to build the necessary technology skills before successful ICT integration can be completed. This skill-building takes considerable time and therefore should be provided as part of preservice teacher training. In no way should this prevent individual elementary or secondary schools from providing ongoing training, but may help to alleviate the long term issues of technology integration (Jung, 2005). Once skills are present within preservice or inservice teachers multiple methods may be used, but those presented to learners along with strong constructivist and structured

collaborative components tend to promote more ICT integration over time (Collis & Jung, 2003; Jung, 2005).

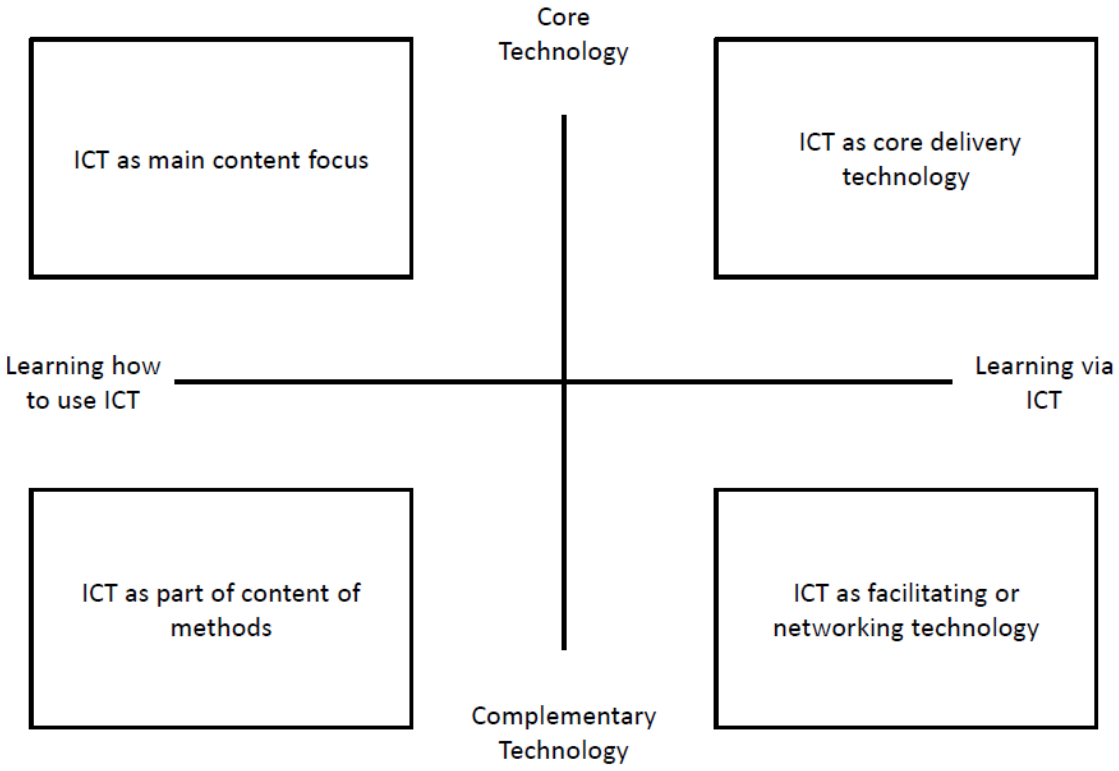

Figure 3. Four Common Integration Models

Jung describes these four models in great detail. The first model *ICT use as main content focus of teacher training* focuses on the basic ICT (Technology) skill development, rather than the ICT-pedagogical integration. The second model, *ICT use as part of teaching methods* moves from basic skill building and teachers are provided with examples of ICT-pedagogy integration in their training process. The third and more integrated model, *ICT as core technology for delivering teacher training*, where the content of this approach does not necessarily focus on ICT skill itself but rather covers a variety of ICT applications. Fourth, *ICT used to facilitate professional development and networking* that takes an approach of providing training while incorporating technology

for delivering teacher training. The fourth and last model is the ultimate goal, but the least utilized due to difficulties of individuals with differing skills (Jung, 2005). In universities and schools there are many examples of ICT integration at different levels, but more-so than ever Internet and web-based communication technologies are being used to support teachers' on-going professional development and networking.

Predictors of Technology Usage

For ICT integration to be successful, those responsible for the promotion of the technology integration effort should understand that at the root of integration is the teacher who will make the ultimate decision about whether to integrate technology or not (Ertmer P. , 2005). Responsible ICT-TPACK integration should then carefully assist teachers by pre-identifying predictors of successful technology usage among staff, as well as proactively identify barriers before they can manifest as problems to successful ICT integration.

A major predictor of technology use, albeit complex, is self-efficacy. There have been many studies to determine the relationships among self-efficacy, TPACK, and ICT usage of both preservice and inservice teachers (Abbitt, 2011; Sang, Valcke, Van Braak, & Tondeur, 2009). Many of these studies presented discussions and identified variables that act as predictors. Among these are constructivist practices, experiences, attitudes, and beliefs (Sang, Valcke, Van Braak, & Tondeur, 2009). By identifying these predictors, it is then possible to support situations and build programs to promote behaviors conducive to learning and using specific skills. Albert Bandura (1997), describes these predictive variables as primary influences on self-efficacy beliefs:

> (a) enactive mastery experiences, (b) vicarious experiences, (c) social influences, and (d) physiological and affective states. Among these four influences, mastery experiences were suggested as having the strongest influence on self-efficacy beliefs and thus a strong influence on behavior. The influence of these experiences on self-efficacy will vary depending on whether or not success was achieved as well as the effort required to do so. Enactive mastery experiences in which a person experiences success will lead to increased self-efficacy, provided that these experiences are in an authentic environment and the task requires "overcoming obstacles through perseverant effort" (Bandura, 1997, p. 80).

These four variables influence behaviors that will lead to change, such as with encouraging teachers to integrate ICT-TPACK into their instruction. Promoting positive influences in self-efficacy with constructivist approaches will better the odds of successful ICT-TPACK integration among both future and present teachers. However, the relationship between self-efficacy and ICT-TPACK integration rests in the attitudes of teachers, who as individuals may harbor attitudes that are pre-existing and negative. These pre-existing attitudes will influence or undermine participation and decisions regarding the behaviors needed for ICT-TPACK integration. Before an integration begins, those responsible to lead the effort should primarily focus on the evolving nature of attitudes and beliefs in regards to self-efficacy. These attitudes are the mental and emotional obstacles of ICT-TPACK integration and must be overcome prior to any successful TPACK –ICT integration (Abbitt, 2011; Bai & Ertmer, 2008; Bandura, 1997).

Pajares' (1992) research on the relationship between knowledge and beliefs and its effect on self-efficacy, detailing how knowledge and beliefs may influence teaching. Pajares states that "knowledge and beliefs are inextricably intertwined" and that "beliefs are instrumental in defining tasks and selecting the cognitive tools with which to interpret, plan, and make decisions regarding such tasks" (p. 325).

This relationship is discussed further in additional research. Just as the relationship between knowledge and beliefs is a predictor of behaviors, similarly is the relationship between beliefs and attitudes. Richardson (2003) commented, "attitudes and beliefs are a subset of a group of constructs that name, define, and describe the structure and content of mental states that are thought to drive a person's actions" (p. 102). Richardson's comment describes the complex scenario in attempting to predict a behavior. In the case technology integration, in which attitudes, knowledge, beliefs as subsets should all be considered if the goal is to promote the behavior of using technology (Bai & Ertmer, 2008). Ultimately, positive attitudes will increase the potential for successful technology integration, while negative attitudes will decrease the chances.

Demonstrating how technology integration can support learning objectives for the preservice teachers may result in a stronger belief in technology usage, a more positive attitude, and stronger knowledge base using the skills all before the teachers enter the classroom (Baran, Chuang, & Thompson, 2011). Literature supports this claim that teacher training in conjunction with the promotion of student-centered constructivist beliefs reinforces more teachers to use technology than does traditional practices and mindsets (Bai & Ertmer, 2008; Niederhauser & Stoddart, 2001; Norum, Grabinger, & Duffield, 1999). Given the understanding that ICT-TPACK integration requires strong beliefs, skills, and knowledge, it should be the position of the teacher training institution to foster these positive attributes through constructivist, student-centered programs (Honey & Moeller, 1990; Sang, Valcke, Van Braak, & Tondeur, 2009).

Constructivist Practices

Time allotment is a major factor in ICT integration, and many schools and universities simply do not have enough time to adequately train and foster these beliefs in accordance with other demands. Therefore, teacher training programs and individual schools should promote constructivist, learner-centered ICT-TPACK integration using approaches to build confidence in technology skills as a means of supporting future students in the classroom (Abbitt, 2011; Albion, 2001).

To further define constructivist practices, Taylor, Frasier and White (1994) developed the five critical components of constructivist teaching; scientific uncertainty, student negotiation, shared control, critical voice, and personal relevance. These constructivist components of ICT-TPACK integration are necessary in determining predicting and reinforcing patterns of usage in the classroom for preservice teachers (Wang, Ertmer, & Newby, 2004) and inservice teachers (Higgens & Mosley, 2001).

General Technology Integration Barriers

Beyond the immediate needs of skills and knowledge of ICT, there are other factors to consider that influence the success or failure of an ICT integration program. Cuban (1993) discussed the need to acknowledge and stress the importance of knowledge, beliefs, and attitudes, stating that they 'shape what they choose to do in their classrooms and explain the core of instructional practices that have endured over time' (p. 256). Addressing attitudes is vital for ICT-Integration to take place, but there are also many other considerations that may act as barriers.

ICT integration is not a simple concept, considering the changing technology environment and continual changes in skillsets and culture over time. Children and young

staff tend to handle technology with a sense of ease and may illustrate acquired technology skills, but if faculty or school leadership is not responsive to the complexities of technology needs, or is technophobic, technology implementation will not be successful (Wilmore & Betz, 2000).

To be successful, it is essential to understand that there are many barriers that exist when considering ICT integration and implementation, both seen and unseen. Ertmer (1999) and later Bai and Ertmer (2008) effectively classified barriers into two separate types; external barriers and internal barriers.

Among the types of barriers, external barriers are considered to be key obstacles, such as skills, access, support and time. When external barriers are present, ICT-TPACK integration is virtually impossible due the lack of a foundation or infrastructure to build upon. External barriers can though be overcome by contributing financial resources, making time for training, and updating infrastructure. If these external barriers cannot be fixed, then ICT-Integration is bound to fail.

Internal barriers are both seen and unseen barriers to ICT-TPACK integration, consisting of intrinsic qualities such as belief-systems about teaching and learning, culture and teaching practices, which can all affect ICT integration. Internal barriers are more ingrained, harder to identify, more personal, and in most ways more difficult to overcome than external barriers. Internal barriers play a major role in ICT integration and ultimately are responsible as to whether ICT-TPACK integration takes place in the classroom (Bai & Ertmer, 2008; Ertmer P. , 1999).

A teacher's personal view of technology certainly interferes with integration; central to this perspective is the difference between *transparent* and *emergent*

technologies. Transparent technologies are considered to be technology like chalkboards, pencils, or books that are used ubiquitously on a constant basis, and tend to be integrated into the culture of the classroom. Emergent technologies are new technologies that need both investigation and introduction into the teaching environment and usually refer to newer computer based digital technologies (Cox & Graham, 2009; Graham, 2011). It is important to note that the view of emergent or transparent technology is from a personal perspective, and what may seem to be transparent to one teacher with skills and training may be emergent to the novice who has not had previous exposure to the technology.

Technology Integration in Preservice Teacher Education

With the continued development of new and exciting technologies with real applications for the classroom, there have been a growing number of forward thinking teacher training programs that have experimented with a wide range of innovative and constructivist teaching techniques (Gunter, 2001; Pierson & Thompson, 2005). One approach, which was considered radical at the time but has now gained interest in progressive teacher training programs as the ultimate goal in technology integration is the infusion model. This model would replace the common stand-alone technology course in favor of technology content delivered throughout the entire teacher preparation curriculum (Milken Exchange on Educational Technology, 1999). This goal, albeit popular, still remains elusive as the technological and cultural infrastructure of the universities. Skills of incoming students and faculty have been a major challenge that has impeded the complete integration if an infusion model.

Although universities differ in the method of developing technology skills in teacher preparation, the single introductory course with a focus on the simple

introduction of technology tools is the most common (Mehlinger & Powers, 2002). Many of these courses are taught in the beginning stages of teacher preparation; therefore, attrition of skills as time grows has made technology instruction difficult in later classes (Pierson & Thompson, 2005).

This structure has made true technology integration and infusion a difficult prospect in teacher preparation. In a single stand-alone course the issue of faculty responsiveness comes into the spotlight, where the emphasis is on a wide array of technology tools in a one-shot course. In this case, the promotion of student's needs in learning and context can easily be lost over the long term (Mehlinger & Powers, 2002) ultimately affecting the self-efficacy of the preservice teacher. Further evidence is found in the Milken Exchange on Educational Technology (1999), where correlations between the stand-alone course and technology skills and technology integration into teaching and learning are low. To compliment this, an early study by Oliver (1993) stated that beginning teachers who had received formal training in technology applications as a stand-alone course did not differ in the future classroom use of technology from those who did not receive any technology training. Pierson and Thompson (2005) similarly described the issue of attrition of skills;

> Based on anecdotal evidence from our student teachers, we knew the disconnected single course was not effective in producing lasting learning. They reported not remembering how to use technology tools, they were not familiar with new software programs, and they had never even heard of new standards that guided teacher technology use, notably the very state standards over which they would be tested in order to be certified. (p. 32)

Pierson and Thompson continued to detail that a one-shot course was disconnected and lacked the cohesiveness with content area strategies. In addition, the expectation that the

preservice teachers' belief systems regarding technology would be positive towards integration over a single semester may have been unrealistic (Bai & Ertmer, 2008).

The ultimate goal, regardless of the vocabulary or method, is a total integrated model, where technology is taught alongside content and pedagogy in real-world contexts, rather than in the vacuum of its own class. It has been elusive due to the type and pace of the technology itself and the increasing skills needed to acquire mastery of the technology. In addition, various internal and external barriers continue to exist, hindering the implementation of a completely integrated technology model into teacher training.

Faculty Modeling is possibly the most effective method for introducing these technology concepts in real-world settings are through faculty modeling of technology behaviors. Research has emphasized that the modeling technology in teacher preparation programs has a positive correlation with the future teachers' confidence, attitudes, and ability to adopt innovation in the classroom (Adamy & Boulmetis, 2005; Baran, Chuang, & Thompson, 2011; Pope, Hare, & Howard, 2002). By modeling technology, the teacher educators not only demonstrate the use of effective technology and context, but serve as role models for preservice teachers as they prepare to use these skills as future professional teachers (Bai & Ertmer, 2008). Bandura (1997) emphasized the highly constructivist nature of modeling in his fundamental theory of social learning, "the importance of observing and modeling the behaviors, attitudes, and emotional reactions of others, specifically, focusing on the learning that occurs within a social context and considers that people learn from one another" (pp. 374). It is important that if ICT-TPACK integration is to take place, a social environment where preservice teachers

witness, experience, and utilize technology while considering pedagogy and content so that they can learn to best use it in their own future teaching. In conclusion, ICT-TPACK should emphasize beliefs and attitudes through active modeling of actual technologies in a pedagogical manner. It is the responsibility of the entire teacher training program or education department, and not simply the realm of technology instructors to implement this change (Bai & Ertmer, 2008).

Faculty Barriers to Implementation of ICT-TPACK Integration

Self-efficacy, beliefs, attitudes, and knowledge are not solely the domain of preservice and inservice teachers in regards to technology integration. Faculty of teaching programs can hinder progress of technology integration due to their own beliefs and attitudes, stifling what would be effective ICT-TPACK integration. The autonomous nature of university teaching can enable a certain sense of "territoriality" among faculty when they are asked to add more technology to their already heavy content driven syllabi (Mehlinger & Powers, 2002; Pierson & Thompson, 2005). This may inadvertently cause faculty to use technology inconsistently, perhaps during one or two special sessions and not integrating it into their current coursework (Ferris, Roberts, & Skolnikoff, 1997). The effect of this inconsistency manifests as a 'disconnect', similar to when technology classes are taught separately in a stand-alone course, as a completely separate entity from pedagogy and content (Pierson & Thompson, 2005). Needless to say, this will ultimately have a negative influence on preservice teachers regarding their view of technology in the classroom as it reinforces the idea of technology as a splinter discipline outside the mainstream curriculum.

One possible solution to this barrier is fostering a teaching vision to include technology and early integration among preservice teachers, rather than trying to change their beliefs of technology outside the PCK model long after they are allowed to developed visions and preconceptions of teaching where technology is absent (Russell, Bebell, & O'Connor, 2003). This will allow universities to move away from PCK as a model and include the active use of technology, therefore using the TPACK framework as the viable model to develop new curriculum (Pierson & Cozart, 2004).

Graham (2011) also argues that the path to reaching ICT-TPCK integration might depend on the audience, stating;

> Some might hypothesize that it is more effective to learn content-specific pedagogies and supporting technologies simultaneously. Others might hypothesize that it is best for preservice teachers to begin with TPK and move to TPACK because of the cognitive overload associated with learning new technologies and content-specific pedagogies all at once. Similarly, some might hypothesize that the most effective process for inservice teachers would be to move from PCK to TPACK because of their prior experience with content-specific pedagogies (pp. 1959).

Graham's discussion of the variables regarding the transition from PCK to TPACK is a warning for universities when developing plans to make this transition in a meaningful way. If nothing else, Graham, perhaps inadvertently details the personal importance of the individual learner perspective of TPACK before universities develop and act on ICT-TPACK integration plans. Providing a structure for technology integration though creating a vision of education with technology is difficult in teacher preparation programs, but if the power of preservice teachers' beliefs and attitudes can be positively influenced in favor of ICT-TPACK frameworks, it should be investigated (Bai & Ertmer, 2008).

The Role of the School Leader in ICT-TPACK Implementation

Technology leadership in primary and secondary schools is a dynamic that requires leadership on many levels, including management, technology skills, the ability to support, and the ability to develop and implement ICT-TPACK integration into what may sometimes be a hostile environment. Teachers with years of experience, and those new to the profession teachers alike have unique views and values regarding pedagogy and content. The implementation of ICT integration can add additional stress to an already difficult job. Although there are no absolutes in school climates and environments regarding technology or ICT-Integration, and each school can be as unique as each individual teacher or learner, there are some general theories that can help in facilitating effective ICT-TPACK integration (Dawson & Rakes, 2003).

The school leader as an agent of change. The importance of the school leader in creating an environment and vision of change when it comes to ICT-TPACK cannot be understated. The School Leader, regardless of the training or skill level of teachers, technology integration will not occur without the effective leadership (Dawson & Rakes, 2003). It is difficult for leaders outside of the educational system, such as private business leaders, to understand the differences in skills and leadership required in education due to the nature of the organization and the level of constant change and resistance to that change (Wilmore & Betz, 2000). It was for this reason that Sergiovanni (2001) argued that, "schools should not function as businesses. And school leaders should not function as owners of businesses".

Both Sergiovanni (2001) and Hill (1999) emphasize through their research that School Leaders need to develop leadership models. These models should serve to

encourage School Leaders in develop learning communities and build relationships among the faculty, staff, and community in the continued management of change and the promotion of any new innovation (Wilmore & Betz, 2000). Both Sergiovanni and Hill explore these relationships between school leadership and continual change, and provide an active model for School Leaders to utilize in planning, managing, and leading the effort for any innovation integration (Table 1).

Table 1

Sergiovanni (1996) and Hill (1999) School Leadership Model Comparisons

Sergiovannis' Theory of Community and Ideas-Based Leadership	Hills' Theory of Instructional Leadership
Facets & practices	*Facets & Practices*
Emphasis is on building a shared fellowship . . not on whom to follow, but on what to follow.	Need to reconnect teaching and administration and reclaim the role of instructional leader.
Shared Vision but in an invitational mode, not a command or sell one	Shared belief in the importance of collaboration and community.
Reciprocal process of leaders and followers influencing each other to action	Establishment of professional learning teams.
Clear enunciation of roles and responsibilities. Connected to obligations.	Appointment and on-going training of team coordinators to act as mentors, coaches and lead learners.
Directed to connecting teachers, parents, and students to each other and their responsibilities as defined by shared purposes.	Need to be expert in learning theory, school change and professional development, curriculum theory, assessment and analysis.
Shared visions. Changes in organization and mode of operation to attain goals.	Shared beliefs and values. Seek growth not constant change.
Key tasks of a leader: ➢ Modeling ➢ Maintaining harmony ➢ Institutionalizing values ➢ Motivating, managing ➢ Explaining, enabling ➢ Supervising	Key tasks of a leader: ➢ Initiation, implementation ➢ Institutionalization ➢ Management of the quality of teaching and learning ➢ Professional development of self and others ➢ Improve student outcomes

Furthermore, the main difference between that of a school leader from that of a business leader is that many businesses can avoid some level of change, especially technological. Where education is susceptible to all areas of change, from political to cultural to financial, there is the need of leadership to create effective learning communities to address change is essential and vital to ensure that healthy ICT-TPACK integration takes place (Wilmore & Betz, 2000).

The School Leader as a learner of ICT-TPACK integration. In order for successful ICT-TPACK leadership of the overall ICT-TPACK initiatives in schools, the School Leaders must lead the way by providing training for staff while also personally attending training to build an understanding of ICT. School leaders who are not well-trained technology-capable leaders, or who do not understand the relationships between technology, pedagogy, and content in school curricula will not be successful in ICT integration (Dawson & Rakes, 2003). Research has also determined that School Leaders who received technology training relative to the needs of their school tended to have higher levels of ICT –TPACK success in their schools than those who received generalized curriculum-specific training (Crandall & Loucks, 1982). School leaders and teachers operate in similar social systems, where traditionally they acted as solitary contributors, but are now more connected than ever before. In consideration of this phenomenon it is an important priority that the principal needs training comparable to that of the teacher if there is to be a successful facilitation of implementation of ICT-TPACK (Dawson & Rakes, 2003; Holland & Moore-Stewart, 2000).

The aspect of School Leaders modeling technology should be an integral part of ICT-TPACK integration. Sergiovanni (2001) stated that modeling is a key component of

educational leadership, while Hill (1999) emphasizes that for effective leadership to promote innovation, professional development for both the school leader and staff so that the school leader may be knowledgeable in key areas of implementation. Both Sergiovanni and Hill are correct, whereas the School Leader as the primary facilitator needs the ability to evaluate and give positive feedback and address concerns while employing the new skills learned during the training sessions. Regarding the implementation of ICT-TPACK, It is between this modeling of behavior and active feedback where constructivist learning takes place (Dawson & Rakes, 2003).

In order for the school leader to become a confident leader of ICT-TPACK integration, the principal must have confidence in the skills in order to provide support to the teachers and staff of the school. This confidence comes from training and a building of self-efficacy and beliefs in the positive values of the technology. Ultimately, when the School Leader needs support in achieving his or her personal technology goals, it must be the position of the superintendent to assist and provide this support. If the superintendents do not encourage their School Leaders to take risks and to innovate and improve learning outcomes, then ICT-TPACK integration may be at stake (Dawson & Rakes, 2003).

The School Leader as manager of change. The school leader as a manager of ICT-TPACK is an essential part of effective leadership in innovative schools and must be managed, maintained, and skills must be utilized. Considering the changing nature of technology, this will undoubtedly require new procedures, policies, and regulations that must be considered while also keeping abreast of innovations and remaining true to the overall vision of ICT-TPACK integration (Yee, 2000). By maintaining the vision,

alongside progressive leadership skills to manage change, school transformation is not only possible but likely.

Aware of the enormous dynamics involved in effective school leadership, it is necessary that the School Leader develop priorities. Ranking highly among these is the need for the School Leader to have a working knowledge of change management, which encompasses current thinking in the area of leadership, and especially how to manage change in regards to innovation. This directly relates to the implementation of technology in schools and the role of the School Leader as the facilitator and manager of change (Wilmore & Betz, 2000).

In order to be effective in all aspects, and not solely in ICT-TPACK integration, School Leaders must realize that schools are the center of change, but in the end it is teachers themselves that will decide what happens in regards technology integration (Sergiovanni, 2001; Wilmore & Betz, 2000). Teacher attitudes are much of the reason for resistance from converting from traditional teaching methods using PCK to the computer-oriented ICT-TPACK approach, which is understandable and even expected due to the discomfort many individuals experience because such a conversion in thinking can represent a drastic change (Dawson & Rakes, 2003). For this level of change to take place, it will require external pressure and leadership with the skills and qualifications to make this change.

The question at hand for School Leaders in the integration of technology is not only one of leadership, but also selecting the right path in consideration of all the factors that affect the transition forward. The question to reform, based on current resources, or to transform and start fresh each boast unique leadership challenges. In many cases the

school leaders may not have the authority to select their preferred route, and therefore face many undesired challenges on the path to ICT-TPACK integration. Fullan (1993/1994) cited an enormous issue that severely limits school leaders from progressively adopting and promoting change;

> "…neither top down regulation nor locally-based reforms will transform schools. The main problem is juxtaposing a continuous change theme with a continuous, conservative system that defies change. Educators must create learning societies as part of a larger social agenda." (pp.14).

There is a substantial need for discussion on ICT-TPACK leadership for those who understand the need for technology as a tool to improve and enhance learning and teaching. Unfortunately, ICT-TPACK leadership has remained a topic that is not frequently considered among researchers and theorists, and therefore much of the time ICT-TPACK falls from the school leaders' overall vision of school change and innovation plans. This lack of direct research and development hinders those leaders that seek ICT-TPACK integration in schools and who could benefit from ongoing discussion, causing them to face a myriad of unpredictable issues and leadership challenges (Yee, 2000).

Specific attributes of school leaders who successfully promote and adopt technology innovation tend to have similar basic attributes, among these are; modeling, knowledge of technology, leadership skills, provide adequate professional development, and facilitation of adequate change management through the establishment of effective

learning communities if the ICT-TPACK innovation will be more than superficial (Wilmore & Betz, 2000). Fullan (1993/1994) highlights eight principles of change management leadership attributes build on previous research on best practices to promote change management;

1) you can't mandate change,
2) change is a journey, not a blueprint,
3) problems are our friends,
4) vision and strategic planning come later,
5) individualism and collectivism have equal power,
6) neither centralization or decentralization works by themselves,
7) connections with the wider environment is critical for success, and
8) every person is a change agent

It is imperative that new leaders not just manage their schools, but display a wide variety of leadership skills (Wilmore & Betz, 2000). The question posed by many, including Sergiovanni (2001) and Hill (1999) that if educational leaders must also be change agents and head learners, not just managers, what are the characteristics of these leaders? No doubt that change management must begin with a change in the values of leadership, abandoning the autocratic styles of the past. The new leader will embrace collaborative leadership, continuing professional development, and sharing an articulated vision is the new norm in successful innovative schools (Fullan, 1993/1994).

One of the most challenging aspects to principals as a manager of change is the growing amount of visibility of the school leader and school in the community. The expectation of school leaders is to be out and in the open more often, not behind a desk. This coupled with ever increasing technology advances has broken down the walls of the schools and therefore the school leader will need to maintain or reclaim roles as educational leaders, rather than solely managers (Townsend, 1999).

The school leader as ICT-TPACK facilitator. Crandall and Loucks (1982) paper titled *Preparing facilitators for implementation: Mirroring the school improvement process. A study of dissemination efforts supporting school*, theorized some of the important elements of school technology leadership.

> "In that study, the researchers theorized: (a) generally, an innovation does not fail because the innovation is flawed, but because of flawed management or support by the school's administrators; (b) if teachers are to successfully implement an innovation, they need the support of the principal; (c) if the principal is to support teachers as they attempt to implement the innovation, then the principal must possess appropriate knowledge and skills." (pp. 458).

Contemporary school leaders have a responsibility to ensure learning across levels while also balancing huge burdens that come with management, finance, resources, emotions, mentoring, evaluations, as well as providing for the safety and security of the students, teachers, and community. The energy needed to maintain can be daunting and attrition is high, and therefore integration of technology may not take precedence to other responsibilities. The question of how to facilitate technology across all schools nationally is of interest, regardless of the particular differences that exist in all schools, in those considered ICT enriched or otherwise (Yee, 2000).

Yee (2000), similarly to Sergiovanni and Hill, focused attention toward practical wisdom for School Leaders to consider while coping with the stress of integrating ICT-TPACK in their schools.

- Shift your personal vision to value ICT as a learning tool rather than as a course to be taught in isolation.
- Accept that a shared leadership style will help you manage your workload and will foster staff member commitment to developing a vision for ICT in teaching and learning.
- Deploy computers in 'easy-access, high-use areas' such as classrooms, libraries, or hallways.

- When you purchase ICT hardware and software, buy ‘top of the line’; the ‘best [ICT equipment] you can afford’ generally provides increased longevity and durability.
- Put the best machines in the hands of teachers’ rather than in computer labs.
- Promote ‘any technology at any time for any learning purpose’ access to ICT by students and staff members.
- Remove the ‘computer coordinator/teacher’ position from your staff roster, and be clear about your expectations for all teachers to learn to use ICT in their classrooms.
- Follow up with appropriate supervision, so that teachers know you really care about whether or not they use ICT in teaching and learning.
- Provide ‘appropriate training and adequate time’ so that several staff members can assist with on-site network administration and troubleshooting.
- Understand that neither principals, nor teachers, develop comfort or skill with ICT by listening to experts talk; instead, support ‘hands-on, needs based, just-in-time’ professional development for all staff members.
- ‘Groom’ a network of people who can help you find answers to ICT questions: teachers, students, parents, ICT vendors, ‘switched-on’ principals, university faculty, maintenance workers, technical support people…
- Actively search for ‘ethical partnerships with credible organizations’ outside of your school to provide additional sources of ICT equipment and expertise.
- Become an ICT learner along with your staff members and students.

Barriers School Leaders Experience in to ICT-TPACK Integration

Both internal and external barriers to ICT-TPACK exist within all schools, but the issues are compounded by the aspect that School Leaders have become increasingly visible in the community. In addition, outside organizations have had an increased influence in school programming, and on occasion both educationally and financially infringe in to what was the authority of the school leaders (Goldring, 1997).

The issue of time is another significant barrier to successful ICT-TPACK integration. School leaders often claim that the lack of time is a significant issue in implementing any new innovation. It is important to remember that the school leader is the school’s instructional leader, and among other aspects, the school leader is responsible for assisting teachers to become technologically literate. Although it is

difficult to manage time and energy in technology integration, time can be saved by understanding and using to the advantage of the School Leader the individual differences among teachers in regards to technology, what should be used, and where some will need little support while others may need much. The idea of the learning community in this scenario becomes very attractive in this paradigm (Dawson & Rakes, 2003; Yee, 2000).

Most importantly among School Leaders is to maintain a humanistic approach to ICT-TPACK integration, where they can operate in a position to assist in defusing the discomfort and fear of technophobia (Wilmore & Betz, 2000) and realizing most importantly the realization that change is a process that takes both time and patience (Dawson & Rakes, 2003). Providing the appropriate training for both School Leaders and teachers while understanding the assumption that technology may be used in a variety of ways is essential, but it is also important to realistically understand that not all ICT use in schools fits into the TPACK structure of pedagogy and content. ICT-TPACK integration can only be established through meaningful, pedagogically sound, financially responsible, and ethical means (Yee, 2000).

It is also important that change manifests itself in productive ways, and that the age of the one-shot workshops that effectively caused frustration and cynicism towards innovation is gone, as is the autocratic School Leaders style of making unilateral decisions for the sake of time and energy, rather than true growth (Yee, 2000).

Assessment, Evaluation, and Measurement of the TPACK Framework

One of these limitations of the TPACK framework is the lack of concrete models that are provided within the framework. This impacts even the best integration efforts, due to an inability to assess integration. Over the past decade multitudes of attempts have

been made to solidify TPACK for testing and measurement purposes, but have instead created a spectrum of beliefs regarding TPACK understanding (Gess-Newsome, 2002). On each end of Gess-Newsome's TPACK spectrum are what was determined to be the integrative and transformative models, which define TPACK as a mixture of different types of knowledge. The "integrative" model utilizes a Venn diagram to emphasize the central message of how the individual components overlap (see figure 2 for example). This 'integrative' diagram is by far the most common model of PCK and TPACK to still be used in current research. (figure 4)

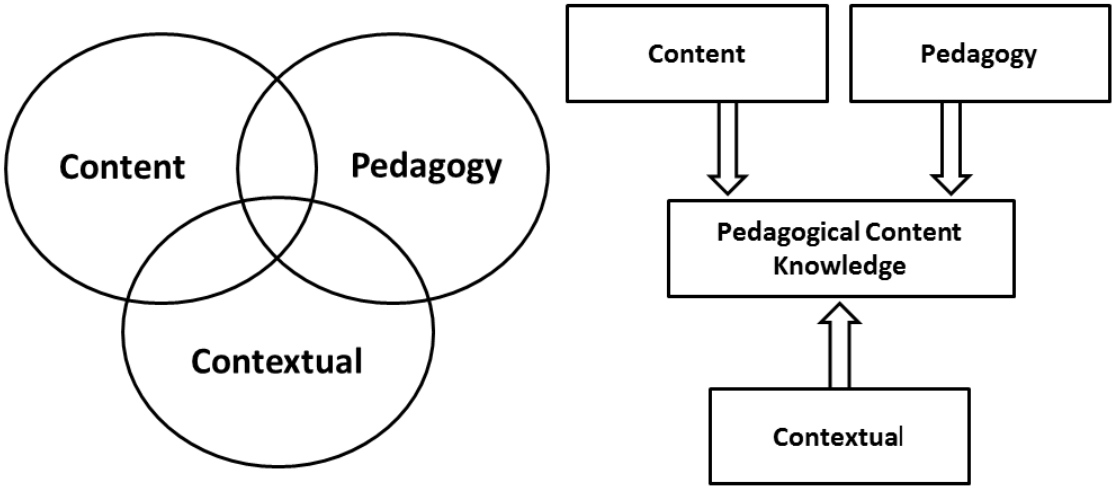

Figure 4. Gess-Newsome's "Integrative" and "Transformative" TPACK Models

The 'transformative' perspective, which Gess-Newsome visualized with blocks and arrows considers TPACK as a synthesized form of knowledge that cannot be measured by the sum of its parts. This may have value, but due to the inability to adequately measure these relationships between the individual parts and components (pedagogy, content, and technology) it has become less popular among researchers (pp.12-13).

Regardless, measuring PCK or TPACK has been additionally limited in both the integrative and transformative models due to the lack of definitive boundaries between each component, and therefore difficult to clearly discriminate between elements in each component (Graham, 2011). The significance of this inability to discriminate between these individual constructs creates a problem with precision and to what degree to these components overlap, or exist, independently. This issue alone limits the values of both TPACK models as a tool that researchers may utilize to identify specific knowledge or predict outcomes (Archambault & Crippen, 2009; Gess-Newsome & Lederman, N. G., 1999).

Demonstrating this lack of boundaries, teachers with more experience will tend to blend content and pedagogy in specific ways that are significant to a particular topic. For example, a teacher will prepare a social studies lesson using the same strategies (technology and otherwise) time after time, rather than employ new strategies. Due to the nature of measurement of TPACK, which mainly consists of self-reporting on pedagogical and content beliefs, teachers will generally not be able to differentiate which elements of teaching are content and which are pedagogy and generally rate their knowledge as high in both pedagogy and content. This is particularly true among those with more experience (Archambault & Crippen, 2009).

Niess (2005) counters this argument about measurement of TPACK, stating that regardless of the teacher's belief, it is the actual integration of all components that is important, stating,

> "TPACK, however, is the integration of the development of knowledge of subject matter with the development of technology and of knowledge of teaching and learning. And it is this integration of the different domains that supports teachers in teaching their subject matter with technology." (p. 510)

Ness highlights the importance of the blending and integration of content, pedagogy, and technology development as a holistic approach rather than focusing on the sum of TPACK's parts. This is further reinforced by the understanding that intertwined knowledge of technology, pedagogy, and content is imperative to both innovative and effective strategies involving technology in the classroom.

Parsimony Approaches to TPACK Measurement

A recent study by Baran (2011) demonstrated a methodology to measure the influence of TPACK. By measuring the components of TPACK by breaking the model into its smallest components based on Mirsha and Koehler's (2006) study which inhabit the main components and the individual intersections of the components and their relationships to one another (Figure 5).

Mirsha and Koehler (2006) also describe the interactions of the various components, stating;

> "TPACK is a framework that focuses on the complex interactions between a teacher's knowledge of content (CK), pedagogy (PK), and technology (TK). The combination of technology with pedagogy in a particular subject area must take into account the dynamic intersections such as TPK (technological pedagogical knowledge), PCK (pedagogical content knowledge), and TCK (technological content knowledge)." (p. 370)

The drastic difference in recent research on TPACK development over the past three years has gone from a comprehensive approach, where all factors are relevant to the phenomena of interest, towards a parsimony approach that simplifies the phenomena by delving into only the factors that hold the greatest value for understanding (Graham, 2011; Whetten, 1989). This new generation of TPACK research towards a parsimony approach maintains the hope that the TPACK will be manageable to research, thus

making TPACK a viable theoretical model that can be accessible to mainstream researchers (Baran, Chuang, & Thompson, 2011; Graham, 2011)

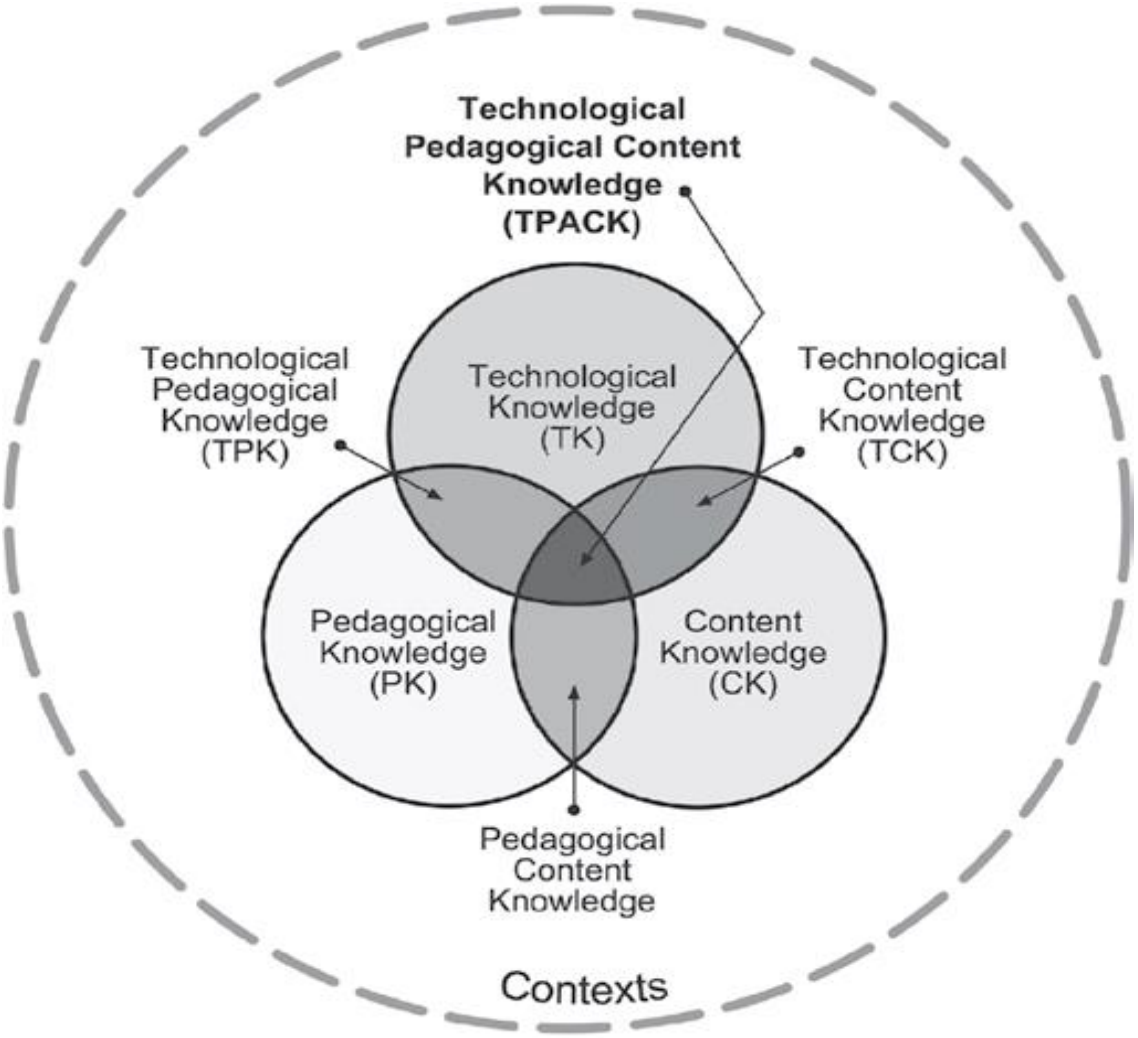

Figure 5. Technological Pedagogical Content Knowledge (TPACK)

The continued development of a parsimony research approach has led academics to generally agree that there are seven individual components of the TPACK model. Shimidt (2009) catalogs the components as both the three general, original concepts, and the four intersections that occur on the integrative model. They are defined as:

1. Technology knowledge (TK): Technology knowledge refers to the knowledge about various technologies, ranging from low-tech technologies such as pencil

and paper to digital technologies such as the Internet, digital video, interactive whiteboards, and software programs.
2. Content knowledge (CK): Content knowledge is the "knowledge about actual subject matter that is to be learned or taught" (Mishra & Koehler, 2006, p. 1026). Teachers must know about the content they are going to teach and how the nature of knowledge is different for various content areas.
3. Pedagogical knowledge (PK): Pedagogical knowledge refers to the methods and processes of teaching and includes knowledge in classroom management, assessment, lesson plan development, and student learning.
4. Pedagogical content knowledge (PCK): Pedagogical content knowledge refers to the content knowledge that deals with the teaching process (Shulman, 1986). Pedagogical content knowledge is different for various content areas, as it blends both content and pedagogy with the goal being to develop better teaching practices in the content areas.
5. Technological content knowledge (TCK): Technological content knowledge refers to the knowledge of how technology can create new representations for specific content. It suggests that teachers understand that, by
using a specific technology, they can change the way learners practice and understand concepts in a specific content area.
6. Technological pedagogical knowledge (TPK): Technological pedagogical knowledge refers to the knowledge of how various technologies can be used in teaching, and to understanding that using technology may change the way teachers teach.
7. Technological pedagogical content knowledge (TPACK): Technological pedagogical content knowledge refers to the knowledge required by teachers for integrating technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies.

This breakdown of the seven components of TPACK and the interrelations between them may provide the best potential for distinguishing the boundaries of pedagogy, content, and technology and their relationships to one another. Regardless of the hopes for real assessment, Archambault and Barrett reported in their 2010 study that after their extended efforts were successful only in clearly identifying one factor that they identified as knowledge of technology. They concluded,

> "Although the TPACK framework is helpful from an organizational standpoint, the data from this study suggest that it faces the same problems as that of pedagogical content knowledge in that it is difficult to separate out each of the domains, calling into question their existence in practice." (p. 1659)

Other impediments to research on TPACK will be unfortunately exacerbated by the continual and ever changing technological landscape as well as the evolving skills and knowledge of incoming preservice teachers. This knowledge and skill level ultimately effects the beliefs and values of future teachers, for the positive or negative when it comes to integration of technology. Unfortunately, the continued reliance on self-reports of beliefs and values will certainly manifest themselves on perceived knowledge of content, pedagogy, and technology, skewing actual results. Regardless, the flexibility of the TPACK framework should accommodate this change (Abbitt, 2011).

In addition, due to the inherent 'fuzzy' borders of TPACK, hundreds of studies claim TPACK as theoretical framing but very little additional theoretical development has occurred. As of 2008, a study by Cox concluded that there were 89 different definitions to the central construct of TPACK applied to and dozens of different definitions and models (Angeli & Valanides, 2005; Archambault & Crippen, 2009; Cox & Graham, 2009). Angeli and Valanides (2009) directly addressed the issue this way:

> "While it is perfectly understood that the preference for a general model might be directly related to its potential wide applicability in different contexts, the lack of specificity is problematic, because the very important issue of how tool affordances can transform content and pedagogy is not addressed. Also, the framework in its present form does not take into consideration other factors beyond content, pedagogy, and technology, such as, for example, teachers' epistemic beliefs and values about teaching and learning that may be also important to take into account. This simplified or general view, one might argue, may lead to possible erroneous, simplistic, and naïve perceptions about the nature of integrating technology in teaching and learning." (pp. 157)

In addition, Angeli and Valandides added:

> "The boundaries between some components of TPACK, such as, for example, what they define as Technological Content Knowledge and Technological Pedagogical Knowledge are fuzzy, indicating a weakness in accurate knowledge categorization or discrimination, and, consequently, a lack of precision in the framework." (Angeli & Valanides, 2009, p. 157)

Evaluation and Assessment of ICT-TPACK Integration

A potential issue among teacher training programs and primary and secondary schools alike is how to provide effective and timely assistance while continually assessing students for problems that may be facing in ICT-TPACK integration. One effective method is to utilize an electronic portfolio as an instrument to build skills, reinforce self-efficacy, showcase skills and talents, and most importantly to measure and assess the preservice or inservice teacher. Ritzhaupt, Ndoye, & Parker (2010) stated that each stakeholder has different purpose for using an electronic portfolio, and these competing purposes must be examined from the student perspective, including the primary purposes: visibility, learning, employment, and assessment. These may serve as both intrinsic and extrinsic motivators to both preservice and inservice teachers alike to work towards ICT-TPACK integration.

Many universities and school districts, due to cost, the sustainability of technology, and the numbers of faculty involved use a summative assessment rather than a formative assessment when it comes to measurement of skills, including technology skills. An electronic portfolio system may help Schools Leaders and Faculty promote reflection, collaboration, and continued technology development over time, where historically these important aspects have become watered down (Ntuli, Kweegwe, & Kyei-Blankson, 2009). Skill building and self-efficacy is as important in electronic portfolio development as it is in any technology to be integrated, and if preservice or

inservice teachers do not understand the purpose of an electronic portfolio, it would be reduced to a static collection of material, and vibrant reflections would not be possible (Gatlin & Jacob, 2002). The amount of student control and the amount of training necessary has a tremendous impact on whether assessment of the electronic portfolio is an effective tool for reflection or teacher development, and ultimately ICT-TPACK integration.

It is difficult to study the exact impact of electronic portfolio development and assessment across a wide range of colleges and universities, because of a multitude of various electronic portfolio platforms and a lack of a research structure between universities, but there are some tools that tend to fair better than others depending on the individual goals of the teacher training program of professional development needs of schools (Richards & Ehley, 2005).

With the multitude of various digital platforms available to universities to develop their electronic portfolio systems, it should be noted that a lack of structure and collaboration among Faculty and School Leaders in electronic portfolio development may hinder both formative and summative assessment. However, specific mandates such as standards-based electronic work samples will only be meaningful with proper guidance, and if teacher educators align program ICT-TPACK philosophy (Wetzel & Strudler, 2006). It has been suggested that without a carefully planned portfolio structure, preservice teachers may produce superficial, low level reflections, negating a large reason for an electronic portfolio in the first place. (Gordinier, Conway, & Journet, 2006).

Electronic portfolio development in conjunction with a lack of connection to classwork and other important aspects of preservice teacher training at the university

level may also have a negative impact on ICT-TPACK development. In order to establish this connection between classroom instruction and electronic portfolio development and integration, it is essential to align with professional standards, and each instructor needs clear expectations for student performance and anticipated products (Tu, Baker, & Pensaville, 2008) Therefore, in order to maximize the benefit of the electronic portfolio, it is necessary to formatively assess, adequately train, and provide assistance when needed.

Constructivist Centered Electronic Portfolio Development. Constructivist ideas such as collaboration and creativity are entwined within contemporary technology and electronic portfolio development. There is also a desire to incorporate more reflective strategies including greater opportunity collaborate with peers, associate teachers and faculty advisors in electronic portfolio development (McCabe, Wideman, & Winter, 2009). By providing a structure within preservice teacher training that promotes constructivism through collaboration and creativity tend to reflect at a deeper level than those who do not. Creativity is likewise important in allowing students to be more secure in their own environment and allows them to promote growth and reflection. It is also necessary to give students a voice and promote a sense of self, and therefore promoting self-efficacy and confidence.

The Need for Reflection. Although there is no definitive singular definition among researchers as to reflection, there are some aspects of reflection that are broadly accepted amongst professionals in the field of education. Dewey (1933) stated that reflective thinking is simply considering a subject and giving it serious and consecutive consideration. Although this definition of reflection may be simplistic, it is a complex

dynamic with multiple facets. ‘Reflective Practice’ as an educational term consists of reflection that incorporates the need for deeper insight through metacognition in teaching and engagement in the reflective process. Reflective engagement helps preservice teachers to actively consider and reconsider beliefs and practices that allow them to move toward metacognition in teaching and improve their overall performance. Regardless of the definition, reflective engagement and self-correction have been shown to lead to increased understanding of skills and knowledge and thereby improved performance by pre-service teachers (Rodman, 2010). Meaningful reflection is necessary for the integration and utilization of any innovation, including ICT-TPACK.

Stone (1998) added that reflection is a process that needs to be nurtured in students and developed, and that the reflective process can be taught. If a prospective teacher can master the ability to be a reflective practitioner through metacognition of various experiences and events pertaining to their teacher training, then effective transfer-of-learning and transfer-of-knowledge can take place (Richards, et al., 2008). However, reflection defined as a technical skill is insufficient to support meaningful teacher learning (Hoffman-Kipp, Artiles, & Lopez-Torres, 2003). Concerning the relevance and importance of reflection on preservice teacher development and ICT-TPACK integration, researchers have concentrated on how we can take advantage of technology in relation to the basic and vital needs of humans (Genc & Tinmaz, 2010), especially in the various components of reflective practice.

Transfer-of-learning and transfer-of-knowledge are essential reflective practices for a contemporary teacher and necessary for ICT-TPACK integration. They consist of the ability to create reflections concerning newly learned experiences or relevant events

to their teaching practices and apply them to different situations—essentially linking content to professional development. Mentkowski and Associates (2000) presented a theory of learning, performance, and development that linked individual growth with educational and contextual factors. The results emphasized how progress in learning interacted with developing identity as a learner and performer. Students were seen to construct ability frameworks across performances as a means of transferring their learning into new situations and contexts. Therefore, these episodes of transfer helped them to link developing abilities and content knowledge with professional development and technology integration.

Similarly, there is a relationship between *reflection* and *self-assessment*. Both reflection and self-assessment depend on observation, but the purpose of self-reflection is *understanding*, in contrast to the *judgment* aspect of evaluation on the basis of a given criteria, which is the purpose of assessment (Richards, et al., 2008).This is especially important in the idea of faculty assessments of their students and the delicate nature of assessing students in a constructivist and positive manner.

Some researchers take reflective components and conceptualize them as a broader topic of Critical Reflective Practice (CRP) which is necessary for handling change effectively (McCabe, Wideman, & Winter, 2009). In addition, CRP is especially useful changing demands of education by including an understanding of self, lived experiences, and the impact the practitioner has on classroom teaching. By linking to individual experiences of the learner, teacher preparation students utilize CRP to understand themselves just as they would the world around them in order to make consistent and decisions. According to Yost, Sentner, and Florenza-Bailey (2000), critical reflections

examine assumptions underlying a decision or act and on the broader ethical, moral, political, and historical implications behind the decision or act. It is evident that a teacher preparation program alongside a structured and formatively assessed, collaborative electronic portfolio system benefits students in enhancing these skills and promotes ICT-TPACK integration. These benefits ultimately are too essential to neglect, and include the ability to be effective decision makers, demonstrate and realize self-improvement and growth, promoting teacher attributes, values, and professional practices, inquiry and reflective learning.

Chapter III:

Methodology

This study was designed to compare the perspectives of College of Education Faculty to those of School Leaders to determine if there were significant differences in the attitudes regarding technological integration and necessary skills among teacher candidates. This chapter will present the methodology used in this study, including the research design; the participants and sampling procedures; the instrument development; procedures for data collection and analysis; and information regarding the reliability and validity of the instrument.

Research Questions

Although additional questions arose during the analysis of the data that will be discussed in Chapter 5, there are two research questions that initially guided this research study,

- What are the similarities and differences between College of Education Faculty and School Leader perspectives regarding the importance of technology skills of teacher candidates?
- What are the similarities and differences between College of Education Faculty and School Leader perspectives regarding the importance of continued technology integration in schools?

Research Design

This study used a mixed-method approach that allowed the researcher to explore the relationships in greater depth between variables regarding attitudinal data. This

method was preferable because it allowed the researcher to explore the relationships and add validity to the interpretation of data through cross-validation. This exploration of the data allowed the researcher to determine if there was convergence among the quantitative and qualitative data. When a lack of convergence among the data was discovered, it led to new questions to investigate (Frankel & Wallen, 2009).

In the case of this study, a mixed-model approach was selected where both quantitative data and qualitative data are collected and initially measured separately. Quantitative components demonstrated data regarding group attitudes, while qualitative data complemented the quantitative data by careful analysis for the overall content and context of the data. This qualitative component gave weight to the perspectives and attitudes of the individual perspectives of participants in regards to their perceived importance of technology integration and skills. Ultimately, both sets of data were combined for analysis and interpretation (Frankel & Wallen, 2009). (Figure 5).

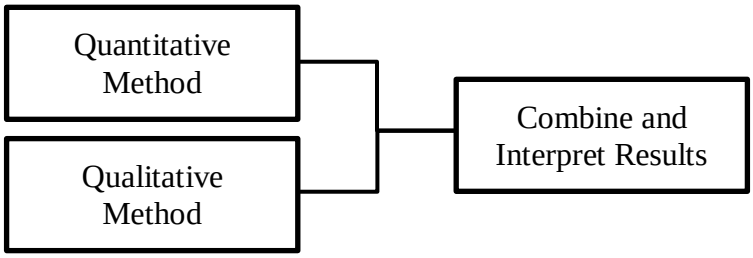

Figure 5. Mixed-Method Model

Participants

School leaders (*N*=46), were chosen through the College of Education's Executive Doctorate Program, which has an emphasis on school leadership and administration. Each of the potential participants holds a valid Principal's license and therefore has a background in the education profession as a teacher and administrator. In addition, as a school leader, they have the responsibility to observe and evaluate their

teaching staff routinely, including the evaluation of national and state technology standards. This sampling was necessary to capture a wide range of experiences, as each participant works locally, but were employed in many different districts and schools, and therefore held different opinions and beliefs. This was preferable to the direct solicitation of school leaders from districts, mainly due to time constraints concerning the different systems regarding permission to conduct studies within the individual districts. This survey was voluntary and all data collected were maintained under the safeguards presented in the Institutional Review Board directives. It should be noted that as doctoral students, they as a group may have ambitions to achieve and be more career oriented than their School Leader peers, which could affect attitudes.

Faculty (*N*=19) participants were recruited through the College of Education, who also provided email access with a current list of faculty teaching in the program. Faculty consisted of full-time tenured faculty, tenure-track faculty, clinical faculty, and adjunct faculty who currently teach classes in the College of Education. It was important to recruit a broad range of faculty with differing values and beliefs regarding pedagogy, content, and technology for comparison and analysis of current attitudes towards the promotion of instructional technology. By providing this wide range of potential experiences and opinions among faculty, the data provided a clearer picture of the effectiveness of current technology initiatives and a potential direction for future initiatives and technology integration.

The data from School Leaders and Faculty were collected and analyzed separately, then compared to determine whether significant differences or similarities emerged.

Instrumentation

This instrument, with the exception of minor sample-specific demographic questions in Part I and collection techniques (paper-based or online), was identical in content for both samples. Part 2: Important Considerations in Evaluating Applicants for a Teaching Position and Part 3: Important Factors in the Portfolios of Applicants for Teaching Positions, were based on the survey instrument from *The Bridge from Student to Teacher: What Principals, Teacher Education Faculty, and Students Value in a Teaching Applicant* (Abernathy, Forsyth, & Mitchell, 2001) while Part 4: The Importance of Technology in Teaching Pedagogy, was developed by the principal researcher. Part 5: Short answer qualitative questionnaire, which was developed by the primary researcher, helped to further explain and add depth, richness, and an individual perspective approach to analyzing the data provided in the quantitative sections.

Quantitative data were gathered through Likert-rating scales (1=No Importance; 3=Moderate Importance; and 5=Highest Importance) in a survey instrument that was analyzed through SPSS software. Qualitative data were collected by group (Faculty or School Leaders), repeatedly read, analyzed, and finally categorized by themes that emerged along with more specific sub-categorical data. These themes were then compared between the two groups for similarities and differences.

The data were collected in the spring semester, 2013. It was imperative for measurement purposes to utilize the same survey instrument for both sample populations to maintain an accurate comparison. This study utilized SPSS software to examine relationships between the variables through descriptive statistics, and General Linear Model ANOVAs. This survey took approximately ten minutes to complete for both samples and was minimally invasive.

Survey Method

Both school leaders and faculty completed the same survey, with the exception of minor changes in the demographic section to accommodate differences in the samples. Due to convenience and timing for this study to be completed, it was necessary to deliver this instrument in two different formats. For faculty, the survey was delivered in a web-based online format (Survey Monkey) presented to the faculty as an embedded link in a recruitment email. This limited errors in data collection and controlled for data entry issues, but may have caused some confusion with multiple online pages to the survey causing some participants to discontinue entering data at certain points due to the feeling that the survey was completed. This caused some of the faculty participants to be removed from the data pool. School Leaders were recruited in person during a class and given a paper-based instrument. The delivery of a paper-based instrument may have had the opposite issue than with the faculty, where pen-and-ink data entry could lead to mistakes on behalf of the participant (skipped questions, directions not accurately followed, etc.). Regardless, both quantitative and qualitative data were collected from both groups, with steps taken pre-collection to identify and minimize data entry errors.

Development of the Instrument, Field Testing, and Reliability

The development of the instrument included an exploratory factor analysis field test that was carried out by the researcher to update and streamline the original survey instrument. This survey was developed with five sections; Section 1: Demographic Information; Section 2: Important Factors in Evaluating Applicants for a Teaching Position; Section 3: Important Factors in the Electronic Portfolios of Applicants for Teaching Positions; and, Section 4: Importance of Instructional Technology in Teaching

Pedagogy. Part 5 consisted of five qualitative questions to add richness and depth to the data collected from Parts 1-4. The quantitative Likert-scale items were ranged from 0 "no importance" to 5 "highly important" and were directly adapted from a prior research study with a similar intent (Abernathy, Forsyth, & Mitchell, 2001). The original study consisted of sections 2 and 3, and relied primarily on descriptive statistics. Unfortunately, no reliability data were published for the original 2001 study, therefore, a field test was completed by this study's researcher, including a factor analysis to determine reliability. There were 54 participants (N=54) in this field test using students from the University of Houston College of Education.

Part 1: demographic information. Some changes were made to the original document to create a more specific demographic collection instrument for this particular study while also respecting the privacy of each participant. Included in the simple demographic information of faculty or school leadership; 1) years in current position; 2) years in the education profession, 3) classes taught for faculty and or grade levels that School Leaders oversee. Also included was a single question to get some background on the participant, "How do you learn about technology?" with four descriptive multiple-choice answers. This section was peer reviewed and not part of the field test.

Part 2: important factors in evaluating applicants for a teaching position. Items 1-19 were originally run as a complete group, with a KMO = .593 and seven components extracted and cumulative variance of 74.151. The first of the factors derived was especially large, while the final 3 components were exceptionally weak with only one item in component 6 and 7, and only two in 5. It did, however, hold a coefficient alpha (α = .808) indicating that the reliability of this portion of the instrument is fairly

strong. The decision was made to streamline Part 2 by removing five items that were weaker, or perhaps redundant (Items 3, 5, 9, 10, and 14) in an effort to raise the reliability of this portion of the instrument. This raised the KMO to .727 while the alpha score remained at ($\alpha = .808$), which did in fact improve the overall reliability. Four components were extracted:

Items Removed

- 3. Samples of teaching and management skill
- 5. Recommendation from school personnel
- 9. Statement of philosophy compatible with school
- 10. Record of volunteer work with children, teaching
- 14. Program of study (actual courses taken)

Component 1

- 8. Number of certifications held
- 12. Graduation with honors or other awards
- 13. Grade point average
- 16. Completion of graduate degree
- 18. Institution where student was certified

Component 2

- 6. Experience with specific programs in district
- 15. Familiarity with specific type of community
- 17. Involvement in professional organizations
- 19. Familiarity or skills with technology

Component 3

- 2. Cooperating teacher evaluation
- 7. University supervisor evaluation
- 11. Recommendation from university faculty

Component 4

- 1. Previous successful teaching position
- 4. Person is already known in the district

It should be noted that although there are only two items in component 4, the researcher believed it was still of value. This component is a gauge of school leaders' attitudes when hiring new teachers over more seasoned teachers. In addition, the theme is loosely related to that in Component 3.

Part 3: important factors in portfolios of applicants. This section originally consisted of questions 20-40 (21 items) and had a KMO of .754; and high alpha score (α=.894). Six components were extracted with a cumulative variance of 72.679. The components themselves were slightly weak and upon noticing an issue with item 20, it was removed and data were run again forcing only five components. The new instrument measured a KMO of .772, a cumulative variance of 69.582 for all five components and a high alpha score (α=.896). Of the five components extracted:

Item Removed

- 20. Evidence of ability to manage whole class

Component 1

- 32. Statement of philosophy
- 33. Statement of beliefs/aspirations
- 38. Statement of personal mission
- 40. Statement of outside interests/hobbies

Component 2

- 27. Examples of use of technology
- 31. Statement of professional goals
- 36. Examples of curriculum development
- 37. Examples of sample units
- 39. Examples of teaching (video)

Component 3

- 23. Examples of variety of teaching strategies
- 25. Evidence of writing ability
- 28. Examples of parent/community involvement
- 35. Examples of unique projects

Component 4

- 21. Evidence of good character
- 22. Evidence of interpersonal skills
- 24. Evidence of thought process
- 26. Evidence of creativity

Component 5

- 30. Evidence of teaching experience beyond levels
- 34. Examples of lesson plans with objectives
- 29. Examples of assessment practices

Part 4: importance of instructional technology in teaching pedagogy. Original items 40-48 (8 items) held a KMO of .681, a moderate alpha score (α=.706), and a cumulative variance of 56.153. There was a noticeable weakness after factor analysis in regards to item 42 that skewed the results and weakened the data set, and therefore it was removed to improve the reliability. The final factor analysis was run without item 42 and was significantly stronger, with a KMO of .708, two components with a cumulative variance of 61.508, and a higher alpha score (α=.784).

Item Removed

- 42. Social Technology (e.g., Facebook, Instagram, Pinterist, MySpace)

Component 1

- 45. Productivity Technology (e.g., Online Calendars, Time Management, Online Organizers)
- 46. Multimedia Technology (e.g., YouTube, Vimeo, Google Video)
- 47. Critical Thinking & Problem Solving Technology (e.g., Mind Mapping, Flowchart/Diagram Makers)
- 48. Reflection, Feedback, and Networking Technology (e.g., Google Sites, Wikis, Polling Audience Response tools)

Component 2

- 41. Presentation Technology (e.g., PowerPoint, Prezi, SlideRocket, MovieMaker)
- 43. Organizational Technology (e.g., Online Courseware, BlackBoard, Moodle)
- 44. Collaboration & Communication Technology (e.g., Google Docs, File Sharing, Secure Dedicated Wiki)

Part 5: qualitative questions. This section was added after the initial field test and was further developed through revision and peer review for clarity. This was intended to allow for elaboration among groups, to narrow and isolate specific themes that emerged, and to add richness and depth to the quantitative data collected in the prior sections. The final instrument consisted of five questions that related back to quantitative sections and allowed for the participant to elaborate and the researcher to cross-validate results. The final instrument can be found in Appendix A.

Collection of Survey Data

College of Education faculty were recruited using faculty rosters of classes taught in the spring 2013 semester and were sent an email link to the online instrument. The survey was administered online via SurveyMonkey. Faculty participants were asked to consent or assent before participating in the study. Once the survey was completed, responses were stored in the password protected online SurveyMonkey account.

Due to time limitations and barriers in recruiting School Leaders, a paper-based survey instrument was presented by the researcher during a scheduled class on the university campus of the Executive Doctorate Program for Educational Leaders. All participants were read the recruiting statement and asked to participate in this study. Assent or Consent was the initial portion of the instrument. It was administered at the end of class so that those who did not wish to participate did not feel any coercion to participate.

Data Analysis for Quantitative Survey Questions

Once all data were collected, they were exported (for online faculty surveys), and manually input by the researcher (for school leader surveys), into an Excel spreadsheet and then exported to SPSS for further data analysis. The analysis included descriptive statistics and General Linear Model ANOVAs to provide effect size and power, and then both samples were compared to each other for similarities and differences.

Data Analysis for Qualitative Survey Questions

The qualitative data were collected alongside the quantitative data, in the same mixed-method instrument for each of the two sample groups. Each sample group (Faculty and School Leaders) were analyzed independently of one another, and later compared for

differences and similarities. All responses were repeatedly read question-by-question, analyzed, and ultimately coded according to the respondents' content, terminology, and phrasing of their answers. This coding was useful in comparing responses and determining the emerging themes and patterns from each group. Due to the amount of data and the nature of the questions, some allowing for more broad responses, many of the emerging themes also yielded important data based on more specifics that required reporting as sub-categories within the emerged theme. In addition, significant answers that demonstrated unique individual attitudes, insightful comments, or items of importance for this study were reported.

Management of Data

All electronic data has been digitally stored and password protected using the SurveyMonkey website and was exported to an Excel spreadsheet for SPSS analysis. Data from paper-based instruments were input electronically in the same password protected spreadsheet (Excel and SPSS files) as the online survey instruments, and the actual paper-copy surveys are filed and stored on campus with the researchers' Dissertation Chairperson and advisor.

Reliability and Trustworthiness

It is assumed that no survey instrument can ever be absolutely reliable, especially one which is based on a self-report of attitudes, beliefs, and values. Nevertheless, continued usage as part of a long-term plan to measure attitudes and values will identify any issues and help maintain reliability over time.

Steps were also taken to maintain reliability and validity of these data and to assure that the data collected were appropriate for analysis. Due to the lower than expected sample sizes, there is increased possibility of Type I and Type II errors.

Therefore, the level of significance proved difficult to ascertain in some cases: thus, in some cases additional analyses were used to interpret the data. The additional analyses were completed by careful proofing of the transcription of raw data, using software to compile raw data, and assuring data conformed to the expectations and requirements of the instrument. All data were carefully entered into an Excel document, reviewed, and imported into SPSS for additional review.

Chapter IV:

Results

The purpose of this study was to investigate the similarities and differences in attitudes, beliefs, and the levels of importance that participants from both groups, Faculty and School Leaders, hold towards technology skills of teacher candidates and concerning technology integration (ICT-TPACK) in the classroom. Data were collected to compared two groups; School Leaders (*N*=46) and College of Education Faculty (*N*=19), which will be demographically profiled in a later section of this chapter.

Research Questions

Two research questions were developed after an extensive review of literature and consideration of the researcher's knowledge of the subject matter, the culture of the samples, and prior experiences.

- What are the similarities and differences between College of Education Faculty and School Leader perspectives regarding the importance of technology skills of teacher candidates?
- What are the similarities and differences between College of Education Faculty and School Leader perspectives regarding the importance of continued technology integration in schools?

Overview of Chapter 4

The following sections will detail 1) demographic and descriptive statistics, such as current employment position (Faculty or School Leadership), years in profession, and years in current position; 2) results from descriptive statistics and the General Linear Model ANOVAs addressing sections 2, 3, and 4 detailing significant differences and

similarities of Faculty and School Leaders; 3) in-depth, question-by-question analysis of open-ended qualitative questions by group and a comparison of emerged themes between the two groups, and, 4) a brief summary of the results chapter.

Demographic Results

The purpose of the demographic section was to identify basic information from each of the participants for comparison. The information generated was used to describe the group identities to promote a more developed reasoning for similarities and differences between the two samples. Among the faculty respondents, 22 selected that they would be willing to participate while three began the online survey instrument but did not complete the survey sufficiently to be utilized for data collection. School Leaders were given a paper-based version of the survey instrument during a scheduled class time, and of the 48 students available, 46 completed the survey with only two selecting not to participate. Therefore, Faculty had a statistically small sample (N=19) while School Leaders were comparatively larger (N=46). This may have impacted the study due to a lack of a large sample size, especially from the faculty group.

Both Faculty and School Leaders were asked to identify how many years they had been in the education profession and how many years in their current position. Faculty were additionally asked the types of classes they taught at the university, while School Leaders were asked in which districts they were currently employed and at which grade levels. The final question of section one, "How do you learn about new technology?" was not utilized in this study due to excessive errors on the part of School Leaders, where the majority of School Leader participants selected more than one answer on the paper-based

instrument, skewing the data and making it impossible to derive any comparative value from the School Leaders sample for comparison.

Classes taught (Faculty). The online survey instrument asked Faculty participants the classes they currently or last taught in the College of Education. Due to the nature of the question and the responsibility of the researcher to maintain privacy of the population, it was decided to omit this question. The reason for this decision was that with such a small population, and the very specific answers faculty gave, it would be fairly easy to identity participants. It should be noted though that the sample for faculty members came from the ranks of tenured, clinical, and adjunct faculty, thus providing a broadly-based sample.

District employed (School Leaders). School Leaders (*N*=45; one missing) were asked in which district they were currently employed. Among them were four (4) inner-city, urban school districts, and thirteen (13) suburban and rural districts represented for a total representation of seventeen (17) districts. Twenty-seven (27) School Leaders stated that they were employed in four large inner-city and urban districts, also with two private school leaders and one charter school leader who also worked in the inner city. The remaining 18 respondents worked in suburban or rural districts, one of which indicated that he/she was not involved with an individual school district but a State organization that serviced multiple school districts in the region.

Assignment by grade levels (school leaders). School leaders reported their school assignments by grade level. Forty-four (*N*=44) School Leader participants answered this question while two did not for unknown reasons. Six possible selections could be made, No Grade Level, Pre-Elementary, Elementary, Middle School or Jr. High,

High School, or All-Levels. Data derived from the only participant that selected 'No Grade Level' indicated employment with a State entity that provided services to larger school regions and multiple districts. The sole participant that selected all levels indicated employment with a private school in an urban area. There were 19 high school leaders (43.2%), 13 Elementary School Leaders (28.3%), 9 Middle and Jr. High School Leaders (20.5%), and one Pre-Elementary position (2.2%) (Table 2).

Table 2

Grade Level Assignments of School Leaders

Grade Level	Frequency	Percentage	Cumulative Percentage
No Grade Level	1	2.2%	2.3%
Pre-Elementary	1	2.2%	4.5%
Elementary	13	28.3%	34.1%
Middle School or Jr. High	9	20.5%	54.5%
High School	19	43.2%	97.7%
All Grade Levels	1	2.3%	100%

Years in the Education Profession (All Participants). It was imperative for the researcher to determine whether the time spent in the educational profession created any differences in attitudes and values relating to the content of this survey. It should be noted that all School Leaders hold a minimum educational standard of a Master's degree while working towards their doctorate, and the Faculty have earned a doctoral degree necessary to be employed as Faculty. School Leaders in this study were all enrolled in the Executive Doctorate Program for Educational Leaders. Based on these data alone, both sample groups are considered to be highly academic-minded individuals and the data in itself sets the stage for a highly-educated sample population that is committed to their profession, ambitious, and career oriented.

Table 3

Years of Experience in the Education Profession

	Faculty			School Leaders		
Years of Experience	Frequencies	Percentages	Cumulative Percentages	Frequencies	Percentages	Cumulative Percentages
1-5	0	0%	0%	3	6.5%	6.5%
6-10	3	15.8%	15.8%	14	30.4%	36.9%
11-15	2	10.6%	26.4%	7	15.1%	52%
16-20	4	21.1%	47.5%	12	26%	78%
21-25	4	21.1%	68.6%	5	10.8%	88.8%
26-30	1	5.3%	73.9%	3	6.6%	95.4%
31-35	1	5.3%	79.2%	2	4.3%	100%
36-40	1	5.3%	84.5%	0	0%	
41-45	3	15.8%	100%	0	0%	
Totals	19	100%		46	100%	

Faculty demonstrated a wider range of years of experience than did School Leaders (Table 3). All Faculty participants had a minimum of six years of experience in the education profession and ranged from three participants in the six to ten year range to an additional three participants in the 41-45 year range. The School Leader data range was more compressed for years of experience in the education profession, with three indicating five or fewer years of experience, and two with 30-35. The cumulative percentages of each sample demonstrate the differences in year of experience, with 79.2% of all Faculty participants indicating less than 35 years of experiences, and 78% of School Leaders held less than 20 years of experience. Although the sample sizes are low for both groups of participants, data do indicate that School Leaders tend to be newer to the education profession and have less combined experience than their Faculty counterparts.

Years in the Current Position (All Participants). Both samples were asked to identify the length of time served in their current positions, as opposed to their complete

time in the education profession. Both samples indicated a large percentage with fewer than five years actively in their current position (faculty = 63.2%; school leaders =76.1%). Differences did emerge with four faculty members indicating that they have held the same position for over 21 years, where the school leadership sample had no participants who indicated that they have held their position for more than 20 years (Table 4).

Differences between the two groups do reinforce the data derived from the previous question, but these data does indicate that there are many participants that change, move, or are promoted to new positions frequently. This may be due to the ambitious and academic minded nature of the participants or due to other forces not noted in this particular data.

Table 4

Years in Current Position

	Faculty			School Leaders		
Years of Experience	Frequencies	Percentages	Cumulative Percentages	Frequencies	Percentages	Cumulative Percentages
1-5	12	63.2%	63.2%	35	76.1%	76.1%
6-10	3	15.8%	79.0%	8	17.3%	93.4%
11-15	0	0%	79.0%	2	4.4%	97.8%
16-20	1	5.3%	84.3%	1	4.4%	100%
21-25	1	5.3%	89.6%	0	0%	
26-30	1	5.3%	94.9%	0	0%	
31-35	0	0%	94.9%	0	0%	
36-40	1	5.3%	100%	0	0%	
Totals	19	100%		46	100%	

Indicators of Teacher Readiness

This section of the survey was developed to gather insight into the specific details of what a School Leader finds most important as indicators of readiness for a teacher candidate when applying for employment. By comparing the similarities and differences

of these data to those collected from Faculty it is possible to determine group attitudes and opinions of what is most important as indicator of teacher readiness.

This section consisted of 14 items with a five point Likert-scale (1=No Importance; 3=Moderate Importance; and 5=Highest Importance). All Faculty participants completed this section in its entirety (*N*=19), school leaders had one missing response for question 2 and question 12, resulting in (*N*=45) for those items, but otherwise all participants answered the other 12 questions (*N*=46). Descriptive statistics, including means and standard deviations were derived from the participants (Table 5).

Table 5

Descriptive Statistics: Indicators of Readiness of a Teacher Candidate

	Faculty			School Leaders		
Question	N	$\bar{X}$	SD	N	$\bar{X}$	SD
1. Previous teaching position	19	3.58	.902	46	3.74	.976
2. Cooperating teacher evaluation	19	3.89	.982	45	3.53	1.036
3. Person is known in the district	19	2.21	.787	46	2.43	1.047
4. Experience with specific programs in the district	19	2.53	1.020	46	3.48	.960
5. University supervisor evaluation	19	3.95	.705	46	3.15	.965
6. Number of certifications held	19	3.00	.943	46	3.16	1.021
7. Recommendation from university faculty	19	3.79	.918	46	3.22	1.009
8. Graduation with honors or other awards	19	3.79	.855	46	3.07	.827
9. Grade point average	19	3.84	.834	46	3.15	.759
10. Familiarity with the local community	19	3.47	8.41	46	3.22	.892
11. Completion of graduate degree	19	3.37	1.012	46	3.07	1.181
12. Involvement in professional organizations	19	3.63	.831	45	2.71	.869
13. Institution where student was certified	19	3.79	.787	46	2.80	.910
14. Familiarity or skills with technology	19	4.00	.882	46	3.74	.648

Data were derived from both samples and analyzed through a General Linear Model ANOVA using SPSS software to measure whether similarities or significant differences were present, as well as the effect size of each item for both samples. Although initial testing did indicate some differences between the samples, it should be noted that due to a lower than expected sample size, homogeneity of variance could not

be achieved. Therefore, it is advised to proceed with caution in interpretation of the following data.

The significant differences that emerged through a GLM ANOVA analysis emerged were;

- 4) Experience with specific programs in the district
- 5) University supervisor evaluation
- 7) Recommendation from university faculty
- 8) Graduation with honors or other awards
- 9) Grade point average
- 12) Involvement in professional organizations
- 13) Institution where student was certified.

Additionally, each of these items had small to moderate effect sizes according to their Partial Eta Squared and moderate to high power according to the Observed Power (Table 6).

Table 6

GLM ANOVA Results: Indicators of Readiness of a Teacher Candidate

	F	Sig.	Partial Eta Squared	Observed Power[b]
1. Previous teaching position	.378	.541	.006	.93
2. Cooperating teacher evaluation	1.834	.181	.029	.266
3. Person is known in the district	.705	.404	.011	.131
*4. Experience with specific programs	12.748	.001	.168	.940
*5. University supervisor evaluation	10.527	.002	.143	.892
6. Number of certifications held	.324	.571	.005	.087
*7. Recommendation from university faculty	4.546	.037	.067	.556
*8. Graduation with honors or other awards	10.107	.002	.138	.879
*9. Grade point average	10.484	.002	.143	.890
10. Familiarity with the local community	1.146	.289	.018	.184
11. Completion of graduate degree	.959	.331	.015	.161
*12. Involvement in professional organizations	15.368	.000	.199	.971
*13. Institution where student was certified	12.686	.000	.212	.982
14. Familiarity or skills with technology	1.754	.190	.027	.257

Computed using $\rho<.05$; * indicates significant differences

Items that were not significantly different were; 1) Previous teaching position; 2) Cooperating teacher evaluation; 3) Person is known in the district; 6) Number of

certifications held; 10) Familiarity with the local community; 11) Completion of graduate degree, and; 14) Familiarity or skills with technology.

The similarity of attitudes between groups regarding familiarity or skills with technology is of special importance to this study and indicates that both groups tend to have a similar sentiment regarding the technology skills. Whether this is a positive or negative sentiment cannot be derived from these data alone, and will be discussed further alongside other relevant data in the following discussion chapter.

Demonstration of Specific Skills by Teacher Candidates

Part 3 of this survey quantitatively asks participants to convey attitudes concerning the specific skills a teacher candidate needs to demonstrate when applying for a teaching position. Responses of Faculty and School Leaders were made through descriptive statistics and a General Linear ANOVA to determine whether significant differences emerged between the groups, or whether similar perspectives were found.

Participants' responses were recorded on a five-point Likert-scale indicating the level of importance the items held according to their perspective, (1=No Importance, 3=Moderate Importance, and 5= Highest Importance). Descriptive statistics were recorded (Table 7) as well as a General Linear Model ANOVA. This section consisted of 20 items asked of both faculty (N=19) and school leaders (N=46). There were three questions (24, 26, and 29) for which one Faculty participant did not complete these specific items and one School Leader did not complete two items, (18 and 25).

Table 7

Descriptive Statistics: Demonstration of Skills of a Teacher Candidate

	Faculty			School Leaders		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD
15. Evidence of Good Character	19	4.63	.597	46	4.67	.580
16. Evidence of Interpersonal Skills	19	4.63	.597	46	4.46	.622
17. Examples of variety of teaching skills	19	4.47	.612	46	4.41	.686
18. Evidence of thought process	19	4.42	.607	45	4.33	.674
19. Evidence of writing ability	19	4.42	.692	46	4.04	.759
20. Evidence of creativity	19	4.00	.816	46	4.07	.680
21. Examples of use of technology	19	3.84	.688	46	3.78	.759
22. Example parent/community involvement	19	3.68	.749	46	3.78	.728
23. Examples of assessment practices	19	4.05	.848	46	3.83	.709
24. Evidence of teaching beyond levels	18	3.17	.875	46	3.39	.930
25. Statement of professional goals	19	3.37	.955	45	3.38	.806
26. Statement of philosophy	18	3.16	1.145	46	3.46	.862
27. Statement of beliefs/aspirations	19	3.58	1.017	46	3.57	.860
28. Examples of lesson plans with objectives	19	4.05	.621	46	3.87	.934
29. Examples of unique projects	18	3.61	.778	46	3.54	.912
30. Examples of curriculum development	19	3.79	.855	46	3.61	.930
31. Examples of sample units	19	3.63	.684	46	3.59	.777
32. Statement of personal goals	19	3.74	1.046	46	3.33	.896
33. Examples of teaching (video)	19	3.95	.848	46	3.83	1.161
34. Statement of outside interests/hobbies	19	2.79	.918	46	2.52	.888

Additional analyses were derived from the data using a General Linear Model ANOVA procedure through SPSS software (Table 8). Results indicate that there were no significant difference ($\rho<.05$) between the two samples (Faculty and School Leaders). As in the previous section, due to sample sizes homogeneity of variance could not be established, therefore the researcher will proceed with caution in interpreting the results. Nevertheless, the relevance that Faculty and School Leaders appear to have similar attitudes regarding the types of skills that teacher candidates should be able to demonstrate is relevant to this study and will be addressed further in Chapter 5 discussion.

Table 8

GLM ANOVA Results: Demonstration of Skills of a Teacher Candidate

	F	Sig	Partial Eta Squared	Observed Power[b]
15. Evidence of Good Character	.074	.787	.001	.058
16. Evidence of Interpersonal Skills	1.089	.301	.017	.177
17. Examples of variety of teaching skills	.112	.739	.002	.063
18. Evidence of thought process	.239	.626	.004	.077
19. Evidence of writing ability	3.496	.066	.053	.453
20. Evidence of creativity	.110	.741	.002	.062
21. Examples of use of technology	.087	.769	.001	.060
22. Example parent/community involvement	.242	.625	.004	.077
23. Examples of assessment practices	1.223	.273	.019	.193
24. Evidence of teaching beyond levels	.787	.379	.013	.141
25. Statement of professional goals	.002	.968	.000	.050
26. Statement of philosophy	.344	.560	.006	.089
27. Statement of beliefs/aspirations	.003	.956	.000	.050
28. Examples of lesson plans with objectives	.615	.436	.010	.121
29. Examples of unique projects	.077	.782	.001	.059
30. Examples of curriculum development	.531	.469	.008	.111
31. Examples of sample units	.047	.828	.001	.055
32. Statement of personal goals	2.562	.114	.039	.351
33. Examples of teaching (video)	.169	.682	.003	.069
34. Statement of outside interests/hobbies	1.199	.278	.019	.190

Computed using $\rho<.05$; * indicated significant differences

Importance of Technology Skills Among Teacher Candidates

This section consisted of seven items designed to gather attitudinal data concerning what types of technology skills are important when selecting a teacher candidate for employment. The reason for the generalized types of technology listed was to prevent participants from becoming too focused on specific technologies that may be popular or trending at the moment. Items were rated on a five-point Likert-scale for consistency with the previous sections (1=No Importance, 3=Moderate Importance, and 5= Highest Importance).

All participants in this study answered the seven items and comparisons were made between the Faculty (*N*=19) and School Leaders (*N*=46). Descriptive statistics, including sample sizes, item means, and standard deviations were derived from the data for comparison between samples (Table 9).

Table 9

Descriptive Statistics: Level of Importance of Technology Skills in Hiring

Question	Faculty			School Leaders		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD
35. Presentation Technology	19	3.89	.658	46	3.76	.848
36. Organizational Technology	19	3.42	1.017	46	3.46	.982
37. Collaboration and Communication Technology	19	3.21	.918	46	3.39	.856
38. Productivity Technology	19	3.11	.737	46	3.50	.810
39. Multimedia Technology	19	3.32	.820	46	3.30	.891
40. Critical Thinking Technology	19	3.63	1.065	46	3.74	.905
41. Reflection, Networking and Feedback Tech.	19	3.37	.895	46	3.43	.886

Continuing to analyze these data, a General Linear Model ANOVA was utilized, similar to the methods used in previous quantitative parts 2 and 3 to determine whether significant differences exist between the groups. No items held a low ρ-value ($\rho<.05$) indicating any significant difference between the samples, but the significance is debatable and conflicted by a low effect size as determined by the Partial Eta Squared =.001) and low power Observed Power on several items. (Table 10).

Table 10

GLM ANOVA Results: Level of Importance of Technology Skills in Hiring

	F	Sig	Partial Eta Squared	Observed Power[b]
35. Presentation Tech.	.378	.541	.006	.093
36. Organizational Tech.	.017	.896	.000	.052
37. Collaboration and Communication Tech.	.545	.451	.009	.116
38. Productivity Tech.	3.360	.072	.051	.438
39. Multimedia Tech.	.002	.962	.000	.050
40. Critical Thinking Tech.	.171	.681	.003	.069
41. Reflection, Feedback Tech.*	.075	.785	.001	.058

Computed using $\rho<.05$; * indicated significant differences

Again, it should be noted that due to the limited sample size, homogeneity of variance could not be established, and therefore the researcher will proceed with caution in interpreting these data. Due to the low power and effect sizes and lack of significant differences, the reliability if these data is in question, and will be further analyzed in the following discussion in Chapter 5 for any potential implications.

Qualitative Responses

The purpose for including this qualitative section was to cross-validate, add richness and depth, and to allow the participants an opportunity to elaborate on data derived from the prior quantitative sections. By allowing qualitative data, this project not only added to the strength of this study, but added some useful and unique insight into the mindsets and attitudes of participants in regards to technology concepts. When dealing with a survey-instrument that measures attitudes through self-identification of those attitudes, a mixed-method approach may allow a more robust understanding of those attitudes by measuring the group responses (quantitatively) as well as individual elaboration (qualitatively).

These qualitative data were collected alongside the quantitative data, as the latter portion in the same mixed-method instrument. The data from each sample group (Faculty and School Leaders) were analyzed independently of one another, and later compared for differences and similarities. All responses were repeatedly read question-by-question, analyzed independently, and were ultimately coded according to the content and context of their answers. This coding was then useful in comparing responses and determining the emerging themes and patterns from each group. Due to the amount of data and the nature of the questions, some or which allowed for more broad responses, many of the

emerging themes were more detailed, contained data that required reporting as sub-categorical information within the umbrella of the emerged theme. In addition, significant answers that demonstrated unique individual attitudes, insightful comments, or items of importance for this study were also reported.

Paper-Based or Electronic Portfolio Preference

Question 42 was the first of two questions that mixed both a nominal data selection with a qualitative short answer elaboration. When asked the question, "If given the option of receiving a paper-based portfolio or an electronic portfolio from a teacher candidate, which would you prefer and why?" participants responded by selecting either a paper-based or electronic portfolio preference, then provided responses as explanations for their reasoning. This method allowed for a more thorough breakdown of the data including the openness that participants expressed to receiving electronic data from teacher candidates, while also allowing them to voice their reasons for their selection. Data derived and analyzed were then compared between groups (Faculty and School Leaders), and then regrouped by those who selected a paper-based portfolio and those who selected an electronic portfolio. This process was important due to the smaller sample sizes of this study, and allowed the researcher to cross-validate the attitudes of each group and note if there were trends present within the reasons for these attitudes.

The descriptive statistics derived from both groups (Table 11) indicated that all Faculty (N=19) and School Leaders (N=46) participated in this particular question. Among the 19 Faculty participants, six (6) selected a preference of a paper-based portfolio and thirteen (13) selected a preference of an electronic portfolio preference.

Likewise, among the 46 School Leader participants, nine (9) selected a paper-based portfolio preference and thirty-seven (37) selected an electronic portfolio preference.

Table 11

Faculty and School Leaders Preference of Portfolio

	Faculty (*N*=19)	School Leaders (*N*=46)
Paper-Based Portfolio Preference	6	9
Electronic Portfolio Preference	13	37

Although both samples maintained a similar majority and minority, percentage-wise there were of some differences between the groups (Figure 7). Among the Faculty sample, 32% indicated a preference of a paper-based portfolio, while 68% selected an electronic version. In comparison, 20% of School Leaders indicated a preference in a paper-based version, and 80% selected an electronic portfolio. Although these differences appear within these data, the significance may be less clear due to the small sample size of Faculty.

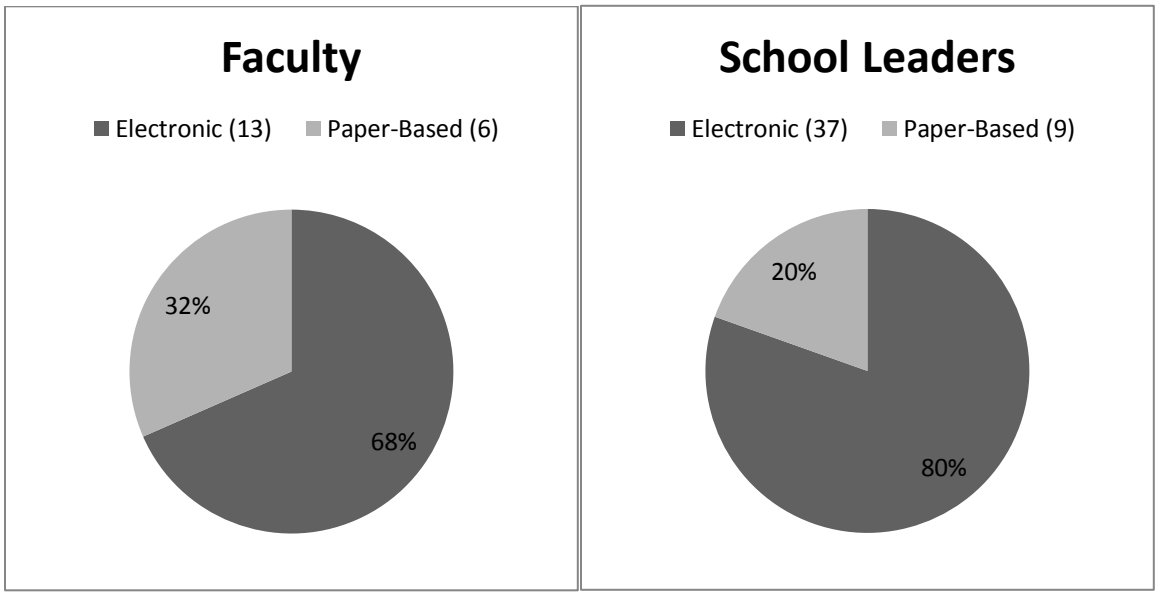

Figure 6. Faculty and School Leader Percentages by Type of Portfolio Preference

The big picture. Analysis of the data for question 42 encompassed four distinct dimensions, each based on the original groupings and secondly on participants' preference of portfolio type. Represented as a four component Venn diagram, several similarities and differences were apparent (Figure 8). Among these similarities, the theme of *Easier* emerged as the most prominent of all the themes and was present in both groups. However, the true differences between the groups were in the sub-categorical data that was derived from deeper analysis of the participants' responses.

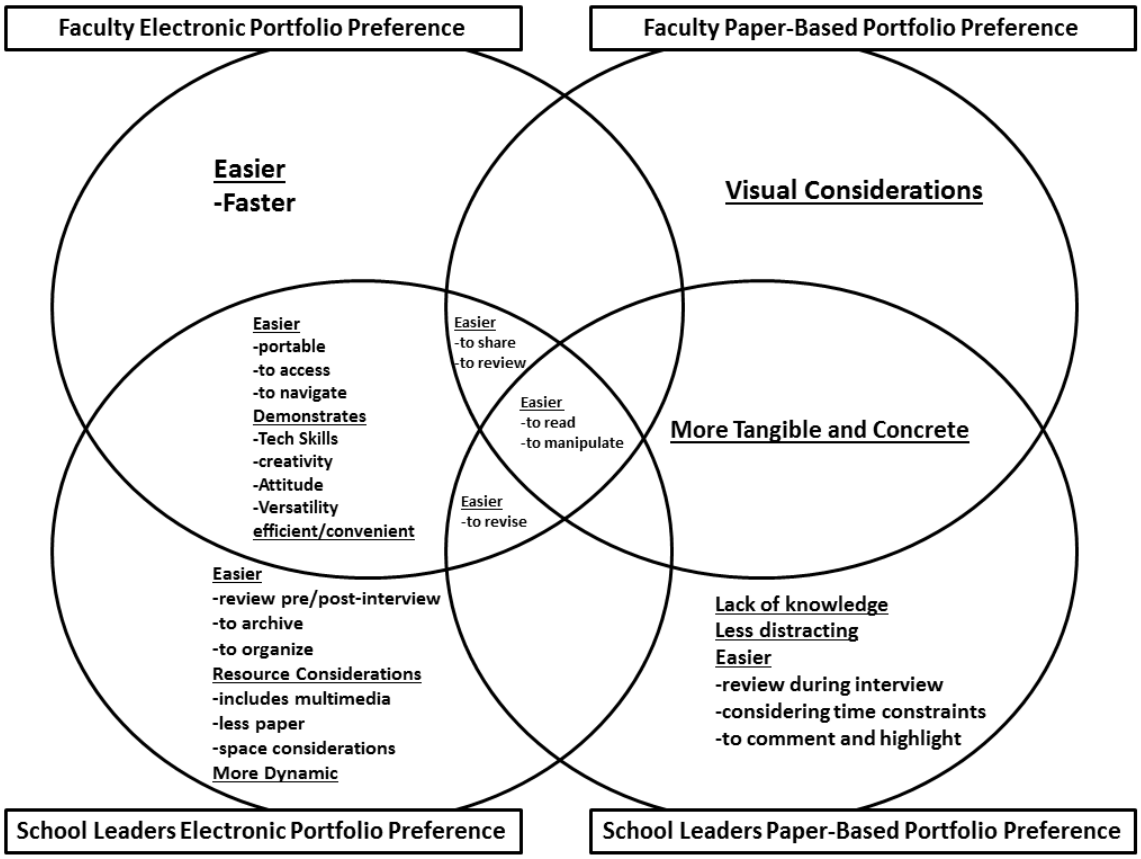

Figure 7. Question 42, Themes and Sub-Categorical Data by Group and Preference

Although this all-inclusive representation details the similarities and differences between the four groups, to understand the specific focuses, attitudes, and differences between these groups it is important to deconstruct the larger picture. Considering the

prevalent issues of sample size to this study, it is necessary to differentiate the lack of congruence in attitudes between those who preferred paper-based and those who preferred the electronic portfolio. In regrouping for analyses more accuracy is possible by identifying individual attitudes prior to guiding the discussion in one direction or another while not impacting the overall analysis.

Faculty and school leader comparisons. In this comparison, the focus is directly on the attitudes of the original groupings of Faculty and School Leaders. Represented as a Venn diagram (Figure 9), the comparison is projected through themes that emerged and specific sub-categorical data. Although the emerged themes are indications of similarities and differences, it is in this sub-categorical data that the differences between in attitudes is most notable and allows for the illumination of group perspectives.

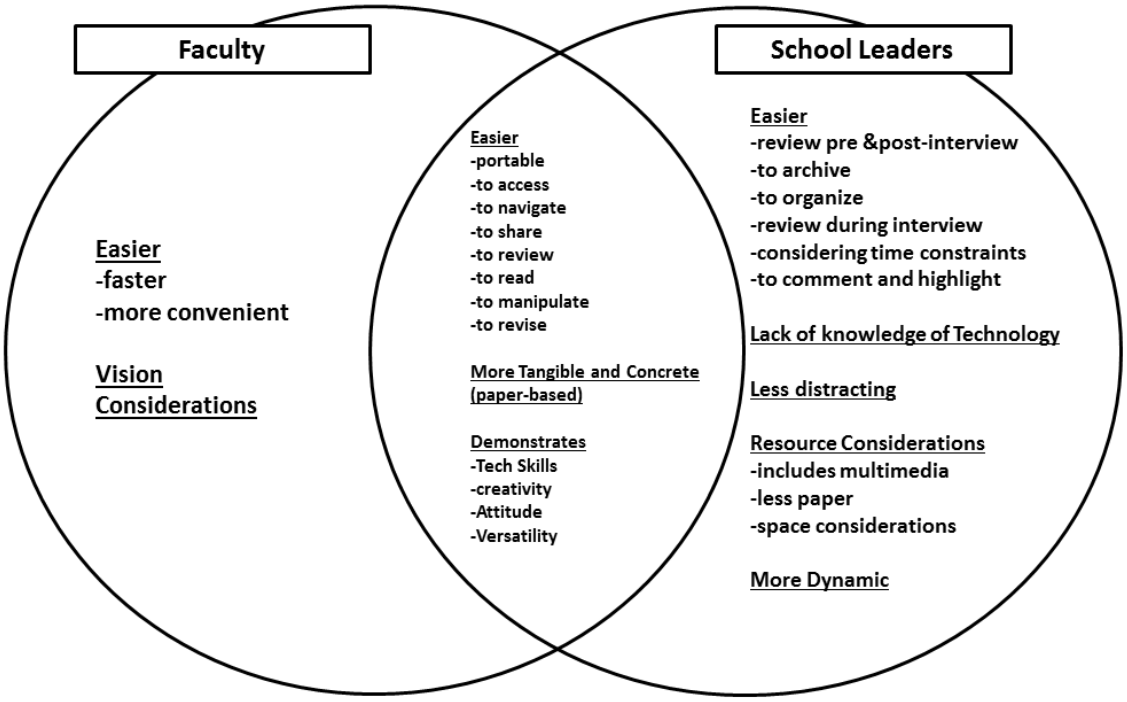

Figure 8. Question 42, Categorized by Groups (Faculty or School Leaders)

All participants of each group participated in this question (Table 12), and therefore Faculty included nineteen participants (*N*=19) and School Leaders included forty-six participants (*N*=46).

Table 12

Group Comparisons of Participants Regarding Portfolio Preference

Faculty	19
School Leaders	46

The analysis of attitudes was conducted by removing the data derived from the selection of paper-based or electronic preferences. This provided an opportunity to consider the largest range of attitudes for comparison, regardless of the reasons for their selection of a paper-based or electronic portfolio.

Similarities. Similarities fall into the intersection of Faculty and School Leaders and comprise the emerged themes of *Easier, More Tangible and Concrete* (from those who selected paper-based), and *Demonstrates* (from those who selected electronic). More specific data were included as sub-categories (Table 13) and indicated that there was a great amount of agreement among the more general attitudes within each group.

The theme of *Easier* was by far the most prominent theme that emerged during the analysis of data, reaffirming that if technology does not directly benefit the user, it is unlikely to be utilized. In addition, the emerged themes of *More Tangible and Concrete* and *Demonstrates* were specific only to participants who selected paper-based and electronic portfolios respectively, and therefore will be further discussed in greater detail in the subsequent analysis of data from the perspective of their preference.

Table 13

Similarities Between Groups Regarding Portfolio Preference

Emerged Theme *Sub-Categorical Data*
Easier
portable
to access
to navigate
to share
to review
to read
to manipulate
to revise
More Tangible and Concrete (paper-based)
Demonstrates (electronic)
technology skills
creativity
attitude
versatility

Differences. Although the emerged theme of *Easier* was shared between both groups, the sub-categorical data demonstrates various traits that are consistent with each group. Where Faculty participants relied heavily on more generalized responses concerning their selection of portfolio being faster and more convenient, School Leaders were far more specific.

Many School Leaders indicated that their reasons for selecting a specific type of portfolio was to review pre & post interview; to archive; to organize; to review during interview; to consider time constraints; and, to comment and highlight. This demonstrates that there may be specific job functions that influence their opinions and needs that faculty simply do not have in their professional lives, such as the physical act of interviewing teacher candidates and the need for efficiency. This was also evident in School Leaders indicating a need in the emerged theme of *Resources Considerations*,

such as physical space, a reduction in paper materials, and the inclusion of multimedia from teacher candidates who are interviewing for employment. Additional themes that emerged among School Leaders was the *Lack of Knowledge of Technology* which of course would have an effect on the individual's selection, and *Less Distracting* indicating that the dynamic of a portfolio may be lost in translation if it is overly technical or requires specific skills to view.

Table 14

Differences Between Groups Regarding Portfolio Preference

Faculty	School Leaders
Emerged Theme	*Emerged Theme*
Sub-Categorical Data	*Sub-Categorical Data*
Easier	Easier
Faster	to review pre & post interview
convenient	to archive
	to organize
	to review during interview
	considering time constraints
	to comment and highlight
	Resource Considerations
	includes multimedia
	less paper
	space considerations

Faculty held few differences from School Leaders, with the exception of their focus on speed and convenience. These general ideas with a lack of specificity may indicate a difference in the understanding of the culture outside the university setting, or perhaps caused by low sample sizes among the faculty.

Paper-Based and Electronic Portfolio Comparisons. Similar to the analysis of Faculty and School Leaders regarding their group attitudes towards the preference of paper-based or electronic portfolios, it was necessary to determine whether there were

prevalent attitudes and beliefs among participants that were driven by their preference of portfolio type and distorted the overall group perspectives. This comparison is imperative due to the small sample sizes of both groups, and to get an enhanced representation of the impact of participants' attitudes that reflect a tendency towards more, or less, open attitudes towards technology.

In this comparison, the participants were regrouped by their preference of portfolio type, and not by their original grouping (Table 15). Those from both groups who preferred a paper-based portfolio (*N*=15) were compared to those preferring an electronic portfolio (*N*=50)

Table 15

Paper Based to Electronic Portfolio Comparisons

Paper-Based Portfolio Preference	15
Electronic Portfolio Preference	50

Demonstrated again as a Venn diagram, the similarities and differences of the Faculty and School Leaders are more easily noted and emerged themes arrange somewhat differently when viewed side-by side (Figure 10). This projection of data is necessary to isolate the attitudes driving the participant to select the type of portfolio and to further explore the individual participant perspective that influences whether they are open towards or opposed to technology. Analyzing only the single comparison between the Faculty and School Leaders would lead to a basic understanding of the group norms, and potentially contribute assumptions to the original groups incorrectly. By regrouping and comparing these data again from a new perspective, more certainty can be added that the individual is being represented, as well as the whole group.

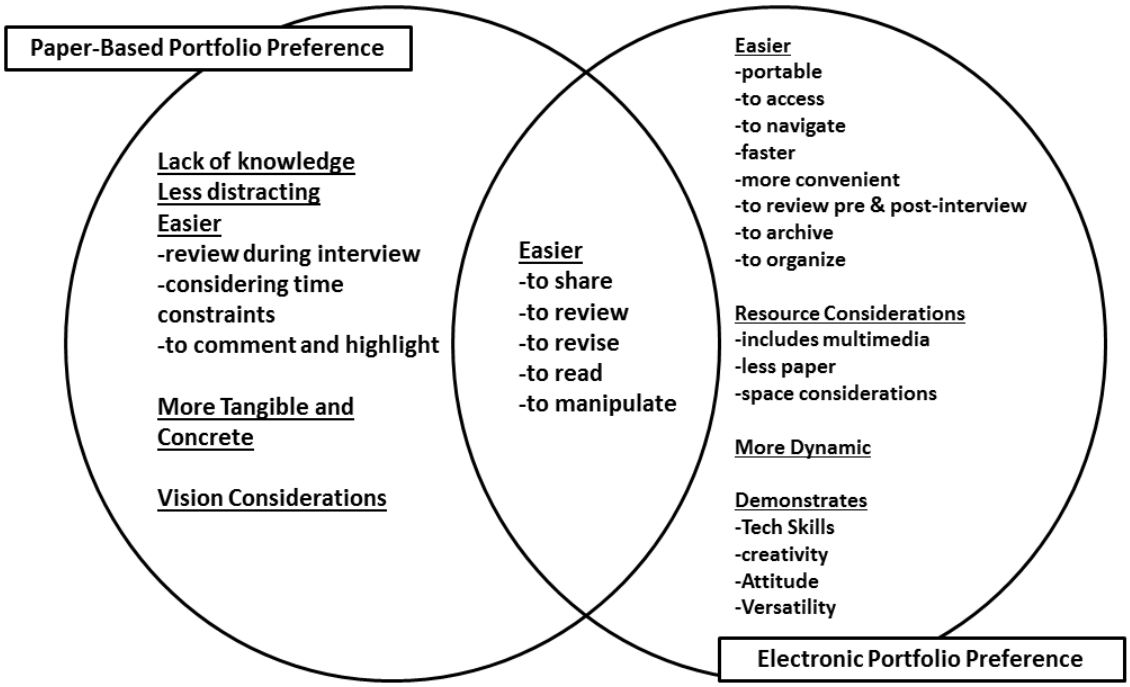

Figure 9. Question 43, Categorized by Portfolio Preference

Similarities. From this projection of data, and similar to the Faculty and School Leader comparison, the emerged theme of *Easier* continued to be the primary influence on attitudes towards those who preferred a paper-based or who preferred an electronic portfolio (Table 16). This adds evidence to the previous comparison that regardless of the professional role, an individual will or will not utilize technology due to their individual perception of how easy the technology is to utilize. Again, the sub-categories of sharing, reviewing, revising, reading, and manipulating were important aspects to both samples who selected electronic and paper-based portfolios, indicating that the opinion of *Easier* depends highly on the participant's technology skill level (some finding electronic easier, and others finding paper-based easier). Unlike the previous comparison, the emerged theme of *Easier* was the only theme shared between both groups.

Table 16

Similarities Among Paper-Based or Electronic Portfolio Preferences

Emerged Theme *Sub-categorical Data*
Easier
to share
to review
to revise
to read
to manipulate

Differences. The differences between the comparisons of the groups that selected either a paper-based or electronic portfolio further demonstrated how the role of perceived ease impacts attitudes towards technology utilization. Nevertheless, the sub-categorical data emphasizes the differences in attitudes towards technology and the individual perspectives at work (Table 17)

Among the main differences in the emerged theme of *Easier*, those who selected a paper-based portfolio indicated that it was *easier to review during an interview* and was *easier considering time constraints.* Although not vastly different from those who selected an electronic portfolio and indicated it was *easier to review pre and post interview*, it does shed light on an issue of technology that even slight differences in perspective may influence individual technology use.

Other differences regarding those who selected a paper-based portfolio was that it is more *Tangible and Concrete*, allowing participants to physically manipulate it. The indication of *Vision Considerations* was additionally an important perspective among those who might be hiring for specific positions that would require a paper-based portfolio, such as an art teaching position. These differences are important because they

do provide a unique insight into the attitudes of the participants regarding the specificity of technology utilization, and its limitations.

Table 17

Differences Between Paper-Based or Electronic Portfolio Preference

Paper-Based	Electronic
Emerged Theme	Emerged Theme
Sub-Categorical Data	Sub-Categorical Data
Easier	Easier
to review during interview considering time constraints	portable
	to access
	to navigate
	faster
	more convenient
	to review pre & post interview
	to archive
	to organize
More Tangible and Concrete Vision Considerations	More Dynamic
	Resource Considerations
	includes multimedia
	less paper
	space considerations
	Demonstrates
	technology skills
	creativity
	attitude
	versatility

Likewise, those who indicated a preference in an electronic portfolio generated several themes. Among these were *Resource Considerations* that included the need to conserve paper, use multimedia, and to consider the need for space. Additionally the theme of *More Dynamic* was mentioned repeatedly in regards to an electronic portfolio.

The most stark contrast between those who preferred electronic portfolios from those who preferred paper-based portfolios was the emerged theme of *Demonstration*, specifically the need to demonstrate technology skills, creativity, attitude towards

technology, and versatility. Only those who preferred an electronic portfolio included responses citing the need for a teacher candidate to demonstrate skills while seeking employment; while those who preferred paper-based portfolios were void in this theme. This may have negative implications for technology integration in the school, or for the teacher candidate seeking employment with an electronic portfolio, just as a candidate with a paper-based portfolio may find difficulty with School Leaders relying on more technology.

Hiring a Candidate with Limited Technology Skills

Question 43 was structured similar to Question 42, consisting of a two-part question that allowed a teacher to indicate yes or no followed by a short answer question to elaborate. The question "Would you recommend for hire a teacher candidate who had few or no technology skills, but otherwise demonstrated sound pedagogical and content area skills?" is constructed to have a more narrow focus than the previous question. The data were gathered from Faculty (*N*=19) and School Leaders (*N*=46) and all participants of this study responded to this question.

Twelve (12) faculty participants indicated they would hire a candidate with limited technology skills, as did 34 School Leaders. Likewise, six (6) Faculty indicated that they would not hire a candidate with limited technology skills in comparison to nine (9) School Leaders. Three (3) School Leaders and one (1) Faculty participant indicated they may hire a candidate with limited technology skills, depending on the specifics of the position itself (Table 18).

Table 18

Faculty and School Leaders Who Would or Would Not Hire

	Faculty (N-19)	School Leaders (N=46)
"Yes, I would hire…"	12	34
"No, I would not hire…"	6	9
"Maybe, depending on specifics"	1	3

Percentage-wise, the two groups appear similar with the same minority and majority selections, but it should be noted that due to small sample sizes there may be some distortion among the data (Figure 11).

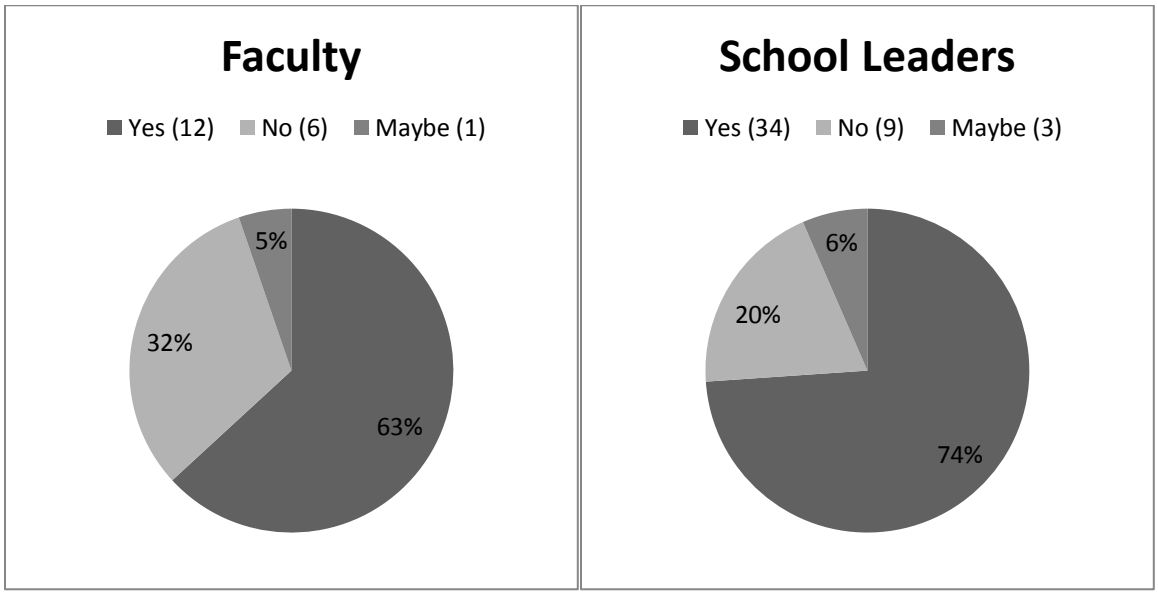

Figure 10 . Question 43, Percentages by Groups; Who Would vs. Would Not Hire

The big picture. The dimensions of this question are represented as a four component Venn diagram consisting of both Faculty and School Leaders in addition to whether they would, or would not, hire a teacher candidate with limited technology skills (Figure 12). This provides a more detailed of the data for analysis and assists the researcher in demonstrating the specific attitudes and beliefs that lead Faculty and School Leaders to be more open or closed to technology skills and integration. This four-component projection of data increases the ability to determine whether similarities and

differences between Facutly and School Leaders are cultural, job specific beliefs, or whether individual preferences or perspectives concerning technology promotes these. The responses provided by four (4) participants who stated Maybe as an answer choice are not represented on the Venn diagram, but will be discussed in detail later in this analysis.

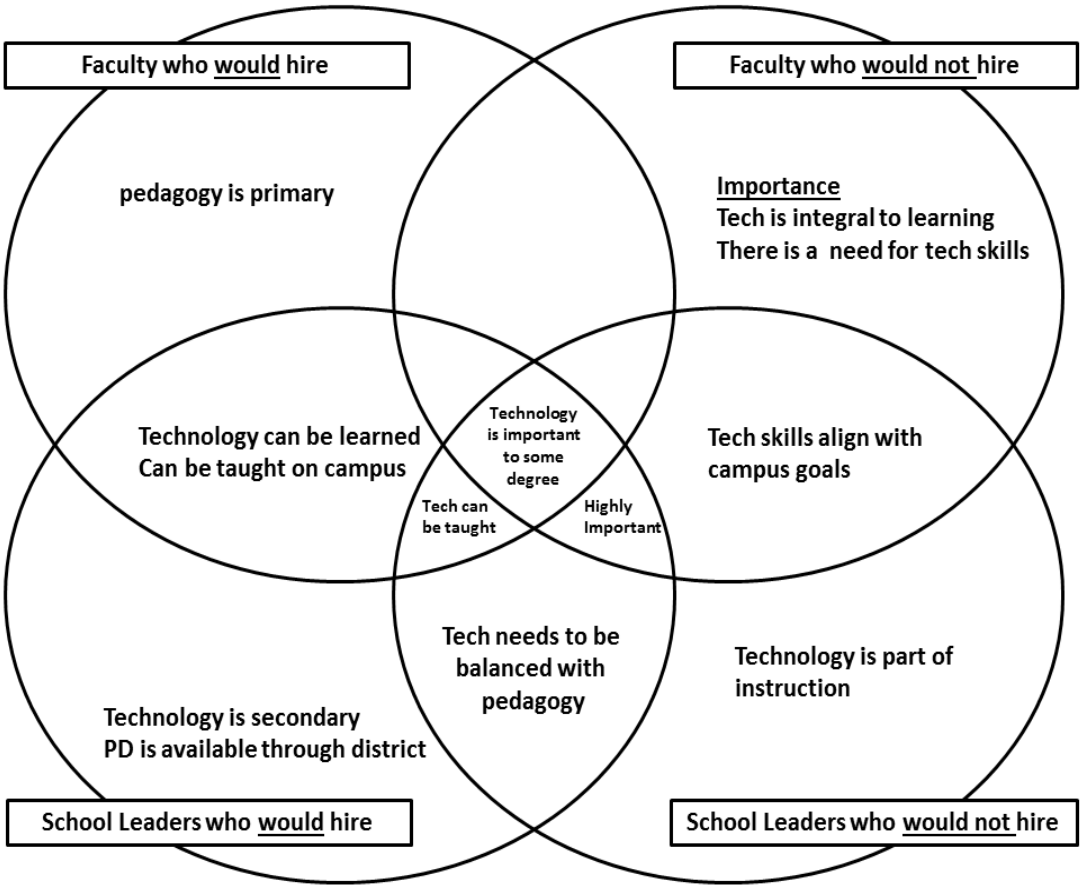

Figure 11. Question 43, Themes and Sub-Categorical Data by Group and Preference

Faculty and School Leader Comparisons. This comparison of perspectives will focus solely on the similarities and differences of Faculty and School Leaders regardless of their willingness to hire or not hire a candidate with limited technology skills. All Faculty (*N*=19) and School Leaders (*N*=46) took part in this question and provided responses (Table 19).

Table 19

Group Comparisons: Willingness to Hire With or Without Skills

Faculty	19
School Leaders	46

This Venn diagram projection of data grouped by Faculty and School Leaders demonstrates the spectrum of perspectives that each group cites as factors in whether or not they would hire a teacher candidate with limited technology skills (Figure 13).

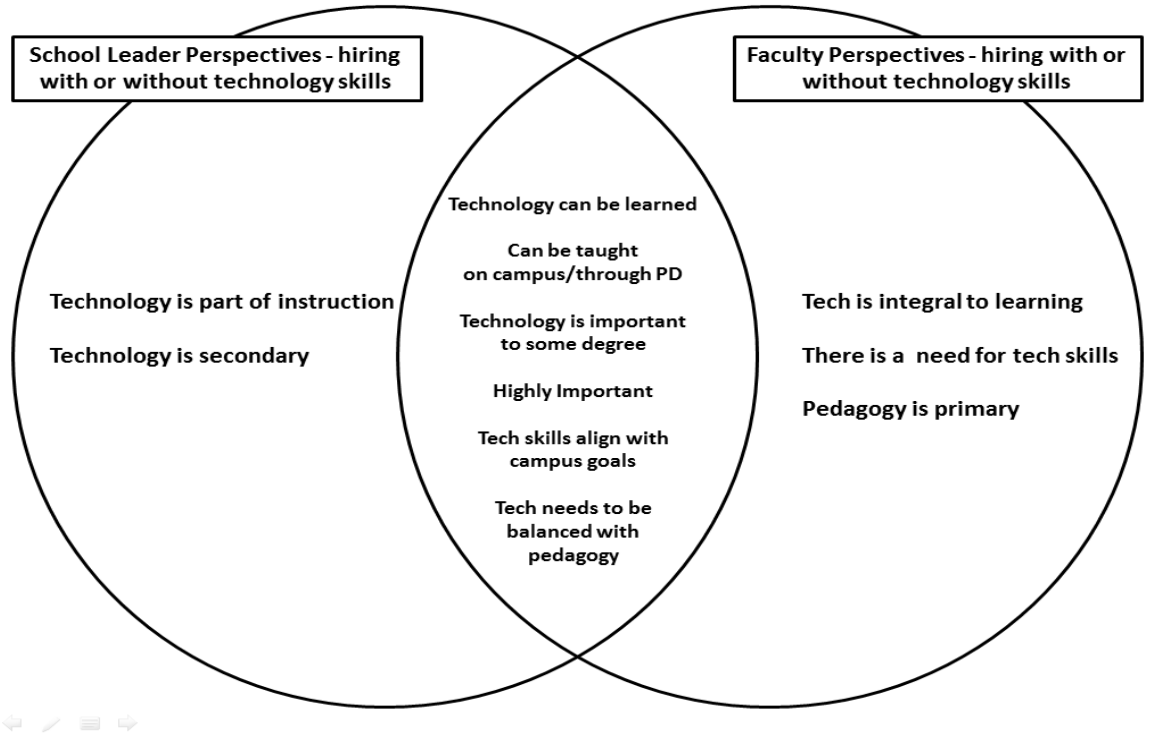

Figure 12. Question 43, Emerged Themes by Faculty and School Leader Groups

In this case, attitudes towards the importance of technology skills of teacher candidates are analyzed and compared between School Leaders and Faculty. These comparisons were made of the themes that emerged among and between each group. Due to the narrow focus of this question, there was very little sub-categorical data to report.

Similarities. Several significant similarities were noticeable when comparing the themes that emerged independently among the Faculty and School Leader samples.

Among these similarities was the theme cited most often, that *Technology can be Learned,* closely followed by the theme *Technology can the Taught.* These themes differ in the intent of the participants' statements, where *Technology can be Learned* directly places the responsibility to learn technology on the shoulders of the teacher candidate, while *Technology can be Taught* focuses more support for the teacher candidate through campus support or professional development provided by school or district leadership.

Additional themes regarding the perspective of importance were noted among both groups, ranging from *Technology is Somewhat Important* to *Technology is Highly Important*. No group indicated that technology was not important, but some participants from both groups did place the importance of *technology skills to be balanced with pedagogy* and the need for *Technology skills to be aligned with campus goals.* These similarities demonstrate a wide range of attitudes pertaining to the beliefs surrounding technology integration and skills.

Table 20

Similarities Between Groups: Hiring and Technology Skills

Emerged Theme *Sub-categorical data*
Technology can be learned
Technology can be taught
on campus
through professional development
Technology is somewhat important
Technology is highly important
Technology skills align with campus goals
Technology skills need to be balanced with pedagogy

Differences. School Leader perspectives on whether they individually would or would not hire a candidate with limited technology skills, differs from their Faculty

counterpart. Three themes emerged from the School Leader responses; *Technology is part of instruction, Technology is secondary,* and *Professional Development is available throughout the district.* These three themes demonstrate a range of perspectives from different individual School Leaders indicating that technology holds a degree of importance when hiring, and technology skills are an obtainable goal through training and development.

Analysis of Faculty also yielded three themes that emerged during the analysis; *Technology is integral to learning*, *Pedagogy is primary,* and *There is a need for technology skills.* Unlike the range of perspectives provided by School Leaders, Faculty tended to set the bar higher in their perspectives regarding the importance of technology skills when hiring a teacher candidate (Table 21).

Table 21

Differences Between Groups: Hiring and Technology Skills

Faculty	School Leaders
Emerged Themes	*Emerged Themes*
Technology is integral to learning	*Technology is part of instruction*
Pedagogy is primary	*Technology is secondary*
There is need for technology skills	*PD is available through the district*

Considering the themes that emerged between the two groups may shed light on the perceived importance of technology skills of teacher candidates. While School Leaders indicated at the highest portion of the spectrum of importance that *Technology is part of instruction*, Faculty responded with a higher commitment to technology, citing that *Technology is integral to learning*. These two themes may seem similar, but in the

essence and intent of the individual responses comprising these themes, Faculty tended to place a higher regard on technology skills in teacher candidates.

A second theme emerged in both groups that may seem similar, but is in reality a different perspective and importance level regarding technology skills among teacher candidates. While the School Leaders participants cited that *Technology was secondary*, individual Faculty perspectives cited that *Pedagogy is primary*. Further considering this difference between perspectives, when technology, or any innovation is considered secondary, much of the time it falls by the wayside or is considered a separate-discipline rather than something to integrate continually. In regards to the Faculty perspective, *Pedagogy is primary* actually falls into the TPACK theory, focusing on the integration of content and pedagogy, and supplemental technology to good practices comes last.

The third theme for both Faculty and School leaders also appears similar, but can be misleading. While School Leaders cited repeatedly that *Professional development is available through the district*, faculty cited that there is a *Need for technology skills*. Both of these themes emerged from multiple responses and consisted of many participants views. When considering the School Leader theme, *Professional Development is available through the district*, it indicates an attitude or belief that they as School Leaders can assist in supporting and training teacher candidates.

The theme that emerged among Faculty, *There is a need for technology skills*, relates to the School Leaders perspective, but is different in a contextual way. Whereas School Leaders are willing to assist and take some responsibility to support and train teacher candidates to enhance technology skills, Faculty tended to rest the responsibility of technology skills upon the shoulders of the teacher candidate.

Those who would hire and would not hire comparisons. This projection of data was designed to isolate certain attitudes, beliefs and opinions that were common between participants who stated they would hire a teacher candidate with limited technology skills, and compared them to the themes that emerged within the group that would not hire. Although the purpose of this study is to compare attitudinal data between Faculty and School Leaders, it was necessary to investigate the data from another perspective to ensure that the data were analyzed correctly and not being influenced by attitudes that had little to do with the job functions of Faculty or School Leaders. The participants who were regrouped by those who stated they would hire as opposed to those who stated they would not hire, forty-six (46) participants stated that they would hire a candidate with limited technology skills, while fifteen (15) stated they would not hire (Table 22). In addition, three School Leaders who participated in a paper-based instrument took the liberty to write-in a response of "Maybe", which will be discussed later in this analysis.

Table 22

Would and Would Not Hire Comparisons

"Yes, I would hire…"	46
"No, I would not hire…"	15
"Maybe, depending on specifics"	4

The following Venn diagram details the comparative data in the form of themes that emerged within each group, while the intersection represents the similarities between the two groups. Unlike the comparison of the Faculty and School Leaders diagram, where many of the emerged themes tended to be shared, it is important to note that by reorganizing the data into this perspective, there is slightly more difference between the groups than similarities (Figure 14).

These differences between the placement of these emerged themes from the perspective of those who would or would not hire demonstrates the different ranges of attitudes that occur within what was a holistic grouping of Faculty and School Leaders. With further analysis of this trend, it may become more evident that there is a wide spectrum of attitudes within each group that are individualistic perspectives based on preconceptions, prior experiences and knowledge, rather than a job-specific culture.

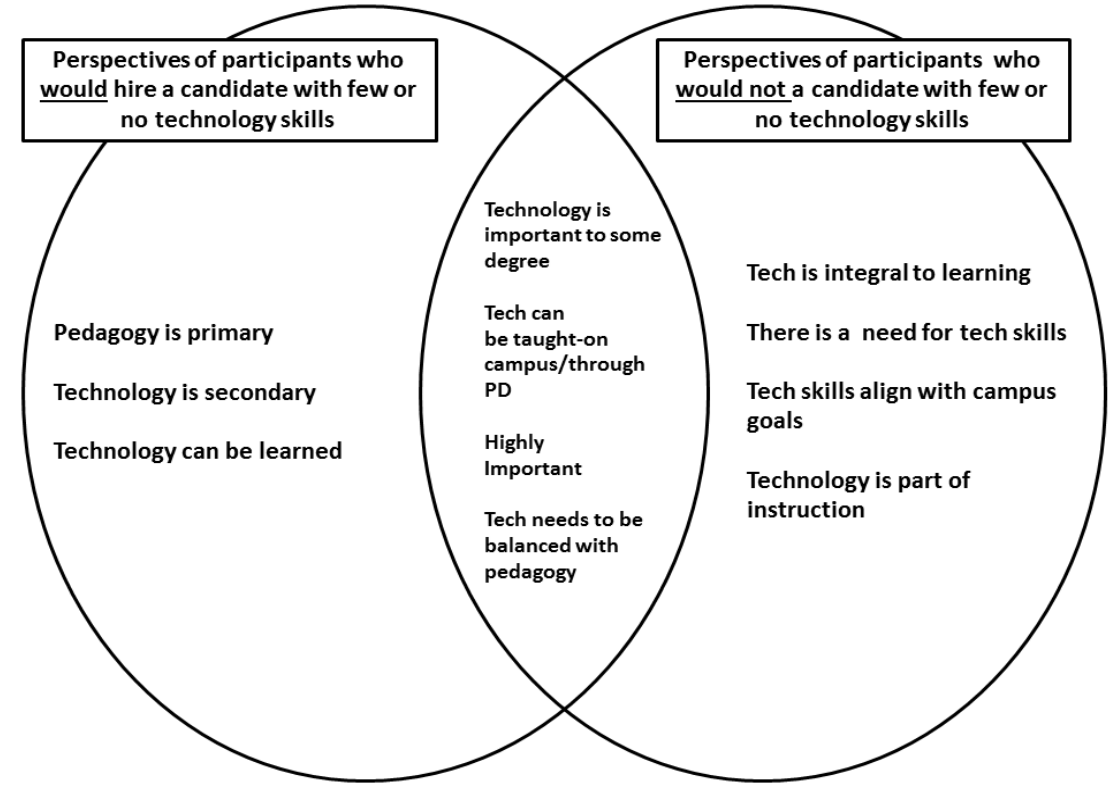

Figure 13. Question 43, Emerged Themes by Selection Would or Would Not Hire

Similarities. Some of the similarities mirror the previous Faculty and School Leader comparison, but differences were noticed within the distribution of the themes that emerged. This different perspective will allow for further exploration into the similarities of Faculty and School Leaders by isolating their perspective attitudes regarding technology, and attempting to find the contributing factors for these attitudes.

In this comparison, *Technology can be learned* was a shared theme between those who would and those who would not hire a teacher candidate with limited tech skills, which was not indicated as a similar theme in the Faculty and School Leader comparison. This is in addition to other shared themes of *Technology can be taught on campus* or *through professional development*, *Technology is somewhat important*, *Technology is highly important* and *Technology needs to be balanced with pedagogy* (Table 23).

Table 23

Similarities: Would and Would Not Hire Based on Technology Skills

Emerged Themes
Technology can be taught on campus
Technology can be taught through professional development
Technology is somewhat important
Technology is highly important
Technology needs to be balanced with pedagogy

Differences. The differences between these two groups, those who would and those who would not hire a candidate with limited technology skills was far more apparent in this perspective of the data (Table 24). Similar to the differences found in the previous Faculty and School Leader comparison, the intent and context of the vocabulary that the participants used in their responses demonstrate a range of beliefs and attitudes that differ between the groups.

Table 24

Differences Between Those That Would and Would Not Hire

Would Hire	Would Not Hire
Emerged Themes	*Emerged Themes*
Pedagogy is primary	Technology is integral to learning
Technology is secondary	There is a need for technology skills
Technology can be learned	Tech skills align with campus goals
	Technology is part of instruction

Among those who stated that they would hire, the themes that emerged were *Pedagogy is primary*, *Technology is secondary*, and *Technology can be learned*. This is in contrast to those who would not hire, with emerged themes of *Technology is integral to learning*, *There is a need for technology skills*, *technology skills align with campus goals*, and *Technology is part of instruction*. In order to understand the significance of the differences, further analysis of the context was necessary.

Those who cited they would hire a candidate with limited technology skills indicated that *Pedagogy is primary* and *Technology is secondary*. The opposing group who cited they would not hire held the themes that *Technology is integral to learning* and *There is need for technology skills*. The difference is noticeable in the level of importance that each group place on the technology skills of teacher candidates. It is apparent that those who would hire with limited technology skills found these skills less important than those who would not hire. In addition, the theme of *Technology can be learned* may lead the attitudes, beliefs, and opinions of those who would hire a candidate with limited technology skills, that technology skills may or may not be important, but can be learned after hiring,

The themes that emerged, *Technology skills align with campus goals* and *Technology is part of instruction,* aligns with the theories regarding technology integration in schools. This was validated by the fact that those who stated they would not hire a candidate with limited skills responded in this way. These participants, whether Faculty or School Leaders, demonstrated higher perceived importance of technology, which may indicate a potential exposure to the ideas behind integration methods such as ICT-TPACK.

Preferred Technology Skills of Future Teacher Candidates

Question 44 was a much simpler, single short-answer question without a leading statistical response prompt. This method allowed participants to be more open and freely elaborate on the question, "What type of technology training or skillsets would you like to see more of in future teacher candidates seeking employment (specific skills, abilities, or attitudes)?" and allowed for a broad set of responses. This question was designed with Faculty and School Leaders in mind to reflect and discuss the specific skills and training that participants feel is most important to them in when seeking teacher candidates. The broad approach to this question did allow a wider range of participant responses, and therefore provided a richer and deeper analysis of the individual participants and on the groups. All participants took part in this question, with nineteen Faculty (N=19) and forty-six (N=46) participants providing responses (Table 25).

Table 25

Group Reflections on Teacher Candidate Skills

Faculty	*N*=19
School Leaders	*N*=46

Faculty and school leader comparisons. The responses of participants were collected and retained within their original groupings of Faculty and School Leaders, and the themes that emerged and their corresponding sub-categorical data was compared between the groups. Similarities and differences became apparent, especially in the more detailed data derived from within the sub-categorical data. These similarities and differences were then projected as a two component Venn diagram to represent these themes and data for comparison (Figure 15).

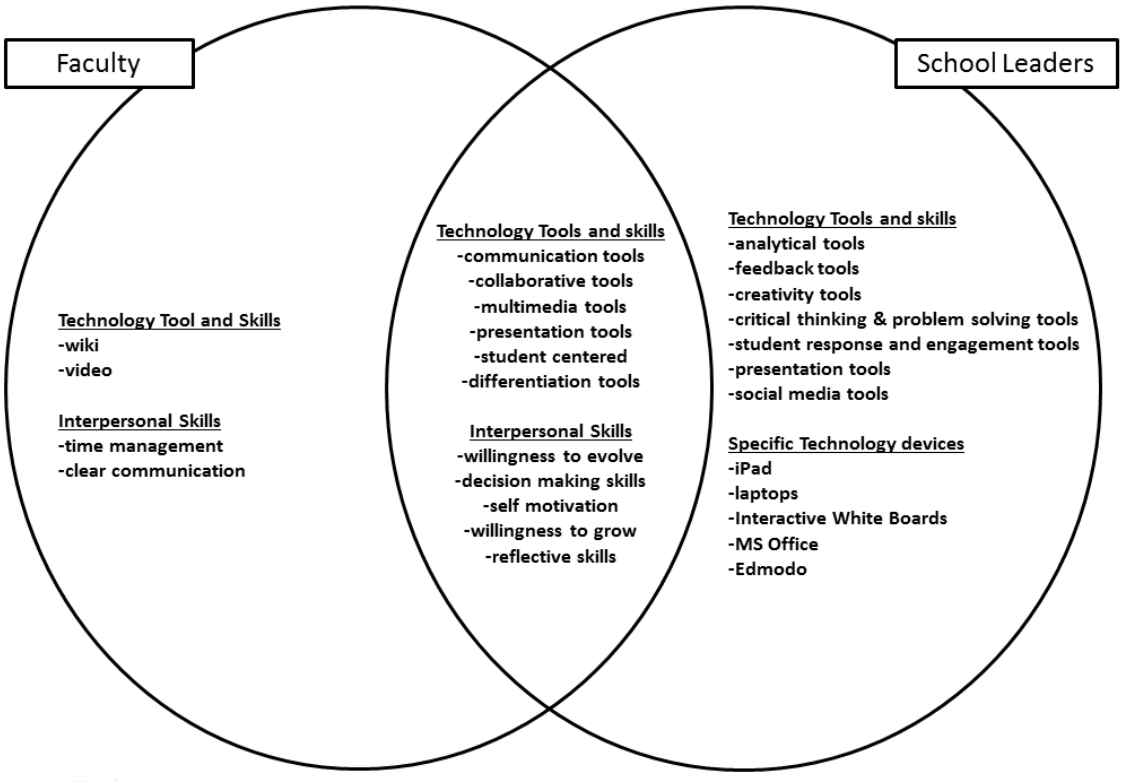

Figure 14. Question 44, Comparisons by Group Regarding Skills Wanted

Unlike the previous question that generated a more narrow set of responses, the broadness of this question did not necessarily have an influence on the number of themes that emerged, but led to a large amount of sub-categorical data within the theme that implied significant differences between the groups. Themes that emerged were *Technology Tools* (specific applications and software or online content), *Specific Technology Devices* (hardware and physical items to manipulate), and *Interpersonal Skills* (intrinsic traits and skills).

Similarities. Aspects of two themes emerged commonly between Faculty and School Leaders. Although the bulk of these themes were shared, some aspects of them were not, and therefore it was the sub-categories that detailed the true differences and similarities within this model.

Within the emerged theme of *Technology Tools*, which consisted of generalized types of technology available to use in the classroom, six sub-categories were repeated among the participants from both groups (Table 26). These were the perceived needs of communication tools, collaboration tools, multimedia tools, presentation tools, student-centered tools, and differentiation tools.

Table 26

Similarities Between Group Reflections on Teacher Candidate Skills

Emerged Themes *Sub-categorical data*
Technology Tools and Skills
communication tools
collaborative tools
multimedia tools
presentation tools
student-centered tools
differentiation tools
Interpersonal Skills
willingness to evolve (with technology skills)
decision making skills
self-motivation
willingness to grow
reflective skills

Both Faculty and School Leaders independently generated a theme of *Interpersonal Skills*. Most, but not all, of the sub-categorical data were shared between the two groups, indicating shared importance to both groups. Among them were *willingness to evolve (with technology), decision making skills, self-motivation, willingness to grow (professionally),* and *reflective skills*. Each of these sub-categories and the *Interpersonal Skills* theme that emerged seem to indicate a deeper understanding of the skills needed in Teacher Candidates seeking employment and a knowledge of the types of basic skills needed prior to promoting technology integration.

Differences. Again, significant differences emerged between the groups. Faculty tended to be more general in their responses and held numerous perspectives of importance that were thematically similar to those of School Leaders, but sub-categorical data shifted attention away from similarities. Within the repeated *Technology Skills and Tools* theme that emerged among the Faculty, the skills of using Wiki's and video as instructional resources and tools was discussed and demonstrated a specific knowledge of Wiki's, perhaps utilized at the college level. Wiki's, which are collaborative and communicative tools, were mentioned repeatedly by name and therefore were listed as differences, but within this group essentially could be considered a similarity because School Leaders called for collaborative and communication tools. Video was also mentioned by multiple Faculty participants, specifically in the context of digital stories (Table 27). More intriguing was the theme of *Interpersonal Skills*, which was an unexpected theme from the researcher's point-of-view, but indicated that both groups considered the basis for the applied skill of the technology tools, rather than the tool itself. Among these *Interpersonal Skills* was time management and clear communication, an essential skill for continued growth and professional development. In addition, both groups emphasize a need among teacher candidates to be able to manage change effectively through interpersonal skills, which is absolutely necessary for TPACK integration to take place.

Table 27

Differences Between Group Reflections on Teacher Candidate Skills

Faculty	School Leaders
Emerged Themes *sub-categorical data*	*Emerged Themes* *sub-categorical data*
Technology Tools and Skills	Technology Tools and Skills

wiki's	analytical tools
video tools	feedback tools
	creativity tools
	critical thinking and problems solving
	student response and engagement tools
	presentation tools
	social media tools
Interpersonal Skills	Specific Technology Devices
time management	iPad
clear communication	laptops
	interactive white boards
	MS Office
	Edmodo

School Leaders were far more specific in their perspectives on the importance on skills they wanted in teacher candidates. Two related themes emerged within this group, *Technology Skills and Tools,* which was similar to the theme that emerged with Faculty but with different sub-categorical data. Additionally, the theme of *Specific Technology Devices,* consisted of the types (both general and specific) of technology hardware School Leaders are interested in when seeking Teacher Candidates. This perspective demonstrated that the many School Leaders may have a relatively coherent plan or basic vision for technology integration in their respective schools.

Among School Leaders, the theme of *Technology Tools and Skills* ranked high among participants. Sub-categorical data repeated several types of important tools, such as analytical tools, feedback tools, creativity tools, critical thinking and problem solving tools, student response and engagement tools, social media tools, and given the most attention were presentation tools. This broad selection of various tools demonstrated the individuality among School Leaders, and potentially emphasized the needs for specific schools and environments that are not universal throughout all schools or districts.

Building on the prior theme, School Leaders went deeper to also identify *Specific Technology Devices* they want teacher candidates to have the ability to use and integrate in the practice of teaching. Specific sub-categories consisted of iPad's, laptops, MS Office, Edmodo, and most consistently, interactive white boards. The importance of interactive white boards, according to several participant responses, was due to the district and school having the appropriate equipment already, compounded by a lack of training or will of current staff to consistently use them.

According to the data, Faculty tended to focus more on the teacher candidate's ability to acquire skills and utilize them in generalized, broad applications, while School Leaders were more focused on specific applications and skills that are immediate needs, according to their perspectives. This is likely due to job-specific attitudes and the professional experiences of School Leaders, while Faculty may be relying on theory and a basic understanding of the complexity of the position of School Leader.

Barriers to Technology Integration

This question was developed to gather data from both Faculty and School Leaders on actual and perceived barriers to technology integration in the classroom. Unlike the previous qualitative questions, this question focused attention away from the teacher candidate and onto the perceived abilities to integrate technology in schools. This was a seemingly narrowly focused and direct question, but in actuality allowed participants a wide range of perspectives from the somewhat obvious prohibitive external barriers, to social and psychological internal barriers, to technology integration. All participants responded to this question. Faculty yielded nineteen responses (N=19) and School Leaders yielded forty six responses (N=46) (Table 28)

Table 28

Group Reflections on Barriers to Technology Integration

Faculty	19
School Leaders	46

Faculty and school leader comparisons. Responses from both groups were gathered and analyzed separately for similarities in context and content and the themes were allowed to emerge within the group. Within these themes, a substantial amount of sub-categorical data that indicated intent was also collected and reported, which added a depth and an added perspective of the attitudes and beliefs of the participants and the culture of the group. After a complete analysis, data relating to the emerged themes and the sub-categorical data were compared for similarities and differences between and within the groups (Figure 16).

As the analysis of participant responses was being completed, two distinct themes emerged: *Internal Barriers to Integration* and *External Barriers to Integration*. These themes were allowed to emerge, but may as well have been predetermined as all barriers to technology integration fall into the themes of internal or external barriers. More importantly, to observe the mindset, attitudes, and beliefs regarding these barriers, there is a need to delve deeper into the sub-categorical data that was provided in the participants' responses.

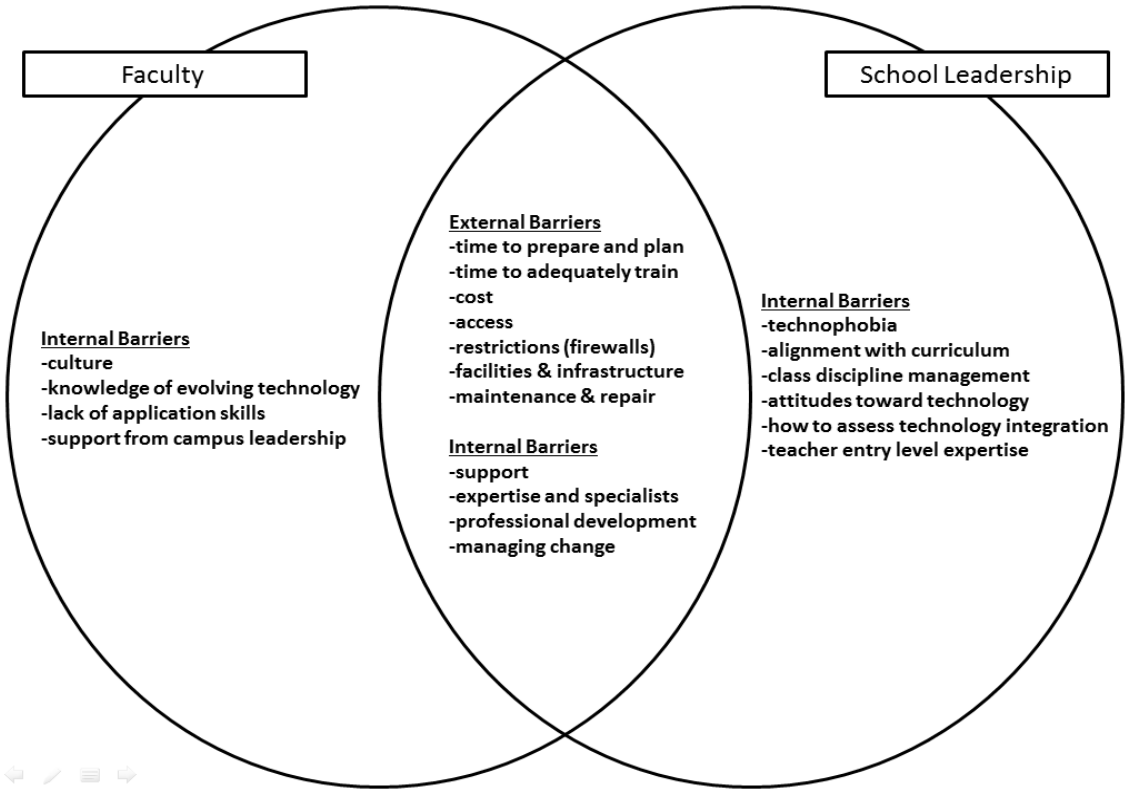

Figure 15. Question 45, Group Comparisons of Barriers to Technology Integration

Similarities. Both of the emerged themes of External Barriers and Internal Barriers were shared between the independent groups of Faculty and School Leaders. In this case, the true analysis of data to determine the attitudes and beliefs is found in the richer, more specific sub-categorical data. The theme of *External Barriers to Technology Integration* was somewhat predictable due to the absoluteness of these barriers, which prevent technology integration from taking place. Internal Barriers to Technology Integration tended to be more generalized and broad, and to encompass more unique perspectives of Faculty and School Leaders.

External Barriers only existed as a theme that was shared between both groups, consisting of the sub-categorical data of time to prepare and plan, time to adequately train, cost, access, restrictions such as firewalls or internet filters, facilities and

infrastructure, and maintenance and repair (Table 29). All data were cited repeatedly within both groups, but the most frequent response was that of cost. *External Barriers* are generally barriers that tend to exist within the experiences of both Faculty and School Leaders and are some of the more obvious and physical barriers to technology integration.

Table 29

Similarities Among Group Reflections on Barriers to Technology

Emerged Theme *sub-categorical data*
External Barriers
time to prepare and plan
time to adequately train
cost
access
restrictions (firewalls, filters, etc.)
facilities and infrastructure
maintenance and repair
Internal Barriers
support
expertise and specialists
professional development
managing change

The theme of Internal Barriers incorporated a broader spectrum that was noted in both similarities and differences, with the placement determined by the sub-categorical data. Among these similarities were support, expertise and specialists (to provide training and support), professional development, and managing change. Sub-categorical data did indicate among both Faculty and School Leaders that the importance of change management is essential for technology integration to take place.

Differences. One common theme emerged between both of the groups, *Internal Barriers to Technology Integration*, but the differences become apparent in the context

and intent of sub-categorical data of the participants' responses(Table 30). For Faculty, these sub-categorical differences range from generalized responses suggesting teacher candidate traits to support from campus leadership, while School Leaders focused on more specific teacher traits such as curriculum and management. Although these differences may seem somewhat insignificant, these two groups indicate a slight difference in attitudes and experiences regarding technology usage in the classroom.

Table 30

Differences Between Reflections on Barriers to Technology

Faculty	School Leaders
Emerged Theme *sub-categorical data*	*Emerged Theme* *sub-categorical Data*
Internal Barriers to Technology Usage	Internal Barriers to Technology Usage
culture and willingness	technophobia
knowledge of evolving technology	alignment with curriculum
lack of application skills	class discipline management
support from campus leadership	attitudes towards technology
	how to assess technology integration
	teacher entry level expertise

Faculty cited four distinct sub-categories of *Internal Barriers* that they perceived as substantial barriers to the use of instructional technology in the classroom. Among these are culture and willingness (to use technology), knowledge of evolving technology, lack of application skills, and support from campus leadership. The first three of these barriers focused responsibility on the teacher candidate, while the fourth focuses attention towards the support system provided by campus leadership.

School Leaders cited a slightly wider range and more specific issues regarding the *Internal Barriers*, which consisted of technophobia, alignment with curriculum, class discipline management, attitudes towards technology, how to assess technology

integration, and an issue with teacher entry level expertise. Technophobia is the fear of technology and can be a substantial issue in technology integration, but is unlike the later barrier, attitudes towards technology, which implies a potential lack of interest rather than fear of technology.

Other issues cited by School Leaders are of higher urgency if technology integration and usage in the classroom is to take place. Among these are how to assess technology integration, class discipline management, and alignment with curriculum. These statements are different in context, but intertwined within the aspect of solid curriculum development. Without curriculum development that consistently includes the integration of technology within lessons, technology integration will be lost at the earliest stages of planning.

Faculty repeatedly described a barrier as being a lack of support from campus leadership (the School Leaders themselves), while the School Leaders cited a lack in their teachers entry level technology expertise. This aspect of assigning responsibility does emphasizes the importance of this study, to ensure that Faculty who train teachers and School Leaders who support them have an open dialogue and can see eye-to-eye on the issues that are prevalent concerning technology training and later integration.

The Future Role of Instructional Technology

The final qualitative question was developed to gain an understanding of the attitudes and perspectives of Faculty and School Leaders regarding continued integration of instructional technology over time. This question, "*What do you believe is the role of instructional technology in teaching and learning in future classrooms five years from now?"* required the participants to consider and share their perspectives regarding what

role technology will have in the near future, and also delves into the personal beliefs regarding technology integration of the participants. Among the respondents, one of the nineteen Faculty participants did not respond (*N*=18) and two School Leaders did not participate (*N*=44) (Table 31).

Table 31

Group Reflections on the Future of Technology in the Classroom

Faculty	18
School Leaders	44

Faculty and School Leader Comparisons. This question was designed to allow a wide range of potential responses, depending on how specific and detailed that the participants' responses were. After a final analysis, data were grouped by themes that emerged, along with more specific sub-categorical data, and compared for similarities and differences.

Although responses varied slightly, both fell into three themes that emerged from the data; *Continued Integration*, *Importance Level*, and *Technology will be used for-*. The theme *Continued Integration* involved how the role of technology will continue in the classroom, through software, usage, and devices. *Importance Level* consisted of participant statements indicating the level of interest or importance of instructional technology in the classroom, which ranged from no change to extreme change in the way we teach. Lastly, the theme *Technology will be used for-* indicated perspectives of potential strategies and delivery of content through technology. A Venn diagram projection (Figure 17) of these themes and their corresponding sub-categorical data was

created and as in previous questions the details regarding specifics of attitudes of the individual groups tended to rest in the more specific, detailed sub-categorical data

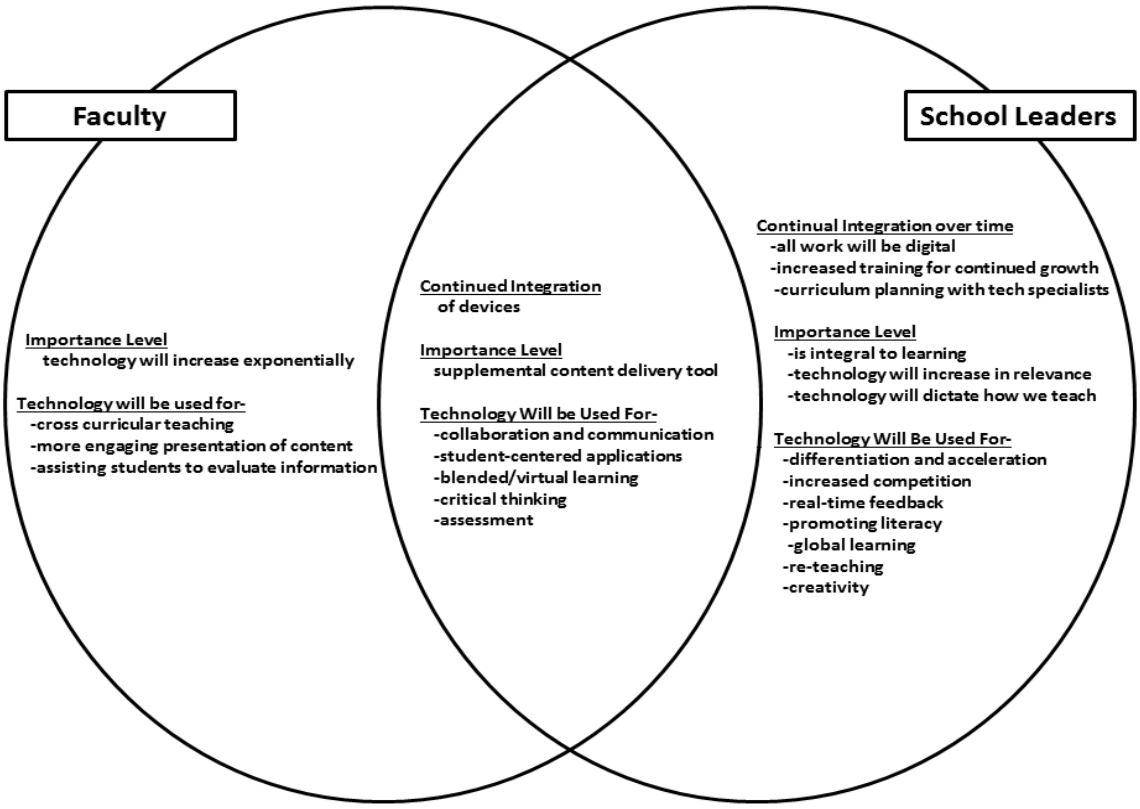

Figure 16. Question 46, Comparisons of Perspectives on Future Uses of Technology

Similarities. Among the three themes that emerged from this question, components of each were shared in the form of sub-categorical data. This may indicate that the perspective attitudes and beliefs of both Faculty and School Leaders toward instructional technology in the classroom may be fairly similar. Within the shared theme of *Continued Integration,* several participants from each group indicated that there will be a continued integration of devices available to teachers within five years. These devices were not specifically mentioned, but borrowing data from the previous question regarding devices, School Leaders seem to have specific ideas in mind. Blending this data with the shared theme of *Importance Level,* where technology was viewed as a

supplemental content delivery tool, developed an image of perspectives where an increase of specific devices utilized to support content delivery is prevalent (Table 32).

Table 32

Similarities of Perspectives on the Future of Technology in the Classrooms

Emerged Themes
Sub-categorical data
Continued Integration
Continued Integration of Devices
Importance Level
technology as a supplemental content delivery tool
Technology will be used for
collaboration and communication
student-centered applications
blended/virtual learning
critical thinking tools
assessment

The largest theme that emerged from an analysis of responses was that of *Technology will be used for-*. A large set of sub-categorical data was shared between the two groups, and consisted of; collaboration and communication, student-centered applications, blended/virtual learning, critical thinking tools, and assessment. This may indicate that many of the Faculty and School Leader perspectives regarding technology in the classroom lean towards a constructivist plan using technology as a supplemental tool for continued ICT-TPACK technology integration. Although considering the small sample size, this does indicate an openness and acceptance of potential planning for continued growth of technology integration by a considerable portion of the participants from Faculty and School Leaders).

Differences. Several differences emerged within the themes and sub-categorical data of each theme. Although there were several similarities between the groups, Faculty

and School Leaders did yield differences in the context of their sub-categorical data. It is important to note that although some differences did emerge, the smaller number of participants from the Faculty group likely had an effect on the amount of data reported.

Within both groups the theme of *Continued Integration* emerged, and because of the lack of sub-categorical data from the Faculty, it was considered a similarity rather than a difference. In the elaboration of School Leaders, differences from Faculty did emerge, including; all work will be digital, increased training for growth, and increased curriculum planning with technology specialists. The School Leaders indicated a need for increased curriculum planning with technologists demonstrated a deeper understanding of the issues concerning technology integration, where there needs to be consistency and inclusion of technology into a rigorous curriculum for integration to occur (Table 33).

Table 33

Differences between Groups on the Future of Technology in the Classroom

Emerged Theme *Sub-categorical data*	*Emerged Theme* *Sub-categorical data*
	Continued Integration all work will be digital increased training for growth curriculum planning with technology specialists
Importance Level of technology technology will increase exponentially	Importance Level of technology is integral to learning will increase in relevance will dictate how we teach
Technology will be used for- cross-curricular teaching more engaging presentation student evaluation of information	Technology will be used for- differentiation and acceleration increased competition real-time feedback promoting literacy global learning re-teaching creativity

Within the theme of *Importance Level of Technology*, Faculty indicated that technology will increase exponentially, while School Leaders cited collectively a wider range of perspectives, from technology is integral to learning, will increase in relevance, and that technology will dictate how we teach. When considering both the similarities and differences, School Leaders and Faculty groups have indicated through their responses that they hold a belief that technology will increase in importance.

The emerged theme, *Technology will be used for-* indicated the perceptions of both groups, not only about technology integration, but about the direction of technology usage in the classroom. There were generalized responses among Faculty who cited from numerous participants that technology will lead to more cross-curricular teaching, more engaging presentation, and more student evaluation of information. Again, School Leaders were more specific in their responses, including differentiation and acceleration, increased competition, real-time feedback, promoting literacy, global learning, re-teaching, and creativity.

Summary of Chapter

This chapter reported results of the quantitative and qualitative data gathered and analyzed within two distinct groups, Faculty and School Leaders. The purpose was, as specifically as possible, to determine the attitudes and beliefs of each group and compare their perspectives for similarities and differences regarding the role of technology skills and the importance of technology integration. While the quantitative data gave a general feel for the data and demonstrated group attitudes of the participants collectively, the qualitative section gave added depth and richness by allowing individuals to elaborate.

Group themes emerged from this elaboration, as well as more specific sub-categorical data that gave further insight into the attitudes of the participants.

When using small sample sizes the potential for error increases, therefore the use of this mixed-method model was effective in cross-validating components of this study. This cross-validation in many cases confirmed the findings, with unique individual insights and quotes that add further insight or lead to intriguing questions will be discussed further in Chapter 5.

Chapter V:

Discussion

The purpose of this study was to investigate the similarities and differences in attitudes, beliefs, and the levels of importance that participants from both groups, Faculty and School Leaders, hold towards technology skills of teacher candidates and concerning technology integration (ICT-TPACK) in the classroom. Data were collected, repeatedly read, and analyzed for themes that emerged, along with more detailed and specific sub-categorical data. Once findings were evident, comparisons were made between the groups and differences and similarities became apparent. In this study, the motive was to determine these similarities and differences to provide a clearer vision of the perspectives of the groups and to determine whether the Faculty and School Leaders see eye-to-eye on the training of teacher candidates and the future of technology integration in the classroom.

This chapter will provide a discussion of the related cross-validation of quantitative and qualitative data, limitations of this study, recommendations for further research, and a brief summary of this study.

Restatement of the Research Questions

During the development of this study, two questions emerged as the primary focus. In order to maintain the integrity of this study, the data collected were analyzed with the two following questions in mind, providing a narrower spectrum of the analysis. Although other questions did arise throughout the analysis of these data, they were not included in the scope of this study but are discussed in detail as recommendations for

continued research and as implications of this study. The two research questions that guided this study were;

- What are the similarities and differences between College of Education Faculty and School Leaders' perspectives regarding the importance of technology skills of teacher candidates?
- What are the similarities and differences between College of Education Faculty and School Leader perspectives regarding the importance of continued technology integration in schools?

Overview of Discussion Chapter

This discussion section will describe in greater detail the additional comparison of both quantitative and qualitative data as a cross-validation measure, and a discussion of the implications of this study. Part 2, 3, and 4 of the survey were designed to measure and ultimately allow comparison of data between Faculty and School Leaders, however qualitative questions were added in a mixed-method approach to cross-validate and add a richness and depth to these data.

Quantitative questions (Part 2-4) additionally corresponded to a qualitative question found in Part 5. When analyzed together, the qualitative questions added a great amount of detail to the data by providing an option for elaboration and allowing unique individual attitudes to arise that may have been lost in a quantitative only study. These cross-validations are detailed in the following sections, which include *Technology Readiness* which compares Part 2 to Question 43; *Demonstration of Skills* comparing Part 3 to Question 42; and *Perceived Needs of Technology Skills* comparing data from Part 4 and Question 44.

During the continued analysis of the data, a trend did emerge that warranted further research. The examination of responses from qualitative questions 43) "Would you hire a candidate with limited technology skills" and 45) "What are the barriers to technology integration?" demonstrated a conflict among individuals that required further investigation and which is reported later in this chapter.

Technology Readiness

Part 2 asked participants to rate the importance of specific items as indicators of readiness that the participants would seek in teacher candidates who are applying for positions as teachers. Fourteen individual items were presented with a ratings scale of 1 (No Importance) to 5 (High Importance). Responses were then analyzed through SPSS software for descriptive statistics and through a General Linear Model ANOVA to find whether any significant differences emerged between Faculty and School Leader Responses.

Significant differences between Faculty and School Leaders were found in their answers to the following question: 4) Experience with specific programs in the district; 5) University supervisor evaluation; 7) Recommendation from university faculty; 8) Graduation with honors or other awards; 9) Grade point average; 12) Involvement in professional organizations; and 13) Institution where student was certified. These differences seem to favor one group over the other, demonstrating differences of opinion when it comes to interests that are related to the Faculty beliefs, School Leader beliefs, or simply as attitudes of individuals who bring to the table their own perspectives and beliefs and influenced the data due to the small sample size.

One of the similarities between the of Faculty and School Leaders were that they did not show any significant differences in their perspectives on question 14) Familiarity or skills with technology. This stand-alone, quantitative datum provided little direction other than the fact that both groups had similar attitudes, whether positive or negative. But, when cross-examined with the related qualitative question, richer and deeper detail was apparent. Statistical analysis found similarities and differences between the groups, but comparing the results to Question 43, "Would you recommend for hire a teacher candidate who had few or no technology skills, but otherwise demonstrated sound pedagogical and content area skills," we can further investigate the similar attitudes regarding technology and the level of importance of specific skills from the perspective of the Faculty or School Leaders.

Differences were discovered in the attitudes within groups (Faculty and School Leaders), where only approximately one-third of participants stated that they would be willing to hire a teacher candidate with limited technology skills. This seems to verify that there are similarities in the attitudes and beliefs of each group, but delving into the elaboration of the qualitative answers, many participants do not rate technology high upon their wants and needs. One School Leader stated, "Tech skills are always secondary and can be learned!" while another stated that "Technology skills can be learned. The pedagogy comes first." Likewise a Faculty participant mirrored this sentiment with the response, "Technology is not the important factor," while another stated, "Strong, sound pedagogy is at the heart of a good teacher. Technology is icing."

As demonstrated from the review of literature, some may view technology as a splinter discipline or a stand-alone skill, and participants may hold little interest in

technology integration into the classroom (Pierson & Thompson, 2005). Or, perhaps it is closer to the perceived level of importance that the role of technology had within the ICT-TPACK structure as a supplementary tool (Koehler & Mirsha, 2008; Graham, 2011). From these data alone, it is difficult to determine the levels of importance the individuals held for technology or the reasoning for those levels. However, it does indicate that one of the core attitudes is the belief that technology holds some level of importance, albeit secondary, after content and pedagogy.

On the contrary, those who stated that they would not hire a teacher candidate with limited technology skills were the minority, but their responses were much more integration-centered and included statements indicating a need for technology skills. One Faculty participant stated, "It would be a disservice to the children to have a teacher that isn't technologically capable," and a School Leader similarly emphasized "Technology is part of instruction. They should not be considered 'sound' without using technology to deliver content area instruction." Another School Leader added a deeper evaluation of a candidate with limited technology skills;

> "If the candidate was a product of the teacher education program, that candidate should have some technology skills. Having few to no technology skills is an indication to me that the candidate is either refusing to grow in this area of professional practice or has otherwise severe deficits in this area."

If nothing else, data regarding attitudes of technology skills among Faculty and School Leaders indicated a wide range of attitudes and beliefs from the perspective of those who would, and those who would not hire. Again, the main motivator for differences between the groups was the level of perceived importance of technology skills among participants (Bai & Ertmer, 2008). Obviously, those who cited that they

would not hire without technology skills perceived a much higher importance that those who would hire with limited skills.

Additionally, those what would not hire a candidate with limited technology skills held perspectives that were more student–centered while those who would hire were clearly focused on more teacher-centered development. This trend demonstrates how individual beliefs and attitudes play a major role not only in ICT-TPACK integration, but also in the complex dynamic regarding where the problems with ICT-TPACK originate: with the leadership, the teacher, or the student.

Considering the quantitative and qualitative data together, the conclusion can be drawn that there are very few straightforward group perspectives or attitudes regarding the level of importance of technology skills. The attitudes regarding certain skills were noted as representing a fairly broad spectrum of individually perceived importance, rather than a job-specific culture or group-think mentality. There were qualities and interests that emerged due to job-specific details, such as general similarities within educational culture that may affect ICT-TPACK integration. Whether Faculty or School Leaders actively promote skills seems to depend on their individual interests, beliefs, and attitudes as the data suggest (Bai & Ertmer, 2008; Pajares, 1992).

Demonstration of Skills

Part 3 was intended to find similarities and differences between group perspectives regarding the importance of a teacher candidate's ability to demonstrate skills through evidence, examples, and samples when applying for a teaching position. Nineteen items were presented with the rating scale of 1 (No Importance) to 5 (Highest Importance). An analysis of descriptive statistics and a General Linear Model ANOVA

were again generated using SPSS software, to determine what significant differences emerged between the groups.

Once analysis was complete, it was apparent that no significant differences emerged between the Faculty and School Leaders. Initially, questions arose concerning the reliability of these data and whether there may have been errors in the analysis, which drove the researcher further to confirm this finding. In doing so, two separate correlations for Part 2 were generated using SPSS statistical software, one for Faculty and another for School Leaders. Those data were then compared side-by-side. These correlations did coincide accurately with one another with very similar outcomes, helping to confirm the original findings.

To gain insight, the theme of demonstration of skills was compared to the qualitative question 42, "If given the option of receiving a paper-based portfolio or an electronic portfolio from a teacher candidate, which would you prefer?" In this case, the majority of participants selected the option of an electronic portfolio over the paper-based portfolio, with faculty at 68% and School Leaders at 80%. Overall, 77% of all participants preferred an electronic portfolio.

Although those who selected electronic portfolios were the majority, 23% selected a paper-based for various reasons, mainly because they found it *Easier*. This was an important trend that carried into the theme of *Demonstrating Skills*, which was ultimately a priority among those who selected electronic portfolios. However, it was non- existent as a theme among those who selected paper-based. The theme of *Easier* as it relates to technology certainly implies that the more difficult a task may seem, or the lower level of individual confidence perceived about the task, self-efficacy may suffer.

Self-efficacy, whether positive or negative, is considered a predictor of whether technology will be utilized by the participant (Sang, Valcke, Van Braak, & Tondeur, 2009).

Unlike those who selected paper-based portfolios, there were many participants who found electronic portfolios more useful as a way to *Demonstrate Skills*, reinforcing the drive to use technology. While the theme of *Easier* drove individuals to select a specific type of portfolio based on their perspective ease, the need for teacher candidates to *Demonstrate Skills* focused some participants' attention towards the electronic portfolio. The need for teacher candidates to *Demonstrate Skills* tended to influence participant responses towards the selection of an electronic portfolio, and appears in some cases to be equal to or to outweigh the theme of *Ease* as a primary influencer in their selection.

Several Faculty who selected an electronic portfolio emphasized a relationship between *Ease* of use and *Demonstrating Skills* with responses such as, it "demonstrates evidence of technology competence," "Ease in presentation, versatility, creativity, portability," and "Easier to manage, distribute, update, incorporate multimedia." School Leaders identified the importance of demonstrating skills with more specific information, such as "(electronic portfolios are) my accepted medium. If I only receive paper then my expectation would be for that teacher to kill trees by making copies for the students," "It demonstrates creativity and professional use of technology," and "[electronic portfolios] displays the teacher's ability to use technology & could potentially teach others & students." Most poetically, one School Leader added, "Paper = boring, Electronic = interactive." Each of these statements indicate two interrelated functions, for teacher

candidates to present evidence of teaching and technology skills, and for School Leaders to be open to view the digital information to make a sound decision in hiring with the idea of ICT-TPACK integration (Baran, Chuang, & Thompson, 2011).

These results also indicate a relationship between the perspective of technology being too difficult to be practical or useful, and therefore interfering with the abilities of School Leaders to select candidates while considering the visual evidence of examples from digital multimedia from an electronic portfolio. Further, this indicates a deeper relationship between the technological-knowledge levels of School Leaders on the impact of effective ICT-TPACK integration within the schools (Dawson & Rakes, 2003). Regardless of teacher candidate technology skills, ICT-TPACK integration will likely suffer under leadership that does not focus attention on evidence of technology skills when hiring, ultimately creating an unlikely scenario for effective technology integration.

This lack of demonstration may also have implications for Faculty as well. As discussed thoroughly in the review of literature, in order for true integration to take place it should be modeled by knowledgeable faculty during the teacher training cycle. It is in this basic act that teacher candidates will begin to consider and reflect on the importance and uses of technology in their future classrooms (Adamy & Boulmetis, 2005; Baran, Chuang, & Thompson, 2011; Pope, Hare, & Howard, 2002; Sergiovanni, 2001).

The mere fact that some Faculty selected a paper-based portfolio due to the fact it was easier to use may indicate a larger resistance to technology integration in general, such as in this response “I believe it is easier to assess a candidate when you have concrete, tangible evidence in a portfolio. I feel like you get a better sense of the candidate.” This sense of tangibility and concreteness was a theme that emerged within

both groups and demonstrated how the act of change is a matter of perspective. A paper-based portfolio may be less physical and take up less space, but the digital data are as tangible as a paper version, if not more so considering the increased ability to add dynamic multimedia content. This perspective is likely due to the quick evolution from paper to digital media, and unless an individual is willing to change, the possibility of accepting technological innovation is severely decreased, barring some outside pressure or encouragement to be more accepting of technology advances (Dawson & Rakes, 2003).

When evaluating the similarities between and among groups, it does provide a positive outlook, specifically when considering that the types of skills wanted in teacher candidates were quantitatively similar to one another. This similarity may provide the foundation for continued development, training, and goal setting on common wants and needs from those in both university Faculty and School Leadership settings.

Perceived Needs of Technology Skills

Part 4 asked participants to rate general types of technology skills that they considered important when hiring a teacher candidate. Seven skills were presented with a rating scale of 1 (No Importance) to 5 (High Importance). The only potential difference reported was that of Reflection, Networking and Feedback technology, but with a low effect size and observed power, this result may not be entirely accurate. This may be due to low sample sizes, or perhaps due to the overly generalized technology themes listed that distracted or confused participants and had an effect on their overall responses. Nevertheless, other aspects of this question may have demonstrated similarities in attitudes and perspectives between Faculty and School Leaders in presentation,

organizational, collaboration and communication, productivity, multimedia, and critical thinking technologies. This similarity may provide a broad base for Faculty to continue to develop these skills, while School Leaders may wish to consider the immediate needs for their schools, as well as long-term planning. Faculty may also consider training teacher candidates in a broad manner with multiple skillsets and familiarities rather than focusing on a narrow perspective, therefore providing a wider range of skills sought by School Leaders,.

Further emphasized in the qualitative component of Question 44: "What type of technology training or skillsets would you like to see more of in future teacher candidates seeking employment (specific skills, abilities, or attitudes)?" the elaboration of Faculty tended to indicate very broad and generalized types of technologies, while School Leaders were very specific in their responses. School Leaders undoubtedly have experience in school settings and know the limitations of their individual campuses, financial implications, and abilities of their current staff. This knowledge would cause them to be more detailed, specific, and knowledgeable of what technologies should potentially be integrated within a current campus plan or curriculum. Technology applications should be student-centered as well, focusing energy and resources on what is most applicable (Koehler & Mishra, 2005; Yee, 2000).

Several School Leaders responded according to this student-centered perspective, citing the need for, "Multimedia skills in developing robust, dynamic technology rich lessons," and "Web 2.0 tools. I would like the teacher to not only use these tools themselves to create lessons but allow students to use and create with these tools." This demonstrates that a portion of School Leader participants are focusing on the long-term,

student-centered technology integration. These skills and tools also tended to relate to hardware devices, such as iPads, laptops, interactive white boards, or specific software that the individual schools may have already invested money towards, therefore leading the case for specific technologies. Other statements added elaboration to related issues, including interpersonal skills, such as "Attitudes-an individual can learn specific skills especially if it will make their jobs easier; however, acquiring a new attitude is less likely to occur," which again emphasizes how attitudes drive actions (Bai & Ertmer, 2008).

A student-centered and meaningful approach to technology integration and skills poses a complex paradigm for Faculty. When training teacher candidates who will ultimately graduate and disperse to different schools, different school districts, and sometimes different states, each with a wide spectrum of wants and needs for teacher candidates. Therefore, how should technology training take place in teacher training? It is evident through research that the one-shot technology training course is not as effective as complete. Instead, Teacher Candidates should be immersed into various technology applications through the infusion of technology into the core courses through faculty modeling (Adamy & Boulmetis, 2005; Baran, Chuang, & Thompson, 2011; Hill, 1999; Pope, Hare, & Howard, 2002; Sergiovanni, 2001).and reflection (Dewey, 1933; McCabe, Wideman, & Winter, 2009; Richards, et al., 2008; Yost, Sentner, & Folrenza-Bailey, 2000).

Infusion of technology into the program may provide an effective way to strengthen pedagogical and content area skills among teacher candidates to improve instruction while supplementing with a strong but broad technology core among the teacher candidates. This was noted in the following Faculty responses, "Ease of use in all

types so that it is the first choice of teachers and it is not a struggle that adds more of a burden to already overwhelmed teachers." Another Faculty participant cited, "Use technology to enhance instruction rather than just have 'electronic worksheets' or presentation software, and deeper understanding of using technology as a method of instruction." Most importantly, and not understated, one Faculty member summed up the importance of ever changing technology as, "How to keep up!"

As stated in the previous section, the idea of ease should be a priority to enhance the attitudes, and promote positive beliefs among teacher candidates and ultimately School Leaders as well. Any ICT-TPACK integration should ultimately include strong pedagogy and content area knowledge (PCK), and followed with meaningful and useful technology to supplement and enhance instruction in an ICT-TPACK framework (Pierson M. , 2001; Shulman, 1986).

Realization of Expectations

As specific data were analyzed, it became apparent that there was an intriguing pattern emerging within both groups. Of the total participants of this study (*N*=65), forty-five participants stated in question 42 that they would hire a teacher candidate with limited technology skills. Within this group of forty-five (45) participants, that consisted of thirteen (13) Faculty and thirty-two (32) School Leaders. To the researcher, this finding seemed rather strange, since on the previous question concerning the participants' preference of paper-based or electronic portfolios, both groups favored electronic and technology-driven portfolios. In this case there seemed to be the opposite interest in technology.

The total participants who stated that they would hire a candidate with limited technology skills had themes emerge of *Pedagogy was Primary*, *Technology can be Learned* and *Technology can be Taught*. These data were then compared to Question 45, concerning the participants' perception of barriers to the effective use of technology in the classroom. Of the forty-five (45) participants who would hire, sixteen (16) directly stated that they would hire a teacher candidate with limited technology skills because they could train them at the campus level or through professional development.

During further analysis, these same sixteen participants cited seriously prohibitive external barriers that contradicted their stated abilities to train and support the teacher candidate, such as a lack of expertise to train, cost, access, ability, infrastructure, and time (Table 34). Some of the individual statements were:

Table 34

Conflicts Between Statements: Would Hire and With Extensive Barriers

Would hire with limited skills because -	Barriers
"With support teachers can learn technology skills,"	"Lack of Technology-Lack of training time."
"There is always training and workshops,"	"Lack of training."
"He/She could be trained to use the technology required for the job,"	"lack of teacher training and a lack of willingness to learn on the part of teachers"

This poses a serious question concerning the attitudes and beliefs of both Faculty and School Leaders, who on one hand directly state that the technology can the learned (by the teacher) or taught (by the campus, district, or through professional development), then later cite prohibitive external barriers or excessive internal barriers to make teaching

and learning of technology difficult, if not impossible (Bai & Ertmer, 2008; Ertmer P. , 1999) (Figure 18).

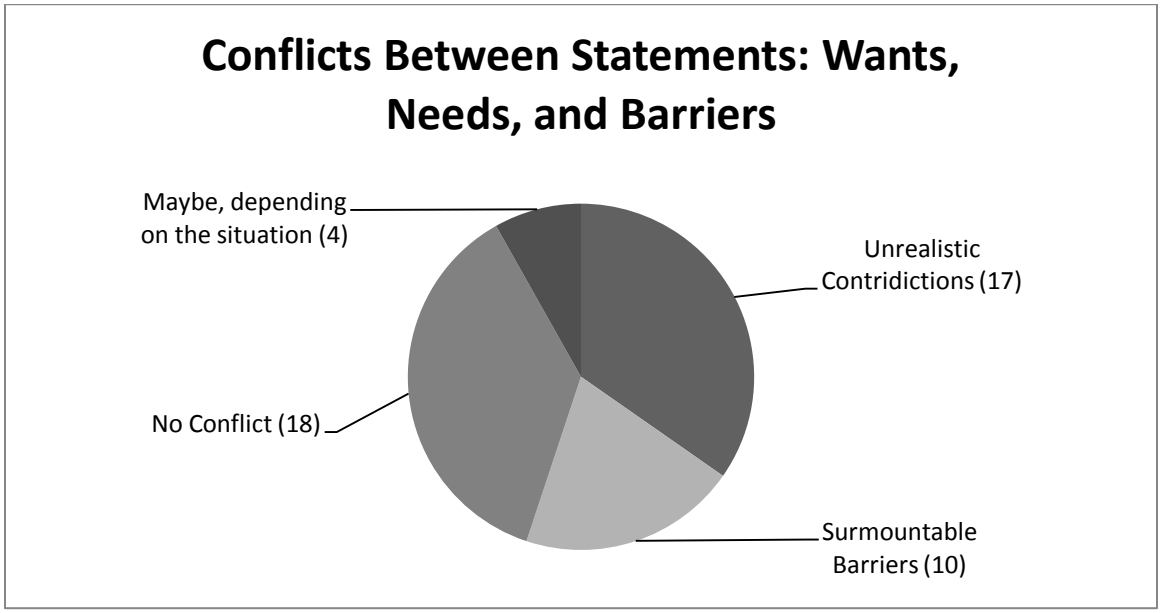

Figure 17. Conflicts Between Statements; Wants, Needs, and Barriers

Additionally, ten (10) participants stated they could train orteachers could learn after employment, but stated a range of difficult but surmountable barriers (Table 35).

Table 35

Conflicts Between Statements: Surmountable But Difficult Barriers.

Would Hire with limited skills, but -	Barriers
"I can provide teacher with training to increase her technology skills,"	"the rigor of curriculum does not allow technology to be used as much as I would like to see it, "
"We can teach the technology if the pedagogy is sound and they have a willingness to learn,"	"teachers need to see technology as a way to tap student creativity and collaboration while not consuming too much time."
"Teachers can be taught!"	"Fear of not being able to learn new technologies. Age of teachers may be a factor; the more "seasoned" may be fearful."
"Only if he/she had a few. I would not recommend a candidate with no tech skills"	"Undergraduate programs do not focus enough on tech applications.

These internal barriers tended to be more complex in nature though, such as; teacher sentiment, attitudes, and technophobia, which all take valuable time and energy to overcome. Some statements included:

These types of barriers had little to do with the technology itself, but are social and cultural norms within a school that acted as distractors from ICT-TPACK integration, including the individual and autonomous nature of teaching (Mehlinger & Powers, 2002). It is also necessary to consider that these ten participants were all School Leaders, who responded throughout this study with specifics rather than generalizations or broad foci. Therefore, it may be that these statements are specific to the actual experiences of School Leaders in their current positions and encompass a real-world view of the issues that plague their attempts for ICT-TPACK integration rather than their impromptu opinions on the subject. Nevertheless, the question of why they would select to hire a candidate with limited technology skills under the auspice that they will be able to train is difficult to answer.

Among two groups of participants who demonstrated unrealistic contradictions or those who stated difficult but surmountable barriers all gave responses that were in direct conflict with one another, or at least damaging to their original statement. The reasoning for these responses may lie far beyond the scope of this study, but it may stem from a misunderstanding of the technology itself or a low perception of importance or resistance towards the usage of technology in the classroom (Wilmore & Betz, 2000).

The remaining eighteen (18) participants cited responses that were complimentary to one another, without conflicts. However an additional set of attitudes emerged. These

participants either stated that they only perceived insignificant barriers, or had a very low opinion of technology in the classroom (Table 36).

Table 36

No Conflicts Between Statements But Indications of Low Importance

Would hire with limited skills, but-	Barriers stated
"A teacher with sound instructional methods can have a greater impact on student achievement."	"I've observed lessons in classrooms that incorporated technology, but did not enhance instruction/ the lesson."
"It is extremely easy for an intelligent person to acquire technology skills."	"Technology for technology's sake is common."
"Tech skills are always secondary! & can be learned!"	"Lack of focus!"

Throughout the course of this study, participants indicated that technology had some degree of importance, but some individual participants ranked it lower than their others. Therefore, it should not be considered that these participants are against technology integration, but may just hold a lower value in comparison to other aspects, such as content and pedagogical standards. Regardless of the intent, preconceptions, or misconceptions, they are correct in their regards that technology is supplementary to a strong pedagogy or content area expertise (Graham, 2011; Shulman, 1986), but without a context of importance for technology skills, ICT-TPACK integration will not occur.

Incidentally, four participants (one faculty and three school leaders) indicated, "Maybe, depending on the situation" as a consideration of employing a teacher candidate with limited technology skills (Table 37).

Table 37

Participants Who Selected Maybe as a Response

Would consider hiring with limited skills-	Barriers
"It depends on the skill sets"	"Time for training"
"It depends on the area of study. If it's a math or science teacher the candidate would be hired."	"Many may fear the software and not attempt to use it because it appears too difficult."
"All factors of eligibility would be considered."	"Technical Difficulties with equipment interfering with lesson and time constraints to cover lesson."
"Maybe – if the teacher can address a critical shortage area and demonstrate ability to learn technology skills."	"Classroom management availability of tech resources – teacher expertise level with teacher; teacher confidence with technology."

These statements included unique perspectives from participants and gave some insight to the difficulties of hiring teacher candidates. It should not be taken lightly that the complexity and dynamic of hiring teacher candidates for positions, and the needs of schools that go deeper than the promotion of technology integration. It does, though, appear to be evident throughout the findings presented in this study that most issues relating to school culture and environment have an effect on one another, including ICT-TPACK integration. Therefore, it is imperative that Faculty and School Leaders focus on promoting continued growth rather than focused on constant and continual change (Hill, 1999). The ultimate reasons for participants' to be conflicted in their responses is of ongoing interest to the researcher, but it is not within the scope of this study and therefore will be discussed in the following section Recommendations for Future Research.

Limitations of the Study

Small sample size. One of the major limitations of this study is the small sample size which may have effected on the accuracy of the overall data. However, studies similar to this have similar hazards. Therefore, if high quality studies of this nature are to be completed, researchers will need to move beyond self-identification and attitudinal data. One potential solution could be utilizing technology to create a Distributive Collaborative Research Model (DCRM), where universities work together to develop research plans and complete research to combine data and findings (Pierson, Shepard, & Leneway, 2009). This DCRM may free researchers from solely relying on attitudinal data and allowing more opportunities for direct observation and larger samples. Until we in the research community can develop a DCRM scaffold plan and collaborate on a large scale between universities, timely and important studies will not reach the depth necessary to instill efficient and effective change through research.

Reliance on self-reporting of attitudinal data. To expand on the previous limitation of this research, the reliance of self-reporting of attitudes is a necessary, but weak feature of this type of study. Self-reporting of perspectives can be both misinterpreted and force the researcher to rely on data that may be incorrect. A mixed-method study was utilized to limit this, but self-reporting was necessary to collect these data. Potential solutions to these issues may be in direct observation of multiple participants over time. This also poses limitations, but may ultimately yield more accurate data and potentially allow the researcher to witness and report findings, rather than solely rely on data that may be influenced by forces outside the view of the researcher.

Timeframe for collection and analysis of data. Time was a major limitation of this study. Due to the Faculty and School Leader schedules, and the fact that survey instruments had to be completed, disseminated, and collected prior to the end of the semester, which limited the opportunity to conduct a complete field testing of the instrument. Although field testing of the instrument was completed prior to sending the surveys, the time available limited the researchers ability to conduct a thorough analysis of the instrument itself. In the future, this instrument should be further field tested with the intention of increasing reliability and streamlining.

Sampling. The issue of sampling was also an issue for this study. Again, due to timing issues it was necessary to sample the population quickly which led to an imbalance in numbers between faculty and school leaders. This weakened the statistical data and may have caused misinterpretation of data. School Faculty were a small population before being sent the survey with only 45 potential possible participants. Only nineteen responses weakened the data substantially.

The sample of School Leaders also presented issues, in that it was a one-shot survey administration to School Leaders who were enrolled in the Executive Doctorate program who attended class on one night. Because these participants, were working towards their doctorate in Educational Leadership the data from their sample may be skewed and not entirely represent the attitudes and beliefs of all School Leaders. By being enrolled in the doctoral program, these participants may have additional drive to achieve positions above their current ranks, and therefore may be an ultra-ambitious group with similar mindsets. Provided adequate time and resources, School Leaders

should be sampled directly from their schools, rather than relying on a group sample during class time.

Recommendations for Further Research

By completing a mixed-method study, various interesting phenomena were noted during the cross validation of data. There clearly appeared to be a disconnection among both samples, but primarily among school leaders, concerning their willingness and abilities to train employees to use technology in the classroom. This is not to say that there was intentional dishonesty, but there seems to be a cultural issue that leads to this outcome. It may be due to a fear of technology, an overly competitive professional environment that makes taking risks difficult, political or cultural issues, or a lack of belief or support in instructional technology. Regardless, this cultural phenomenon should be further researched and studied with the intention of discovering the underlying issues and identifying potential solutions.

Another possible recommendation for future research involves the need for Faculty to take the next steps in total integration of technology into the various core classrooms, rather than offering a stand-alone technology course that promotes a separate discipline. From the student perspective, it is no longer good enough to discuss the merits and theories of instructional technology in teaching and learning. Instead, students need to begin to actively promote them throughout the entire program (Milken Exchange on Educational Technology, 1999). Research should be completed to realistically promote a technology integration agenda and to determine steps or a needs assessment necessary to promote technology into the teacher preparation program.

Implications for Practice

The main purpose of this study is to inform both Faculty and School Leaders about the difficulties of technology integration in both higher education institutions and primary or secondary schools. By having a mutual understanding of the needs for, and barriers against technology integration, we can better serve our future teachers, both prior to and after employment. It is well understood and accepted that teachers will ultimately be the driving force that shape the future of education, and should therefore have a mastery of both content and pedagogical knowledge, as well as an equal knowledge of technology applications according to the TPACK model.

School Leaders must make the decision to contribute the time and energy into technology integration, if it is to be realized. Half-hearted or non-supportive leadership will not be effective in implementing any innovation, especially one as complex as technology integration. If a School Leader does decide to take up the challenge, he or she must become the primary learner, facilitator, manager, and leader of technology integration. In addition, it is necessary to focus on continued support of staff, promoting continual growth rather than change, and provide adequate time and training.

University Faculty that train preservice teachers also have a difficult challenge ahead regarding technology integration. Research plainly states that a stand-alone technology course is hardly effective in promoting long term technology skills and self-efficacy among future teachers. The main goal of technology integration for the betterment of the future teacher is a technology rich environment, where preservice teachers experience technology through constructivist and reflective approach. Exposure

is critical, and Faculty should continue to model technology applications through their classes.

Summary

Individual perspectives regarding technology skills were the driving force of this study. Although no participants' cited that technology was unimportant, their views indicate that technology has a place in the classroom. What that place is, however, is a matter of degrees of perceived importance. School Leaders tended to be more specific and direct in what they want in Teacher Candidates, from strong content and pedagogy with little technology, to a high proficiency of technology to integrate into every lesson. Likewise, Faculty tended to be generalized and broad in discussing needed skills, without definitive programs or types. Given the individual nature based on experiences on various campuses of School Leaders and their vast differences in needs, Faculty may actually be complementing the needs of School Leaders by promoting a wide, broad range of generalized skills among teacher candidates. Considering the results of this study, it would be virtually impossible for Faculty to adequately train teacher candidates on the specifics of technology for all cases. Combined with a generalized training regimen within preservice teacher training, School Leaders must also be responsible for learning, managing, training, and facilitating technology integration in their individual schools and considering their individual needs.

It is also safe to assume from the results of this study, that for ICT-TPACK integration to effectively take place, both Faculty and School Leaders have to share the role of trainers and support teacher candidates and teachers alike both before and after employment. If there is a break in this cycle, it will likely have a negative effect on

technology integration over time. By not adequately training preservice teachers to use technology, negative preconceptions will arise and create even more obstacles to overcome. Striking any serious external barriers, providing ongoing support and encouragement for ICT-TPACK integration in positive, constructivist, and managed implementation, technology integration will remain a tangible and obtainable goal for an increasing number of colleges, universities, primary and secondary schools.

This study will hopefully add to current and future pool of data to encourage the efficient and effective planning, decision making, and training of teacher candidates, as well as the continued integration of technology among both universities and schools at the local, district and State level.

References

Abbitt, J. (2011). An investigation of the relationship between self-efficacy beliefs about technology integration and technological pedagogical content knowledge (TPACK) among preservice teachers. *Journal of Digital Learning in Teacher Education*, *27*(4), 134-142.

Abernathy, T., Forsyth, A., & Mitchell, J. (2001, Fall). The bridge from student to teacher: What principals, teacher education faculty, and students value in a teaching model. *Teacher Education Quarterly*, 109-119.

Adamy, P., & Boulmetis, J. (2005). The impact of modeling technology integration on pre-service teachers' technology confidence. *Journal of Computing in Higher Education, 17*(2), 100-120.

Albion, P. (2001). Some factors in the development of self-efficacy beliefs for computer use among teacher education students. *Journal of Teacher Education, 9*(3), 321-347.

Anderson, R., & Dexter, S. (2005). School technology leadership: An empirical investigation of prevalence and effect. *Educational Administration Quarterly, 41*(1), 49-82. doi:10.1177/0013161X04269517

Anderson, S., Groulx, J., & Maninger, R. (2011). Relationships among preservice teachers' technology-related abilities, beliefs, and intentions to use technology in their future classrooms. *Journal of Educational Computing Research, 45*(3), 321-338. doi:10.2190/ec.45.3.d

Angeli, C., & Valanides, N. (2005). Preservice elementary teacher as information and communication technology designers: An instructonal systems design model based on and expanded view of pedagogical content knowledge. *Journal of Computer Assisted Learning, 21*(4), 292-302.

Angeli, C., & Valanides, N. (2009). Epistemological and methodological issues for the conceptulization, development, and assessment of ICT-TPCK: Advances in technological pedagogical knowledge (TPCK). *Computers in Education, 52*(1), 154-168.

Archambault, L., & Barnett, J. (2010). Revisiting technological pedagogical content knowledge: exploring the TPACK framework. *Computers and Education, 55*, 1656-1662.

Archambault, L., & Crippen, R. (2009). Examining TPACK among K-12 online distance educators in the United States. *Contemporary Issues in Technology and Teacher Education, 9*(1), 71-88.

Bai, H., & Ertmer, P. (2008). Teacher educators' beliefs and technology uses as predictors of preservice teachers' beliefs and technology attitudes. *Journal of Technology and Teacher Education, 16*(1), 93-112.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: W.H. Freeman and Company.

Baran, E., Chuang, H.-H., & Thompson, A. (2011). An emerging research and development tool for teacher educators. *Turkish Journal of Educational Technology, 10*(4), 370-376.

Borthwick, A., Pierson, M., Anderson, C., Morris, J., Lathem, S., & Holly, P. (2004). Building learning communities to increase faculty and preservive teacher use of technology. *Journal of Computing in Teacher Education, 21*(1), 23-32.

Collis, B., & Jung, I. (2003). Uses of information and communication technologies in teacher education. In B. Robinson, & C. Latchem (Eds.), *Teacher education through open and distance learning* (pp. 171-192). London: Routledge Falmer.

Cox, S., & Graham, C. (2009). Diagramming TPACK in practice: using an elaborated model of the TPACK framework to analyze and depict teacher knowledge. *TechTrends, 53*(3), 60-69.

Crandall, D., & Loucks, S. (1982). Preparing facilitators for implementation: Mirroring the school improvement process. *Amercian Educational Research Association Annual Meeting.* New York.

Cuban, L. (1993). *How teachers taught: Consistancy and change in American classroms: 1890-1990* (2nd ed.). New York: Teachers College Press.

Dawson, C., & Rakes, G. (2003). The influence of principals' technology training on the integration of technology into schools. *Journal of Research in Technology in Teacher Education, 36*(1), 29-49.

Dewey, J. (1933). *How we think.* Boston: D.C. Heath.

Doering, A., Velesianos, G., Scharber, C., & Miller, C. (2009). Using the technologcical, pedagogical, and content knowledge framework to design online learning environments and professional development. *Journal of Educationional Computing Research, 41*(3), 319-346.

Ertmer, P. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development, 47*(1), 47-61.

Ertmer, P. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development, 53*(4), 25-39.

Ferris, A., Roberts, N., & Skolnikoff, W. (1997). Technology and preservice education: Models that work. *Educational Technology Review, 7,* 13-19.

Frankel, J., & Wallen, N. (2009). *How to design and evaluate research in education* (7th ed.). (M. Ryan, Ed.) New York: McGraw-Hill.

Fullan, M. (1993/1994). *Change forces: Probing the depths of educational reform.* (Vol. 10). Pennsylvania: School Development and the Management Change Series.

Gatlin, L., & Jacob, S. (2002). Standards-based digital portfolios: A component of authentic assessment for preservice teachers. *Action in Teacher Education, 23*(4), 28-34.

Genc, Z., & Tinmaz, H. (2010). A reflection of preservice teachers on e-portfolio assessment. *Procedia Social and Behavioral Sciences, 9,* 1505-1508.

Gess-Newsome, J. (2002). Pedagogical content knowledge: An introduction and orientation. In J. Gess-Newsome, & N. Lederman (Eds.), *PCK and science education* (pp. 3-17). New York, NY: Kluwer Academic Publishers.

Gess-Newsome, J., & Lederman, N. G. (Eds.). (1999). *Examining pedalogical content knowledge.* Dorchet: Kluver.

Godfrey, C. (2001). Computers in school: Changing technologies. *Australian Educational Computing, 16*(2), 14-17.

Goldring, E. (1997). Educational leadership: Schools, environments and boundry spanning. In M. Preedy, R. Glatter, & R. Levacic (Eds.), *Educational management - Strategy quality, and resources.* Buckingham, Phildelphia: Open University Press.

Gordinier, C., Conway, K., & Journet, A. (2006). Facilitating teacher candidates' reflective development through the use of portfolios, teacher work sample, and guided reflections. *Teaching and Learning, 20*(2), 89-105.

Graham, C. R. (2011). Theoretical considerations for understanding technological pedalogical content cnowledge (TPACK). *Computers & Education, 57,* 1953-1960. doi:10.1016/j.compeau2011.04.010

Gunter, G. (2001). Making a difference: Using emerging technologies and teaching strategies to restructure an undergraduate technology course for pre-service teachers. *Educational Media International, 38*(1), 13-20.

Higgens, S., & Mosley, D. (2001). Teacher' thinking about information and communciations technology and learning: Beliefs and outcomes. *Teacher Development, 5*(2), 191-210.

Hill, P. (1999). *Instructional leadership and effective schools.* Melbourne: Center for Applied Educational Resource, The University of Melbourne.

Hoffman-Kipp, P., Artiles, A., & Lopez-Torres, L. (2003). Beyond reflection; Teacher learning as praxis. *Theory into Practice, 42*(3), 248-254.

Holland, I., & Moore-Stewart, T. (2000). A different divide: Preparing tech savvy-leaders. *Leadership, 30*(1), 37-38.

Honey, M., & Moeller, B. (1990). Teachers' beliefs and technology: Different understanding. *Technical Report Issue*(6).

International Society for technology in Education. (2008). *ISTE*. Retrieved 2 14, 2013, from Nets-T: http://www.iste.org/docs/pdfs/nets-t-standards.pdf?sfvrsn=2

Jung, I. (2005). ICT-pedagogy integration in teacher training: Application cases. *Educational Technology and Society, 8*(2), 94-101.

Koehler, M., & Mirsha, P. (2008). Introducing TPCK. In A. C. Technology, *The handbook of technological pedagogical content knowledge (TPCK)* (pp. 3-29). Lawrence Erlbaum Associates.

Koehler, M., & Mishra, P. (2005). What happens when teachers design educational technology? The development of technological pedagogical content knowledge. *Journal of Educational Computing Research, 32*(3), 131-152.

Lee, M., & Tsai, C. (2010). Exploring teachers' preceived self-efficacy and technological pedagogical content knowledge with respect to educational use of the World Wide Web. *Instructional Science, 38*(1), 1-21.

McCabe, M., Wideman, R., & Winter, E. (2009). The “R” word in teacher education: Understanding the teaching and learning of critical reflective practice. *International Electronic Journal for Leadership in Learning, 13*(7), 271-283.

Mehlinger, H. D., & Powers, S. M. (2002). *Technology & teacher education: A guide for educators and policymakers.* Boston: Houghton Mifflin.

Mentkowski and Associates. (2000). *Learning that lasts: Integrating learning, development, and performance in college and beyond.* San Francisco: Josey-Bass.

Milken Exchange on Educational Technology. (1999). Will new teachers be prepared to teach in a digital age? Retrieved 3 18, 2013, from http://www.mff.org/pubs/ME154.pdf

Mishra, P., & Koehler, M. (2006). Technological pedagolocal content knowledge: A framework for integrating technology in teachers' knowledge. *Teachers College Record, 108*(6), 1017-1054.

National Council for the Accrediaton of Teacher Preparation. (2008). *Professional standards for the accrediation of schools, colleges, and departments of education.* Retrieved 2 18, 2013, from http://www.ncate.org/Portals/0/documents/Standards/NCATE%20Standards%202008.pdf

Neiss, M. (2005). Preparing teachers to teach science and mathematics with technology: Developing pedagogical content knowledge. *Teaching and Teacher Education, 21*(5), 509-523.

Niederhauser, D., & Stoddart, T. (2001). Teachers' instructional perspectives and use of educational software. *Teaching and Teacher Education, 17*, 15-31.

Norum, K., Grabinger, r., & Duffield, J. (1999). Healing the universe is an inside job: Teachers' views on integrating technology. *Journal of Technology and Teacher Education, 7*(3), 187-203.

Ntuli, E., Kweegwe, J., & Kyei-Blankson, L. (2009). Electronic portfolios in teacher education: A case study of early childhood teacher candidates. *Early Child Education Journal, 37*, 121-126.

Oliver, R. (1993, July). The influence of training on beginning teachers' use of computers. *Australian Educational Computing, 189*, 196.

Pajares, M. (1992). Teachers beliefs' and educational research: Cleaning up a messy construct. *Review of Educational Research, 62*(3), 307-332.

Pierson, M. (2001). Technology integration practice as a function of pedagogical expertise. *Journal of Research on Computing in Education*(33), 413-430.

Pierson, M., & Borthwick, A. (2010). Framing the assessment of educational technology professional development in a culture of learning. *Journal of Digital Learning in Teacher Education, 26*(4), 126-131.

Pierson, M., & Cozart, A. (2004). Case studies of future teachers: Learning to teacher with technology. *Journal of Computing in Teacher Education, 21*(2), 59-63.

Pierson, M., & Thompson, M. (2005). The re-envisioned educational technology course: If addition isn't possible, try division. *Journal of Computing in Teacher Education, 22*(1), 31-36.

Pierson, M., Shepard, M., & Leneway, R. (2009). Distributed collaborative research model: Meaningful and responsive inquiry in technology and teacher education. *Journal of Computing and Teacher Edcuation, 25*(4), 127-133.

Pope, M., Hare, D., & Howard, E. (2002). Technology integration: Closing the gap between what preservice teacher are taught to do and what they can do. *Journal of Technology and Teacher Education, 10*(2), 191-203.

Richards, H., & Ehley, L. (2005). Portfolio reflections in a digital environment: Evaluating an unfinished tool. Paper presented at "Emerging Dimensions in Higher Education Applications; E Portfolios, Technology, and Learning. In D. Shamatov (Chair) (Ed.), *Annual Meeting of the American Evaluation Association.* Toronto.

Richards, H., Diez, M., Ehley, L., Loacker, G., Hart, J., & Smith, P. (2008). Learning, reflection, and electronic portfolios: Stepping toward an assessment practice. *Journal of General Edcuation*(1), 31-50.

Richardson, V. (1996). The role of attitudes and beliefs in learning to teach. In J. Sikula, T. Buttery, & E. Guyton (Eds.), *Handbook of Research on Teacher Education* (2nd ed., pp. 102-117). New York: Maximillian.

Richardson, V. (2003). Preservice teachers' beliefs. *Advances in Teacher Education, 6*(1), 22.

Ritzhaupt, A., Ndoye, A., & Parker, M. (2010). Validation of the electronic portfolio student prosepective instrument (EPSPI): Conditions under a different integration initiative. *Journal of Digital Learning in Teacher Education, 26*(3), 111-119.

Rodman, G. J. (2010). Facilitating the teaching-learning process through the reflective engagement of pre-service teachers. *Australian Journal of Teacher Education, 35*(2), 20-34.

Russell, M., Bebell, D., & O'Connor, K. (2003). Examining teacher technology use: Implications for preservice and inservice preparation. *Journal of Teacher Education, 54*(4), 297-310.

Sang, G., Valcke, M., Van Braak, J., & Tondeur, J. (2009). Student teachers' thinking processes and IT integration: Predictors of prospective teaching behaviors with educational technology. *Computers in Technology, 54*, 103-112. doi:10.1016/j.compedu.2009.07.010

Schmidt, D., Baran, E., Thompson, A., Mirsha, P., Koehler, M., & Shin, T. (2009). Technological pedalogical content knowledge (TPACK): The development and validation of an assessment instrument for preservice teachers. *Journal of Research on Technology in Education, 42*(2), 123-149.

Sergiovanni, T. (2001). *The principalship: A reflective practice perspective. Fourth Edition.* Needham Heights, MA: Allyn & Bacon/Longman Publishing, a Pearson Education Company.

Shulman, L. (1986). Paradigms and research programs in the study of teaching: A contemporaty perspective. In M. Wittrock (Ed.), *Handbook on Reasearch and Teaching* (3rd ed., pp. 3-36). New York: McMillan.

Stone, B. (1998). Problems, pitfalls, and benefits of eportfolios. *Teacher Education Quarterly, 25*(1), 105-114.

Taylor, P., Fraser, B., & White, L. (1994). A classroom environment questionairre for science educators interested in the constructivist reform of school science. *National Association for Research in Science Teaching.* Anaheim, CA.

Townsend, T. (1999). The third millenium school: Towards a quality education for all students. *IARTV Seminar Series, 81.* Jolimont, Victoria.

Tu, T., Baker, R., & Pensaville, M. (2008). *Desiging e-Portfolios to support professional teacher preparation.* Retrieved 2 14, 2013, from Innovate Online: http://innovateonline.info/pdf/vol2_issue2/Designing_e-Portfolios_To_Support_Professional_Teacher_Preparation.pdf

Wang, L., Ertmer, P., & Newby, J. (2004). Increasing preservice teachers' self-efficacy beleifs for technology integration. *Journal of Research on Technology in Education, 36*(3), 231-250.

Wetzel, K., & Strudler, N. (2006). Costs and Benefits of Electronic Portfolios in Teacher Education: Student Voices. *Journal of Computing in Teacher Edcuation, 22*(3), 69-78.

Whetten, D. A. (1989). What constitutes a theoretical contribution. *The Academy of Management Review, 14*(4), 490-495.

Wilmore, D., & Betz, M. (2000). Information technology and schools: The principal's role. *Edcuational Technology & Society, 3*(4), 12-19.

Yee, D. (2000). Images of school principals' information and communications technology leadership. *Journal of Information Technology for Teacher Education, 9*(3), 287-302.

Yost, D. S., Sentner, S. M., & Folrenza-Bailey, A. (2000). An Examination of the Construct of Critical Reflection: Implications for Teacher Education Programming in the 21st Century. *Journal of Teacher Education, 5*(1), 39-49.

Appendix A

UNIVERSITY OF HOUSTON
CONSENT TO PARTICIPATE IN RESEARCH

PROJECT TITLE: A Comparison Study of the Values between College of Education Faculty and School Leadership regarding Technology Integration

You are being invited to participate in a research project for a dissertation in partial fulfillment of the requirements for the degree Doctor of Education for Brian Baldwin from the Department of Curriculum and Instruction at the University of Houston. The project is being conducted under the supervision of Dr. Melissa Pierson.

NON-PARTICIPATION STATEMENT
Your participation is voluntary and you may refuse to participate or withdraw at any time without penalty or loss of benefits to which you are otherwise entitled. You may also refuse to answer any question. If you are a student, a decision to participate or not or to withdraw your participation will have no effect on your standing and any potentially identifiable information will not be shared with your instructors or professors. All returned survey instruments will be digitally stored with password protection by the principal investigator.

PURPOSE OF THE STUDY
This study was designed to evaluate the perceived needs and attitudes of College of Education faculty, school principals, and students to determine if significant differences emerge in how instructional technology is valued as a tool in the classroom, and how this individual vision may shape technology integration in Teacher Education at the University of Houston.

PROCEDURES
A total of approximately 70 Students enrolled in the Executive Doctorate Program and 50 College of Education Faculty will be asked to participate in the initial survey component of this study.

Description of research project:

1. If you agree to participate, responses to a questionnaire concerning your attitudes and values towards technology use and skills among teacher candidates will be used to determine similarities and differences between College of Education Faculty and Schools Leadership. Your individual time contribution is approximately 10 minutes for completion of the survey.
2. Through quantitative and qualitative (statistical and descriptive) means, the researcher will correlate the data to analyze and compare results to determine if significant differences emerge in the attitudes and values of the different samples of participants.

CONFIDENTIALITY
Every effort will be made to maintain the confidentiality of your participation in this project. Each participant's name will be paired with a pseudonym by the principal investigator. This pseudonym will appear on all written materials. The list pairing the subject's name to the assigned pseudonym will be kept separate from all research materials and will be available only to the principal investigator. Confidentiality will be maintained within legal limits.

RISKS/DISCOMFORTS
There are no foreseeable risks or discomforts associated with this research, physically, mentally, or psychologically.

BENEFITS
While you will not directly benefit from participation, your participation may help investigators better understand how best integrate technology into the preservice teacher curriculum in the teacher education program and provide suggestions for future direction.

ALTERNATIVES
Participation in this project is voluntary and the only alternative to this project is non-participation.

PUBLICATION STATEMENT
The results of this study may be published in professional and/or scientific journals. It may also be used for educational purposes or for professional presentations. However, no individual subject will be identified.

SUBJECT RIGHTS
1. I understand that informed consent is required of all persons participating in this project.
2. All procedures have been explained to me and all my questions have been answered to my satisfaction.
3. Any risks and/or discomforts have been explained to me.
4. Any benefits have been explained to me.
5. I understand that, if I have any questions, I may contact Brian Baldwin at 832-647-3398. I may also contact Melissa Pierson, faculty sponsor, at 713-743-4961.
6. I have been told that I may refuse to participate or to stop my participation in this project at any time before or during the project. I may also refuse to answer any question.
7. Any questions regarding my rights as a research subject may be addressed to the University of Houston committee for the protection of human subjects (713-743-9204). All research projects that are carried out by investigators at the University of Houston are governed by requirements of the university and the federal government.
8. All information that is obtained in connection with this project and that can be identified with me will remain confidential as far as possible within legal limits.
9. Information gained from this study that can be identified with me may be released to no one other than the principal investigator and Dr. Melissa Pierson of the College of

Education. The results may be published in scientific journals, professional publications, or educational presentations without identifying me by name.

Appendix B

Recruitment Statement

Subject: Your Values are Important: Instructional Technology Needs Assessment

Dear College of Education Faculty and Schools Leaders

My name is Brian Baldwin and I am a doctoral student of Instructional Technology in the University of Houston. I am currently conducting an evaluation into the Instructional Technology component of the QUEST Teacher Education Program, specifically to assist in the realignment of goals in regards to future employment needs of School Leaders. As you may know, the College of Education is heavily invested in the promotion of effective teaching through technology strategies, and your assistance will be pivotal to ensure that the College determines the most effective and efficient path forward. Due to your perspective and attitudes concerning the use of Instructional Technology, I would appreciate your assistance by completing this short survey (Approximately 10 minutes) that will give important personal insight into your individual instructional technology values and beliefs. I sincerely hope you will participate in this study, as these findings will help communicate your perspectives concerning the use of the instructional technology in teacher candidates. In addition, it will assist us in evaluating and assessing our current goals to ensure we provide the most effective learning technology tools for our current students in the Teacher Training program (QUEST). Any potentially identifiable information will not be shared or released, and all participant responses will be maintained and safeguarded by the principal investigator. If you decline to participate, it will not affect you in any way. This project has been reviewed by the University of Houston Committee for the Protection of Human Subjects (713) 743-9204.

http://www.surveymonkey.com/s/FLPVRL2

Sincerely,

Brian Baldwin
Doctoral Student
College of Education
Department of Instructional Technology

Appendix C

Survey Instrument

Survey to Evaluate the Importance of Instructional Technology in Teacher Candidate Applicants for Employment

Directions: Please select the appropriate answer for the following demographic questions as they pertain to you.

Your Current Position: (Please check the position that applies)

_____College of Education Faculty

Types of classes currently teaching or taught _____

_____School Leadership; Principal, Assistant Principal, Administrator

District Name: _____

Position Title: _____

Grade Levels (Please check the grade level of your school):
_____Pre-Elementary
_____Elementary
_____Middle School or Junior High
_____High School
_____All Levels

How many years have you served in your current position? _____

How many years total have you been in the education profession? _____

How do you personally learn about new technology? (Check one item that best applies)

_____Self-Taught through exploration of books or online content (e.g. Google, YouTube, Etc.)

_____Computer Seminars, Job Trainings, or Classes in Work or University

_____Through Social Connections with Family, Friends, or Colleagues

_____IT Support Staff from your place of employment

Part II: Important Considerations in Evaluating Applicants for a Teaching Position
How do you rate the importance of each of the following sources of information as indicators of readiness for an applicant entering the teaching profession? (1 represents "no importance" and 5 represents "highest importance")

	No Importance		Moderate Importance		Highest Importance
1. Previous teaching position	1	2	3	4	5
2. Cooperating teacher evaluation	1	2	3	4	5
3. Person is known in the district	1	2	3	4	5
4. Experience with specific programs in district	1	2	3	4	5
5. University supervisor evaluation	1	2	3	4	5
6. Number of certifications held	1	2	3	4	5
7. Recommendation from university faculty	1	2	3	4	5
8. Graduation with honors or other awards	1	2	3	4	5
9. Grade point average	1	2	3	4	5
10. Familiarity with the local community	1	2	3	4	5
11. Completion of graduate degree	1	2	3	4	5
12. Involvement in professional organizations	1	2	3	4	5
13. Institution where student was certified	1	2	3	4	5
14. Familiarity or skills with technology	1	2	3	4	5

PART III: Important Factors in the Portfolios of Applicants for Teaching Positions
How do you rate the importance of an individual teachers' ability to produce the following examples, evidence, and samples when applying for a teaching position. (1 represents "no importance" and 5 represents "highest importance")

	No Importance		Moderate Importance		Highest Importance
15. Evidence of good character	1	2	3	4	5
16. Evidence of interpersonal skills	1	2	3	4	5
17. Examples of variety of teaching strategies	1	2	3	4	5
18. Evidence of thought process	1	2	3	4	5
19. Evidence of writing ability	1	2	3	4	5
20. Evidence of creativity	1	2	3	4	5
21. Examples of use of technology	1	2	3	4	5
22. Examples of parent/community involvement	1	2	3	4	5
23. Examples of assessment practices	1	2	3	4	5
24. Evidence of teaching experience beyond levels	1	2	3	4	5
25. Statement of professional goals	1	2	3	4	5
26. Statement of philosophy	1	2	3	4	5
27. Statement of beliefs/aspirations	1	2	3	4	5
28. Examples of lesson plans with objectives	1	2	3	4	5
29. Examples of unique projects	1	2	3	4	5
30. Examples of curriculum development	1	2	3	4	5
31. Examples of sample units	1	2	3	4	5
32. Statement of personal mission	1	2	3	4	5
33. Examples of teaching (video)	1	2	3	4	5
34. Statement of outside interests/hobbies	1	2	3	4	5

PART IV: Importance of Instructional Technology in Teaching Pedagogy

As a College of Education faculty member or school leader, what level of importance do these technology skills have when considering the hiring of a teacher candidate? (1 representing "no importance" and 5 representing "highest importance")

	No Importance		Moderate Importance		Highest Importance
35. Presentation Technology (e.g., PowerPoint, Prezi, SlideRocket, MovieMaker)	1	2	3	4	5
36. Organizational Technology (e.g., Online Courseware, BlackBoard, Moodle)	1	2	3	4	5
37. Collaboration & Communication Technology (e.g., Google Docs, File Sharing, Secure Dedicated Wikis)	1	2	3	4	5
38. Productivity Technology (e.g., Online Calendars, Time Management, Online Organizers)	1	2	3	4	5
39. Multimedia Technology (e.g., YouTube, Vimeo, Google Video)	1	2	3	4	5
40. Critical Thinking & Problem Solving Technology (e.g., Mind Mapping, Flowchart/Diagram Makers)	1	2	3	4	5
41. Reflection, Feedback, and Networking Technology (e.g., Google Sites, Wikis, Polling or Audience Response tools)	1	2	3	4	5

PART V: SHORT ANSWER SECTION

Directions: Please answer the following questions to the best of your ability. If you need additional space for your answer, please feel free to continue your answer on the back of this survey.

42. If given the option between either a paper-based portfolio or an electronic portfolio from a teacher candidate, which would you prefer? (Check the item that best applies)

_____Paper Based Portfolio

_____Electronic Portfolio

Why?_____

_____

43. Would you recommend for hire a teacher candidate that had no technology skills, but has otherwise demonstrated sound pedagogical and content area skills?

_____Yes

_____No

Why?_____

_____

43. What type of technology training or skillsets would you like to see more of in future teacher candidates seeking employment (specific skills, abilities, or attitudes)?

_____

_____

_____

44. What do you see as some of the barriers to effective use of instructional technology in the classroom?

_____

_____

_____

45. What do you believe is the role of instructional technology in teaching and learning in future classrooms five years from now?

_____

_____

_____

Appendix D

Internal Review Board Approval to Conduct Research

UNIVERSITY of HOUSTON
DIVISION OF RESEARCH

April 12, 2013

Mr. Brian Baldwin
c/o Dr. Melissa Pierson
Curriculum and Instruction

Dear Mr. Brian Baldwin,

Based upon your request for exempt status, an administrative review of your research proposal entitled "A Comparison Study of the Values between College of Education Faculty and School Leadership regarding TPACK and Technology Integration" was conducted on March 14, 2013.

At that time, your request for exemption under **Category 2** was approved pending modification of your proposed procedures/documents.

The changes you have made adequately respond to the identified contingencies. As long as you continue using procedures described in this project, you do not have to reapply for review. " Any modification of this approved protocol will require review and further approval. Please contact me to ascertain the appropriate mechanism.

If you have any questions, please contact Nettie Martinez at 713-743-9204.

Sincerely yours,

Kirstin Rochford, MPH, CIP, CPIA
Director, Research Compliance

"Approvals for exempt protocols will be valid for 5 years beyond the approval date. Approval for this project will expire **March 1, 2018**. If the project is completed prior to this date, a final report should be filed to close the protocol. If the project will continue after this date, you will need to reapply for approval if you wish to avoid an interruption of your data collection.

Protocol Number: 13355-EX

316 E. Cullen Building Houston, TX 77204-2015 (713) 743-9204 Fax: (713) 743-9577
COMMITTEES FOR THE PROTECTION OF HUMAN SUBJECTS