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Educator's Technology Integration Barriers and Student Technology Preparedness as 21st Century Professionals

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MS, National Louis University, 1995

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Millions of dollars have been spent to acquire educational computing tools, and many education, government, and business leaders believe that investing in these computing tools will improve teaching and learning. The purpose of this quantitative study was to determine whether charter school educators face technological barriers hindering them from incorporating technology into their classrooms. If they experienced self-efficacy issues integrating technology in their classrooms and if they believed their students were technologically prepared as 21st century professionals. A 5-point Likert scale survey, validated by a pilot study, was completed by 61 charter high school teachers. Their responses were analyzed, scores from the individual mean responses were used to calculate the total mean; and a parametric *t* test used to determine if the null or alternative hypothesis could be rejected. The theoretical foundation for this study was Cubans' and Brickners' first- and second-order barriers to change. In one charter school stratum, teachers experienced barriers integrating technology into their classes, while teachers in the other charter school strata did not. There was statistical significance in teachers' beliefs about their skills integrating technology into their classes and their students being technologically prepared as 21st century professionals. The results of this research could lead to positive social change by providing valuable information to help charter school administrators identify teachers who are experiencing barriers and how they can improve teacher's professional development integrating technology into their classrooms.

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Dedication

This dissertation is dedicated to my Lord and Savior, Jesus Christ, my family, and friends.

Acknowledgments

My first debt of gratitude belongs to Jesus, the Author and Finisher of my faith. I have been through many years of dealing with an upper respiratory illness that has at times incapacitated me. If it had not been for my faith in the Lord, I do not know that I would have ever attempted to finish this project.

I want to thank my mentor, Dr. Thomas Spencer, for his continued help and patience with me through this entire process. I would like to thank my committee member, Dr. Aridaman Jain, for his patience and continued help with the development of my survey, the results of the survey, and dissertation. Both of you have helped me understand the research process and helped me gain a deeper respect for statistical research.

I would like to give special thanks to my family for their support, love, and motivation. They allowed me the time and space to work. They helped me through many difficult times and loved me. I also want to say thank you to my closest friends who prayed for me; made sure that I had time away to rest and relax; and continued to encourage me through the difficult days, weeks, months, and years I faced getting this project completed. I would also like to thank my church family for their continued encouragement and support and the many prayers and Starbucks gift cards to ensure I stay motivated and alert. This was a challenging journey and I’m glad to be at the finish line.

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Chapter 1: Introduction to the Study

At the state and local level educators and leaders were required to develop plans to use educational technologies in the classroom and produce technologically literate students. A federal legislation mandate emphasized that technology be integrated into all K–12 classrooms (U.S. Department of Education, 2002). This directive was based on the belief that learning is enhanced using technology and students would need to develop technology skills to be productive citizens (U.S. Department of Education, 2002). Because learning had been based upon using textbooks and how students interact with their teachers, classrooms would need a paradigm shift to meet the technology mandate. While educators and leaders are working to meet this mandate, another consideration would need to be considered for high school students and their work readiness skills. The reason for this consideration is because many students may choose not to go to college right away, and those who do will still need technical skills to move forward in their work careers.

The Secretary's Commission on Achieving Necessary Skills (SCANS) Report (2000) was charged with producing guidelines for work readiness skills for workers in world class companies. The SCANS Report found that the competencies that workers will need to be productive were: resources, interpersonal skills, information, systems, and technology. A recent survey completed by Lowther, Inan, Strahl, and Ross (2008) of over 400 U.S. employers revealed that high school graduates were deficient in most 21st century knowledge and skills needed to enter today's workforce. The SCANS Report examined the demands of the workplace and what students and workers would need to know and do to succeed in the workplace. SCANS was charged to: (a) define the necessary skills needed for employment; (b) propose acceptable levels in those skills; (c) suggest effective ways to assess proficiency; and (d) develop strategies to disseminate the findings to the nation's schools, businesses, and homes.

Students will need all the assistance they can get to become successful in school and the workplace. Carrier (2008), director of the Ford Motor Company's 21st Century Education Programs stated, "Many communities lag behind in understanding how businesses and schools must work together to make the K–12 workforce connections" (p. 5). The retirement of baby boomers in key occupations may cause a disruption in labor shortages. As businesses begin to realize these shortages, they may become more supportive of Career and Technical Education programs in schools. Therefore, businesses will be looking for employees that possess technology skills, and higher order thinking skills, such as critical thinking; and problem-solving. Employees will also need to be innovative and creative in their thinking, technologically savvy, able to communicate effectively, able to be self-directed, as well as able to work in teams. Therefore, administrators and educators must find ways to prepare students to compete and become leaders in today's workforce.

However, preparing students to be competitive leaders in the workforce can pose challenges for teachers because they need to find meaningful ways to engage, motivate, and inspire students to use technology and be innovative while meeting the demands of school administrators and businesses. Teachers should be sure their personal skill levels in technology are current. Administrators will need to make sure that teachers have the required hardware and software in their classrooms for students to use. To assist teachers and leaders, the U.S. Department of Education (2010) developed a National Education Technology Plan (NETP) calling for "engaging and empowering learning experiences for all learners" (p. 8), while finding innovative ways to take advantage of the opportunities offered by technology. These actions must be taken to meet the goal to empower and educate students. This challenge requires schools and businesses to work together to train high school students with technological skills to prepare them for the workforce and/or college.

With continued technological advancements, today's students are experiencing an even greater disconnect from their teachers. Mumtaz (2001) stated that children spend more time on their home computers than on computers at school. Children go home to teach themselves things that interest them. Students are texting, instant messaging, gaming, blogging, and downloading and uploading music and videos, while teachers are contending for their attention in a less digitally-focused classroom. Prensky (2010) stated, "For the digital age, we need new curricula, new organizations, new architecture, new teaching, new student assessments, new parental connections, new administration procedures, and may other elements" (p. 5). Consequently, teachers and students must become familiar with using technology resources and tools in the classroom for learning (e.g., digital authoring tools, multimedia learning content, communication, and collaboration tools that provided the ability to participate in online learning communities).

The development of information and communication technologies (ICTs) has increased the demand for knowledgeable workers and impacted the educational system in the United States (Voogt, Erstad, Dede, & Mishras, 2013). The advancement of ICTs created jobs nonexistent a decade ago, and students need to be educated to fill those jobs (Voogt, Erstad, Dede, & Mishras, 2013). These types of developments pose challenges for teachers to connect pedagogical techniques with integrating technology into their curriculum. Diaz (1999) affirmed: “A fundamental challenge for many teachers is using computers to create innovative learning opportunities for students” (p. 11). The reason for this challenge is the lack of training integrating technology into the curriculum. Prensky (2008) asserted that technology offers students new, highly effective tools they could use on their own, and teachers should not support the old pedagogy of telling or lecturing. Teachers should serve as a guide or a facilitator, not a speaker standing in front of the class lecturing.

Teachers will need to be able to conceptualize ways to integrate technology into the curriculum and demonstrate it as well as find ways to use technology to develop classroom activities that promote problem solving, provide information, stimulate discussions, and allow for drill and practice (Prensky, 2007). Prensky confirmed that, “Our students’ strengths lie in their ability to quickly master, use, and apply technology in their fearlessness to try new things” (p. 46). Prensky believed that students are savvy enough to filter through what is true, analyze information, and collaborate with people. Davies (2011) argued that it should not be assumed students are instinctively capable of using technology to learn what is expected of them in school because they grew up in a technological age. Just because students seem fearless when using technology, they could still need to be taught how technology could add value to their learning. There are lessons, such as evaluation and comparing the use of technology, students cannot learn on their own; therefore, teachers must pedagogically find ways to work with students using technology and be prepared to face whatever challenges they must meet their students' technology education needs.

If teachers do not show that they are willing to use technology and try new methods that are relevant and engaging, they will not capture their students' attention and will not be as effective as they could otherwise be. Teachers that develop a classroom allowing for trial and error where mistakes are made, motivated students to use technology while providing them with more opportunity to learn and increase self-esteem and self-confidence as they become a part of the learning process within the classroom. Bitner and Bitner (2002) suggested that teachers need to be motivated enough to endure the frustration and turmoil of the change process. The change process is less painful if teachers allow students to become partners in the learning process (Bitner & Bitner, 2002). Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, and Sendurur, (2012) noted, "Our education systems must reflect our students' world or we will not only miss the opportunity to capture their attention, but also forgo their full potential to learn and grow" (p. 432). Students are resisting teachers who are using old pedagogies with new technologies. Prensky (2001) confirmed that the single biggest problem facing education today is, "our Digital Immigrant instructors, who speak an outdated language (that of the predigital age), are struggling to teach a population that speaks an entirely new language" (p. 2). Teachers need to provide engaging and powerful learning experiences for their students. The challenges that teachers face should be identified and addressed so they can move from the predigital age to the digital age, which would include integration of technology.

Much research has documented teachers' integration of technology; however, not much progress was made with teachers integrating digital technologies (the use of computers and other multimedia sources) into their lessons. Hsu (2010) differentiated between teachers' usage ability of technology integration by identifying three issues that need to be clarified: The first issue is the understanding the difference between technology integration proficiency and computer proficiency. Technology integration proficiency requires more complicated aspects such as pedagogical considerations, while computer proficiency requires knowing how to use technology. The second issue is understanding ability and usage could be influenced by beliefs and attitudes. Third, although teachers can integrate technology into teaching, they may not be able to integrate technology into their classes because they face barriers such as the lack of functional equipment, appropriate software, school curriculum, and students' ability.

In my study, I explored the theory of first and second-orders of change developed by Cuban (1988), Brickner (1995), and Ertmer (1999), along with Hsu's (2010) second and third constructs of high school teachers' perceived barriers of integrating technology into their classrooms and their perceptions toward technology integration. The question I focused on in my study was whether these barriers and perceptions will impact high school graduates being technologically-prepared 21st century professionals. In this chapter, I will present the background of the problem, problem statement, purpose of the study, research questions and hypotheses, theoretical foundation, significance of the study, definition of terms, limitations of the study, the implications for social change, and the conclusion.

Background of the Problem

Technology has altered society on a global level. This change has increased the demand for competitive workers, and therefore, impacted the educational system. Millions of dollars were spent to acquire educational computing tools and many educators, the U.S. government, and business leaders believe that investing in these computing tools would improve teaching and learning (Keengwe, Onchwari, & Wachiera, 2008). Having computer tools alone will not improve teaching or learning, nor will large financial investments improve student learning or education. Keengwe, Onchwari, and Wachiera assert that improving teaching and student learning requires educators using and integrating these tools into their curricula and an assessment process put in place to determine whether technology was being used effectively.

Recommendations were made to consider educational computing as a necessary basic skill if American children are going to be globally competitive in today’s workforce. Bauer and Kenton (2005) noted that teachers in the United States were not prepared to meaningfully incorporate technology into their curricula. Educating the youth for success in a global economy has become a challenge for 21st century educators and learners. The adoption of technology integration has been slower than the acquisition of the technology itself due to teachers not thoroughly understanding the role computers should play and their fear of computers taking away their jobs. McCoy (2001) pointed out that "computers have the potential to become the single most important element of change in education during the advent of the 21st century" (p. 23).

In the United States, public schools are responsible for producing technologically literate students that are prepared to succeed in an information/technology based society. If students are to be effective consumers and producers in the 21st century, it is important for teachers and administrators to be involved in the school's curriculum development to provide information on what the changing workplace would demand of them. Conversely, the use of computers should be incorporated into every classroom course, which would include computer applications, such as word processing, spreadsheets, databases, and administrative information systems.

Although technology has been identified as a critical part of student success in the 21st century, Keengwe (2007) asserted that students lack "computer skills in various computer applications that are necessary to support and enhance their learning experiences" (p. 169). Keengwe further stated during the late 1980s and early 1990s teachers were poorly trained in technology integration. Teachers lacked confidence and the self-efficacy to pedagogically integrate technology for students to effectively learn in the classroom. Teachers also feared computers would replace the student and teacher relationship. I addressed the issue of teacher barriers and teachers' perceptions regarding effectively integrating technology into their classrooms in this study as one of the issues students face regarding achieving technological preparedness as 21st century professionals. With this perspective in mind, Prensky (2012) affirmed that for every request a teacher makes of a student using technology inside and outside the classroom, students should have one or more of the following requirements as part of their assignment:

1. Determine the most powerful way(s) to use technology to do assignments.
2. Complete assignments using technology in new and powerful ways.
3. Invent a new, technology-based way to do assignments.
4. Include something technological that has never been done before.
5. Use technology to connect in a new way to do tasks better.

Within the last decade, technology has changed and infiltrated our society. Prensky (2012) added that students lack the necessary skills to become global competitors in the workforce and in higher education because teachers lack the necessary skills to make engaging learning experiences and resources available to these students using technology. Therefore, technology integration in the classroom should change as well. Students are coming to class expecting to use technology and learn to become technologically competitive.

Problem Statement

Integrating technology into the classroom is a challenge for educators. The barriers that hinder teachers from effectively incorporating technology into their classrooms include lack of working computers, poor technological support, and inadequate technology resources. These barriers are first-order barriers identified by Ertmer (1999) as external barriers to the teacher.

Issues of self-efficacy, beliefs about how students learn, and the perceived value of technology to teaching and learning are second-order barriers as described by Ertmer, which are internal to the teacher. First and second-order barriers can hinder students from becoming globally competitive as 21st century professionals.

While national statistics show improvement in access to computer technology, access to computers does not lead to effective technology integration in the classroom. Research by the U.S. Department of Education (2010) released a technology plan revealing that students are not prepared technologically to become global competitors. Wachira and Keengwe (2011) reported that teacher surveys completed by the National Center for Education Statistics (2005) showed consistent declines in the use of technology integration to enhance student learning.

Even if first and second-order barriers are overcome by teachers, for effective integration of technology to take place, teachers need to develop a paradigm shift in their thinking. This paradigm shift is related to teachers believing in new ways of seeing and doing things. The existing gap in the literature does not address educators' barriers in charter schools or teacher self-efficacy integrating technology into their classrooms being associated with student's technological preparedness as 21st century professionals.

Teachers' beliefs predict, reflect, and determine their actual teaching practice (Kim, Kim, Lee, Spector, & DeMeester, 2013. p. 77). The need to determine if teachers are still experiencing barriers and finding solutions to those barriers will allow teachers to successfully integrate technology into their classrooms. The results of this study can contribute to the management field by identifying if charter school teachers are experiencing technology integration barriers and if they believe they are skilled enough to integrate technology into their classes and assist administrators with improving technology integration professional development sessions for teachers

Purpose of the Study

The purpose of this quantitative study was to determine whether charter school educators face technological barriers hindering them from incorporating technology into their classrooms, their self-efficacy issues integrating technology into their classes, and their students being globally competitive as 21st century professionals.

Research Question(s) and Hypotheses

This study was guided by the following research questions and hypotheses:

1. What indicators cause high school educators to believe they face barriers hindering them from incorporating technology into their classes?

H_o1: High school educators believe they face barriers incorporating technology into their classes.

H11: High school educators do not believe they face barriers incorporating technology into their classes.

2. What elements lead high school educators to believe they are not prepared to integrate technology in their classrooms?

H_o2: High school educators are not prepared to integrate technology into their classrooms.

H_12: High school educators are prepared to integrate technology into their classrooms.

3. What indicators show high school educators their students are technologically prepared as 21st century professionals?

H_o3: High school students are not technologically prepared to be 21st century professionals.

H_13: High school students are technologically prepared to be 21st century professionals.

In this study, I explored whether educators are faced with technological and perceived barriers hindering them from integrating technology into their classrooms and whether these barriers are affecting their students from becoming technologically competent. The dependent variable in this study was students being technologically prepared as 21st century professionals, while the independent variables were teachers' barriers and their self-efficacy pertaining to integration of technology into their classroom.

Theoretical Foundation

The term, first-order and second-order change, was derived from Cuban (1988, 2013). First-order changes are "reforms assume that the existing organizational goals and structures are basically adequate and what needs to be done is to correct deficiencies in policies and practices" (Cuban, 1988, p. 228). Cuban defined fundamental change as basic building blocks of goals and structures established and defined for the public-school system and changing them means altering funding, governance, curriculum, and instruction. When these building blocks are altered (e.g., providing vouchers, choices for students to attend charter schools, changing the school curriculum, changing from teacher-centered to student-centered pedagogy), these fundamental changes are considered second-order changes. Second-order changes involve what ought to be and are different from what is embedded in the existing school organization.

Incremental changes were referred to as amendments to current school structures that do not require the removal of the core components of the school structure. This type of change is called first-order change. Examples of first-order change are: creating new academic courses, extending the school day or year, reducing the class size, raising teacher salaries, etc. These first-order changes do not change the basic school structure but correct deficiencies and enhance the existing structure. These types of planned changes vary in their approach and effect on teachers and students.

Cuban's (1988) first-order and second-order change and Brickner's (1995) first order and second-order barriers served as the theoretical foundation for this research. Research Question 1 asked the participants about the first-order barriers to change, while Research Question 2 asked the participants questions relating to second-order barriers to change. The data from these two questions provided me with information about the degree and nature of computer use in classrooms and allowed me to explore the effects of first- and second-order barriers to change. Research Question 3 asked what type of barriers teachers face and whether these barriers hinder them from technologically preparing their students to be 21st century professionals. If teachers have perceived barriers toward technology integration, I wanted to determine if these perceived barriers affect teachers' self-efficacy limiting their incorporation of technology into their classes. These barriers included teachers' beliefs about using technology in their classroom, the teachers' time schedules, inadequate infrastructure in the school, consistent replacement of software and machines, servers crashing, and lack of technical support.

Based on Brickner's (1995) first-order and second-order barriers to change, Ertmer (1999) applied the first- and second-order barriers to the integration of technology in the classroom. Brickner described first-order barriers as "obstacles which impede the effective implementation of a projected change or innovation" (p. 6). First-order barriers are extrinsic in nature and require a "technological quick fix" for the change to occur, and hinder the implementation of a projected change (e.g., lack of updated software or lack of computer access). Ertmer (1999) claimed that second-order barriers can range from personal fears to organizational and pedagogical concerns. Second-order barriers are "obstacles which impede the effective implementation of a projected change or innovation," these barriers are intrinsic in nature and internal to the teacher (e.g., fear of computers or feelings of insecurity using computers (p. 6). Teachers do not want to admit these barriers exist. Students in K–12 schools today have access to computers, laptops, smart phones, and other technology but are still getting classroom lessons that are paper based (e.g., tests, quizzes, worksheets), which shun the use of current technologies. Cuban, Kirkpatrick, and Peck (2001) noted these deeply embedded factors form barriers that deter the use of technology in the classrooms or changes in teaching practices.

Cuban (2013) asserted that reformers sought to change the student classroom to be student centered and that provided intellectually demanding pedagogy that engaged children in academic content and led to their acquiring social and intellectual skills through improved teaching. These efforts were considered as incremental, first-order change that left the current teaching routines and pedagogy intact. Despite technological advances, fundamental structural changes have done little to answer questions teachers have regarding technology and learning. For example: Will laptops motivate my students? Do these new technologies require me to gain knowledge and skills that are connected to what the state and district expect me to teach and what students need? Will my students learn better and more than they do now? (Cuban, 2013, p. 116). Therefore, teachers will not support or make changes in their classroom unless they are sure their students will learn while using the technology. First-order barriers as described by Brickner (1995) were easier to identify than second-order barriers because second-order barriers are usually hidden within first-order barriers. These explanations are not mutually exclusive, but need to be taken into consideration by administrators when making assumptions about the lack of technology use within the classroom.

When it comes to using technology in the classroom, it is important to unlock student access to certain websites, while at the same time monitoring students when on those websites. Jacobsen, Clifford, and Friesen (2002) asserted that computers in schools are “secured, standardized, preconfigured, and completely locked down” (p. 365). This is one of the reasons computers are not being used extensively in the classroom. Unlocking student access to websites for research will give students experience using computers while being engaged with the material. Another reason computers are not used is due to technology not being seamlessly used to think and learn.

A plan needs to be developed for teachers and students to have access to computers in classrooms and labs to prevent inequities (O'Donnell & Dooling, 2000). Davies and Linton (as cited in Davies, 2011) stated, "while most education practitioners value technology, many researchers and school administrators are concerned that technology is not being integrated into classroom instruction as much as theory suggests it should" (p. 46). The problem that arises from this expectation is the fallacy that adopting and using technology provides empirical evidence that someone is technologically literate. To qualify as technologically literate, per Davies (2011), requires "the ability to effectively use technology (i.e., any tool, piece of equipment or device, electronic or mechanical) to accomplish required learning tasks" (p. 47). Technologically literate people make decisions about when to use and how to use technology, what technology can do, and are able use technology proficiently.

The implementation of computer use in a teacher's classroom requires teachers to change their instructional practices, which may sometimes be difficult for them to accept. Moore-Hayes (2011) identified a link between teacher self-efficacy and their perceptions of their ability to provide meaningful educational experiences for students while engaging in and experimenting with new and innovative strategies using technology. However, there is a trend of teachers lacking confidence in using their ability to think outside the box with technology and the curriculum. Teacher efficacy is defined as a teacher's beliefs about their capability as a teacher (Penuel, 2006). Smith (2011) emphasized, "The fundamental challenge facing modern educators . . . to engage students in meaningful learning and help them as they grow" (p. 73). Teachers' perceptions about using educational technology and their ability to integrate technology into teaching impacts their self-efficacy beliefs regarding technology (Levin & Wadmany, 2006; Moore-Hayes, 2011; Pierson & McLachlan, 2004; Wang, Ertmer, & Newby, 2004). Teacher beliefs about technology integration directly affect their use of it in the classroom.

Teacher beliefs serve as a filter for their prioritization of what software applications to use when they do use technology. Chen (2008) confirmed that teachers need to believe technology will help them attain higher-level learning goals. Ertmer (2010) asserted that when teachers incorporate technology into their classes, there is a direct link between their beliefs and their contextual factors (e.g., their interpretation of proposed school policies, school culture, training, availability of appropriate equipment, and integration examples). This link may cause discrepancies when they undertake technological innovation, because teaching with technology is a "complex, ill-structured task" (Harris & Koehler, 2009, p. 62). These inconsistencies will require educators to be adaptable and creative in their use of technology when engaging students in activities of problem-solving, critical thinking, and collaborative learning. Davies (2011) confirmed that "the challenge for educators is to understand how best to teach with technology while developing the technological expertise of their students" (p. 45). Aligned with this inconsistency are barriers, factors surrounding those barriers, and concerns regarding the self-efficacy to implement technology effectively into their classrooms.

Based on Ertmer's (1999) research on first- and second-order barriers-to-change, there is evidence that computers have not brought about a revolution in teaching or in the school organizational structure. Educator access to technology has increased over the years, and in some cases, has reduced or eliminated first-order barriers. In this study, I used Ertmer's (1999) research to determine whether high school educator's first-order barriers are prevalent and hinder them from integrating technology into their classroom and whether teachers can identify any second-order barriers they may need to address to minimize any first-order barriers.

School administrators, school board members, and policymakers often have less experience with technology and are unable to provide strong leadership when it comes to supporting the necessary changes needed to have technology infused into the curriculum. Many school board members and policy makers have only a vague idea of what teachers are thinking or of teachers' daily classroom practices. To compound the issue, the movement to hire administrators (e.g., district superintendents) that are noneducators is on the rise in large cities. For example, ex-U.S. Army Generals Julius Becton in Washington, DC and John Stanford in Seattle. Although these administrators and policymakers have sat in a classroom, they have not taught in a public-school classroom, but they are still making decisions based on what they think should happen in the classroom (Cuban, 2013). School administrators could foster a culture of technology use by using technology. They should lead by example (e.g., communicating with staff via e-mail and demonstrating the use of presentation software to the faculty). If administrators learn to effectively use technology by participating in technology training sessions, faculty may come to share their leader's vision. Upon identification of teachers and administrators' first- and second-order barriers, I determined whether students can use technology to think critically, collaborate, and think reflectively despite teacher barriers

Definitions

Digital competence: Students that have digital competence can use information and communication technology (ICT) creatively. "A complex competence that emerges as the sum of simple ICT skills (using software to search, locate, transform, and control information) and more advanced skills (to evaluate, interpret and analyze) digital genres and media forms to that through the creative and critical use of digital tools and media" (Voogt, Erstad, Dede, & Mishras, 2013, p. 405).

Digital divide: There are issues surrounding the digital divide in the past decade regarding equitable distribution of educational technologies in urban and rural schools versus suburban schools. Though equitable distribution of technology resources may have been provided to many of these schools, teachers that know how to use these resources in these schools are also needed. Unless this issue is addressed, the gap may increase over time. Therefore, those teachers who are likely to teach in rural and urban school settings are primary candidates to receive the needed professional development (Lawless & Pellegrino, 2007).

Digital Immigrants: Digital immigrants are those persons who were not exposed to the widespread adoption of digital technology. Prensky (2001) describes digital immigrants as: "Those of us who were not born into the digital world but have, at some later point in our lives, become fascinated by and adopted many or most aspects of the new technology . . ." (Prensky, 2001, p. 1).

Digital Natives: The new students of today, as defined by Prensky (2001), "are all 'native speakers' of the digital language of computers, video games, and the Internet" (p. 1).

Educational technology: Educational technology is a wide field and there are many definitions from different disciplines based on theoretical knowledge. For the purpose of this study, educational technology as defined by Cifuentes, Maxwell, and Bulu (2011) educational technology is: "A combination of the processes and tools involved in addressing educational needs and problems, with an emphasis on applying the most current tools: computers and other electronic devices" (p. 60). Hooper and Rieber (as cited in Ornstein & Behar, 1995) describe educational technology as "applying ideas from various sources to create the best learning environments possible for students" (p. 251).

High-speed Internet access: The term high speed internet is a marketing term used by technical people referring to Internet access and the access speed. The Federal Communications Commission (FCC) defined high-speed Internet access as, "access [to] the Internet and Internet-related services at significantly higher speeds than those available through 'dial-up' Internet access services" (Bakia, Means, Gallagher, Chen, & Jones, 2009, p. x).

Instructional technology/educational technology: The terms are used interchangeably. The Association for Educational Communications and Technology (AECT) described instructional technology/educational technology as:"a complex, integrated process involving people, procedures, ideas, devices, and organizations for analyzing problems, and devising, implementing, evaluating, and managing solutions to those problems involved in all aspects of human learning" (p. 7).

Self-efficacy: When one has self-confidence to perform. Bandura described self-efficacy as: "…a perception about one's abilities within a given domain" (Abbitt, 2011, p. 136). Abbitt described perceived self-efficacy as: "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (p. 136).

Technology: Technology is used in our lives on a daily basis. According to Ornstein and Behar (1995): Technology "By definition, applies current knowledge to some useful purpose. Therefore, technology uses evolving knowledge (whether about a kitchen or a classroom) to adapt and improve the system to which the knowledge applies (such as a kitchen's microwave oven or educational computing)" (p. 252).

Technology in education: Technology in education is developing lessons using technology. Per Ornstein & Behar (1995): "Technology in education is often perceived in terms of how many computers are video-cassette recorders are in a classroom and how they might be used to support traditional classroom activities, but this is a misleading and potentially dangerous interpretation. It not only places an inappropriate focus on hardware, but fails to consider other potentially useful 'idea' technologies that result from the application of one or more knowledge bases such as learning theory" (p. 251).

Technological fluency: Being technologically fluent means to be able to complete technological tasks quickly. Mills & Tincher (2003) defined technological fluency as: ". . . a combination of the information skills, communication skills, and technology skills necessary to function in a technological environment" (Mills & Tincher, 2003, p. 383).

Significance of the Study

The significance of this study was to explore educator perceptions of what their technological integration barriers were and how these barriers impacted high school graduates for employment within the North Carolina business sector. The school system must make sure that all students have equal access to technology regardless of student social or economic status. In 2009, the U. S. Department of Education's Enhancing Education Through Technology (EETT) program final report was compiled by Bakia, Means, Gallagher, Chen, & Jones (2009). The report discussed the goals of the EETT as a part of the *No Child Left Behind Act of 2001 (NCLB)* which targets "high-need school districts" (p. vii). The EETT was the most comprehensive federal program supporting the improvement of student academic achievement in elementary and secondary schools using educational technology (Bakia, Means, Gallagher, Chen, & Jones, 2009). The goals of the program are listed as follows:

> To ensure that every student is technologically literate by the time he or she finishes the eighth grade, regardless of the student's race, ethnicity, gender, family income, geographic location, or disability, and to encourage the effective integration of technology resources and systems with teacher training and curriculum development to establish research-based instructional methods that can be widely implemented as best practices. (Bakia, Means, Gallagher, Chen, & Jones, 2009, p. 1)

Using a formula, the EETT program was to provide funds to states to support access to educational technologies while providing technology-related teacher professional development to integrate technologies in ways that would academically prepare students (Bakia, Means, Gallagher, Chen, & Jones, 2009). In Fiscal Year 2002 through 2008, the EETT program was given approximately $3.4 billion in funding for educational technology (Bakia, Means, Gallagher, Chen, & Jones, 2009). The EETT program was a part of the No Child Left Behind Act (NCLB) of 2001 that targeted "high need school districts" (Bakia, Means, Gallagher, Chen, & Jones, 2009, p. 1) These school districts have large percentages of low-income students and have one or more schools in need of technology. These were the schools that received Title I funds (Atkins, et al., 2010).

As of January 2010, President Obama announced that more than $1.3 billion of the budget would continue to go to the Race to the Top initiative to local school districts that were committed to change and reform of their schools (Atkins, et al., 2010). The states were encouraged to adopt more challenging standards to prepare children for college and careers by using cutting-edge data systems to track a child's progress throughout their academic career (Atkins, et al., 2010). The teacher will determine what is and is not working in the classroom, and states can turn around some of their lowest-performing schools (Atkins, et al., 2010). Forty-eight states committed to instituting reforms and partnerships to develop a common set of career-ready standards in reading and math (Atkins, et al., 2010).

In March 2010, President Obama sent Congress a Blueprint for Reform of the Elementary and Secondary Education Act (ESEA), which addressed the issues created by the NCLB (U.S. Department of Education, 2010). The blueprint for ESEA put in place an accountability system that set a higher bar for high school students ready to move into college and careers. The system also rewarded high poverty schools and districts that showed student improvement using measures of progress and growth. ESEA also allowed state districts to find meaningful ways to measure principal and teacher effectiveness to ensure every classroom had a great teacher and every school had a good principal while closing achievement gaps.

This quantitative study was significant because by conducting it I addressed the gap in the literature by providing information from charter school teachers regarding their beliefs and perceptions relating to barriers integrating technology and their self-efficacy integrating technology into their classrooms. The results of this study also provide information to assist charter schools with determining the issues hindering teachers from moving forward with incorporating technology into their classrooms. I would like to use the results of this study to work with schools and businesses. This action could lead to providing administrators and teachers with additional information on how to improve professional development for teachers with integrating technology into their classrooms and also provide teachers with opportunities to develop their skills in effectively integrating technology into their classrooms, thereby providing students with pedagogically sound ways to use technology in their classroom.

Since high school graduates will be consumers of the higher education process and will be future workforce participants, they must be skilled in the use of various Internet technologies and software. Friedman (2007) in the book, The World is Flat delineated, "The international economic playing field is level," (p. 270) evoking the metaphor: the world is flat. In the book, Friedman asked the educational question, "Have we been preparing our children for the world they will live in?" (p. 270). Friedman answered the question by stating, "The American education system from kindergarten through twelfth grade is just not stimulating enough for young people to want to go into science, math, and engineering" (p. 275). The responsibility of public education is to ensure students have equal access to technology and technology-based support for their academic success. This should be especially true in schools where economically disadvantaged students are expected to achieve high academic standards equal to their counterparts. Friedman expounds on technology education in the United States by saying:

> Because it takes fifteen years to create a scientist or advanced engineer, starting from when that young man or woman first gets hooked on science and math in elementary school, we should be embarking on an all-hands-

> on-deck, no-holds-barred, no-budget-too-large, crash program for science and engineering education immediately. The fact that we are not doing so is our quiet crisis. Scientists and engineers don't grow on trees. They have to be educated through a long process, because, ladies and gentlemen, this really is rocket science (p. 275).

In the United States, public schools are responsible for producing technologically literate students prepared to succeed in an information/technology-based society (Prensky, 2012). The aim of this study was to document whether high school students are technologically adept enough to help businesses compete to gain and keep a competitive advantage in the United States and whether they are prepared to excel in their college careers if that is the road they choose. The significance of my study in relation to the management field concerns the role of school administrators and their support of technology integration. Teachers are held accountable to integrating technology into their classes. However, if they don't have up-to-date resources, computers, technical support, time, or the skills to help them to achieve this goal, principals and administrators need to set the climate in their schools of promoting effective technology integration. Principals will need to model, encourage, and support the use of technology in their schools. Some examples of modeling, encouraging, and supporting teachers would be for them to attend technology conferences to see what other teachers and schools are doing to integrate technology. Administrators could also provide incentives for teachers in the way of time for teachers to experiment with technology. Principals could purchase computers for the teachers at the end of the school year and tell them to experiment with integrating technology into their classes during the summer. School leaders could also provide professional development opportunities for the teachers to offer brown bag lunch sessions integrating technology.

Social Change

Social change resulting from this study could lead to providing administrators with additional information on how to improve teacher's professional development integrating technology into their classrooms. Another benefit could be that businesses could provide funding to high school teachers and students for additional training on the use of digital technologies. This type of funding could lead to students acquiring skills to work with companies in the United States. Funding could support teacher access to professional development courses to help them pedagogically integrate technology into their classrooms—a win-win situation for businesses, teachers and students. Additionally, software companies may be willing to provide educators with training to enable them to develop and align their technological/pedagogical knowledge to current business practices, while addressing any possible barriers or self-efficacy issues. The findings from this research could lead to the implementation of a school workforce technology development summer program for high school juniors and seniors to ensure they are prepared to meet the required workforce standards.

Summary

High school graduates will be consumers of higher education processes and future workforce participants. They will need to be skilled in the use of various software and Internet technologies. Bybee and Starkweather (2006) concede that, "technology is one of the disciplines identified as a major factor influencing economic progress" (p. 27), and education is one avenue to help resolve the problems of this quiet crisis. The U.S. Department of Education (2002) mandated that student's technology skills need to be developed to be productive citizens.

In Chapter 1, I introduced the study, which focused on barriers charter high school teachers face and their perceived barriers of integrating technology into their classrooms. The background of the problem provided a glimpse of how technology has affected society, the impact it has on business and education, and how important it is for teachers to educate our children to be technologically literate and globally competitive.

I provided information from research conducted by the U.S. Department of Education (2010), The Secretary's Commission on Achieving Necessary Skills (SCANS) Report (2000), a survey completed by Lowther, Inan, Stral, and Ross (2008) discussing the importance of integrating technology into the classroom to help students become successful in the workplace and school. The problem statement, research questions and hypotheses along with the theoretical framework for this study is based upon Cuban's (1988), Brickner's (1995), and Ertmer's (1999), first-order and second-order barriers to change. First-order barriers are extrinsic meaning that teachers may have lack of access to computers and software, insufficient time to plan instruction using technology, inadequate technical support; may feel alienated about securing additional resources (e.g., obtaining additional professional development to increase their technology skills). Second-order barriers are intrinsic and confront the teacher's fundamental beliefs about their current practices and the teacher becomes willing to change by obtaining additional professional development to increase their computer skills, develop work arounds to address technical issues (e.g., have the students assist with locating the issue), find ways to make time for the integration of technology. The important aspect is that teachers recognize their need to understand the difference between the type of barriers (extrinsic or intrinsic) they experience.

The importance of teachers understanding extrinsic and intrinsic barriers about themselves is for them to become better at engaging their students in using technology and allowing students to become actively engaged in the learning process as well. Teachers are the key to the change process (Ertmer, 1999). When teachers feel empowered, they are more likely to use technology to facilitate teaching and learning. The importance of the current study was to survey charter high school educators to decide if they are affected by first or second order barriers, and if they perceive their students are affected technologically by those barriers.

I will discuss my literature search strategies and the importance of technology integration in education in Chapter 2. I provide a historical background of technology being introduced into education for improving science and math achievement in public schools. Thus, technology in education has evolved to ensuring students are technologically prepared for the workforce. As graduates, students can develop a company or help organizations they work for create and keep their competitive advantage. I defined technology integration and its purpose. I discussed the Technology Acceptance Model (Gone, Xu, & Yu, 2008; Teo, 2011), first and second order barriers, educator perceptions, beliefs, and self-efficacy about technology integration, technology and student learning, and the 21st century workforce.

Chapter 2: Literature Review

In this study, I researched if charter school educators faced technological barriers hindering them from incorporating technology into their classrooms, if they encountered self-efficacy issues integrating technology in their classes, and if they believed their students were globally competitive as 21st century professionals. In this literature review, I will address topics relating to my research, such as technology integration; technology integration barriers; first and second-order barriers; areas where teachers face barriers using and integrating technology (such as availability and accessibility, funding, administrator support, technical support, and time constraints); successful integration of technology; teacher perceptions, beliefs, and self-efficacy; and the 21st century student, technology, and student learning; and the 21st century workforce. These underlying themes that run through the literature reflected the purpose of this study--the need to assist teachers to be successful integrating technology into their classrooms and better preparing their students to become 21st century professionals.

Literature Search Strategy

I searched scholarly literature using the Internet and the following online databases accessed through the Walden Library: Academic Search Premier, Computers and Applied Sciences, Education Research Complete, Educational Resource Information Center (ERIC), and Ebrary. I also used the search engine, Google Scholar, which linked to the Walden Library. In these databases and search engine, I searched for peer-reviewed articles and professional journals to provide support for my research. A search for articles related to barriers to technology integration, teacher self-efficacy, and student technological preparedness as 21st century professionals caused me to review additional resources, such as government manuscripts from the U.S. Department of Education and the U.S. Department of Labor, to address the above topics. For example, the U.S. Department of Commerce conducted a survey involving 55 industry sectors in 2003, and education was ranked as the least technology intensive enterprise. Another study of over 400 employers indicated that U.S. high school graduates entering the workforce were lacking the necessary knowledge and skills needed for successful careers (Lowther et al., 2008). I will begin this literature review by addressing the importance of integrating technology in educating and addressing issues related to technology integration.

Technology Integration—Definition

Though there are multiple, but no clear definitions for technology integration, I compiled many technology integration definitions to show their nuances. For example, Wachira and Keengwe (2011) define technology integration as "technology being incorporated into all aspects of learning, specifically objectives and assessment of learning outcomes." Another definition of technology integration by Belland (2008) is the "sustainable and persistent change in the social system of K–12 schools caused by the adoption of technology to help students construct knowledge" (p. 354). Still others consider technology integration as "technology being used by teachers to develop students' thinking skills" (Hew & Brush, 2007; Lim, et al., 2003). The Office of Technology Assessment (as cited in Baylor & Richie, 2002) stated, ". . . it is becoming increasingly clear that technology, in and of itself, does not directly change teaching or learning.

Rather, the critical element is how technology is incorporated into instruction" (p. 401). When technology is successfully implemented into instruction, it is because it is presented to the teacher as a tool to use to support the teacher's instructional methods. [Name the theory or theories. Provide origin or source of the theory. Describe major theoretical propositions and/or major hypotheses, including delineation of any assumptions appropriate to the application of the theory.

Historical Background

> *How a country responds to economic and technical change—whether its response will be strong or weak—depends on how the country integrates learning within its employer institutions (*Carnevale, Gainer, & Meltzer, 1990, p. 14)

Schools in the United States have operated on a factory model to create obedience and competence, by seating students in rows individually while completing assignments; forcing them to memorize their work; and not allowing students to question authority. Schools have remained unchanged since the early 1900s (Morrison & Lowther, 2002). The education process of reform to break away from the factory model of education was not questioned until the publication of *A Nation at Risk: The Imperative for Educational Reform*.

In 1958, Congress passed the National Defense Education Act to improve science and math achievement in public schools (Morrison & Lowther, 2002). The first effect of this act placed overhead projectors in most, if not all P–12 classrooms. In 1962, programmed instruction and educational television were introduced. In the early 1980s, some microcomputers appeared in the classroom. During the 1990s, state and federal initiatives were established to place more computer technology in P–12 classrooms in the hope technology would solve our problems (Morrison & Lowther, 2002).

Americans rely on scientists and engineers to arrange for mass production and technology, managerial, supervisory, and white collar professionals to achieve and maintain low production costs and wide dissemination of products. The United States had a competitive advantage during early stages of new product development and technologies. However, the United States does not fare well when it comes to sustaining this competitive advantage (Morrison & Lowther, 2002). Nonsupervisory skilled and craft workers' need for better skills has presented a major challenge for this sector of the workforce and caused the United States to lose competitive advantage (Morrison & Lowther, 2002). The challenge for American educators and employers is to focus innovation on nonsupervisory employees and not on white collar and technical elites (Morrison & Lowther, 2002). Nonsupervisory employee's workforce is filled with high school graduates (Morrison & Lowther, 2002).

Young people as workers must achieve basic workplace and competency skills to obtain and then keep a job. Per the SCANS report, stated: "more than half our young people leave school without the knowledge or foundation required to find and hold a good job" (p. xv). The current economy and its demand for labor will create opportunities for a less skilled workforce (Carnevale, Gainer & Meltzer, 1990). Employers will need to fill the skill gap and build, from within, their employees' workplace competency skills (Carnevale, Gainer & Meltzer, 1990). Carnevale, Gainer and Meltzer have much to say about the importance of high school students having the skills and knowledge to use technology to fill the skill gap. The link between the need for students to develop workforce skills and the competitive cycle is the need for them to have problem-solving skills to overcome barriers when faced with new situations. They need to be technically adept, creative and innovative, able to work in teams, as well as have a sense of self-worth while setting and meeting goals. Carnevale et al. (1990) suggested when employees can listen and communicate their thoughts clearly and recognize when and how to assume leadership roles, this allows the organization to produce products and deliver services while maintaining efficiency and quality. If these skills are developed in students while they are in school, this may help the organization create and keep its competitive advantage.

At all levels of the organization, the employer role has expanded due to increased technological innovations. Carnevale et al. (1990) suggested this could have either a positive or negative effect on efficiency, quality, and innovation. Technical changes in jobs create basic skill requirements and may do so to the point of creating new occupations. For example, Carnevale et al. distinguished that a machinist may become a technician, a secretary may evolve into an information manager, or a bank teller into a financial services consultant. Technology is increasing the range of skills needed to perform most jobs. Changes in the economy have resulted in changes in business institutions businesses have become more decentralized and their institutional hierarchy flattened, which causes employees of that institution to need higher levels of interpersonal, organizational, negotiation, and teamwork skills (Carnevale et al., 1990).

Therefore, students will need to develop these basic workplace skills to be able to apply them on the job.

Education in relation to on-the-job learning can increase earnings by as much as 30% Sharpe (2005). Academic preparation can increase an American's lifetime earnings between 10 and 13% Sharpe (2005). However, those with a high school diploma and 2 years' formal education has a 20% greater chance of securing on-the-job training, and those with a college education have a 50% greater chance (Sharpe, 2005). Moursund (as cited in Sharpe, 2005) pointed out that there are basic goals of education, and the future of technology could help solve education-oriented problems. Computers could also help solve education-oriented tasks. Moursund advocated that students' goals are to learn problem-solving, learn to learn, and gain an understanding of computers and information science as a part of the core content within each discipline they study. Sharpe (2005) confirmed that students will develop a broad-based fluency in computer tool knowledge and skills while teachers would become more competent. Before going into the discussion of educators' barriers, it is important that I define technology integration.

The Importance of Technology Integration in Education

Since the global economy is driven by technological innovation, it seemed apparent to me that the education system would need to make adjustments within the school curriculum to achieve higher levels of technological literacy. K-12 education in the United States must play a significant role in reaching this goal. In their research, Bybee and Starkweather (2006) provided recommendations for K–12 science and technology education for various segments of the K–12 systems. However, in all their research, they did not find any specific discussion about technology education. The authors believed that the subject of technology education should be viewed as fundamental to achieving workforce competencies in students, such as technology skills, critical thinking skills, solving semistructured problems, and reasoning. The major goal for education is to prepare students for a 21st century workforce.

Bybee and Starkweather (2006) proposed that educators need to reach the goal of preparing a 21st century workforce by requiring higher levels of student achievement, which would require long-term changes in educational policy, school programs, and classroom practices. In Table 1, Bybee and Starkweather synthesized their research in relation to the themes that developed during their research. The common themes that arose in their research at the core of science and technology education were: "high quality teachers, rigorous content, coherent curricula, appropriate classroom assessments, and general accountability aligned with our most valued goals" (p. 29). Educators direct their efforts regarding technology education on the most pressing contemporary challenges and develop improvements to address those challenges. Per Bybee and Starkweather (2006), "Policies, programs, and practices should address: workforce competencies, career awareness, equity issues, and technology, as well as science and systemic alignment" (p. 29). Table 1 shows the types of policies, programs, and practices high-quality teachers incorporate and implement into their teaching practices.

Table 1

Themes and Initiatives for the Purpose of Advancing Reform to Improve K–12 and Teacher Education

High Quality Teachers and Teaching	
Purpose:	Programs:
Teachers have adequate knowledge and skills to improve student achievement in technology.	* Resources and support are allocated for continued professional development. * Professional development is aligned with curricula and assessment. *Opportunities for technology teachers to work in business and industry.
Policies:	Practices:
* Districts hire technology specialists for elementary schools. * Districts have qualified technology teachers for secondary schools. * Differentiated pay for qualified technology teachers.	* Teachers incorporate skills and abilities in their teaching. * Teachers incorporate technology concepts in the curriculum. * Teachers incorporate awareness of technology-related careers. (table continues)

Purpose: Curricula have engaging, challenging, and relevant content based on the technology standards.	Programs: * Districts adopt and implement instructional materials appropriate for elementary and secondary schools. * Districts implement an evaluation program to determine the effectiveness of technology curricula.
Policies: * Districts develop adoption criteria for high-quality curricula. * Districts provide materials, equipment, and facilities for curricula. * School boards, administrators, and parents learn about technology curricula.	Practices: * Teachers implement curriculum materials with high fidelity. * Teachers receive feedback on their use of materials. (table continues)

High Quality Assessments and Accountability

Purpose: Assessments incorporate 21st century workforce knowledge, skills, and abilities.	Programs: * Assessment results are available at classroom, school, and district levels. * Professional development for school personnel to understand assessment results and make instructional decisions.
Policies: * Require use of "short cycle" tests that align with state assessments. * Districts use assessment data to monitor and adjust curricula, professional development, teaching, and testing.	Practice: * Teachers and administrators use assessment data to identify needs for improvement across the system.

Technology education has an important role to play in American education in relation to the global economy. The omission of technology programs in the K–12 curriculum affects business and industry because it creates a deficit of competent and capable 21st century ready workers. Students lacking necessary skills to become knowledge-based workers will cause a negative ripple effect on the workplace and society. When technology in the workplace changes, it affects every area of society: government, education, profit and nonprofit organizations, retail, sales, and communication companies. It is imperative that K–12 classrooms change and adapt to keep up with fast-paced technological changes in society. In the next section, I will discuss the historical background of technology integration.

Purpose of Technology Integration

Technology being integrated into teaching and learning could assist students to become more productive. Having access to technology does not mean that students' academic abilities will change dramatically, but technology should be used to provide students with opportunities to enhance their performance. According to Bakia, Means, Gallagher, Chen, and Jones (2009), technology integration can take on a variety of forms. Variety includes:

> "assessments embedded in computer-based activities; administrative software for teachers; computer-based lesson plans and assignments that could be available anytime and anywhere; research-based educational software for students; distance education; and a plethora of other tools and resources available online or offline" (p. 4).

Technology integration in current literature includes digital elements such as the use of computing devices (e.g., desktop computers, laptops, handheld computers, software, or Internet) in K–12 schools for instructional purposes.

These digital elements according to Papert (as cited in Blikstein, 2013) are protean, versatile, and usable in different ways. They are also unstable (change often) and opaque (the inner workings are hidden from users), which from an educator's perspective presents new challenges in the classroom and has a major effect on teaching and learning. I would be remiss if I did not discuss the Technology Acceptance Model (TAM) to determine what causes people (in this case teachers) to use or not use technology. TAM will be discussed in relation to users' perceived use and ease of use when it comes to using technology. Ajzen and Fishbein (1977) argued that a user's response toward an object has bearing on their overall perception about that object. In other words, the user's behavior is determined by the intention to perform that behavior. That user's intention is his/her attitude toward performing the behavior.

Technology Acceptance Model

Figure 1 shows The Technology Acceptance Model (TAM) developed by Davis, Bagozzi & Warshaw (1989) who theorized that a user's technology usage is determined by the behavioral intentions of the user to use a system. There are two beliefs posited by TAM, perceived usefulness and perceive ease of use to computer/IT acceptance behavior (Gong, Xu, & Yu, 2008; Teo, 2011). Perceived usefulness is defined as the user's belief that using a system or application would improve his/her job performance. From an organizational perspective, employees are motivated by raises, promotions, bonuses, and other reward factors (Davis, 1989; Compeau, Higgins, & Huff, 1999).

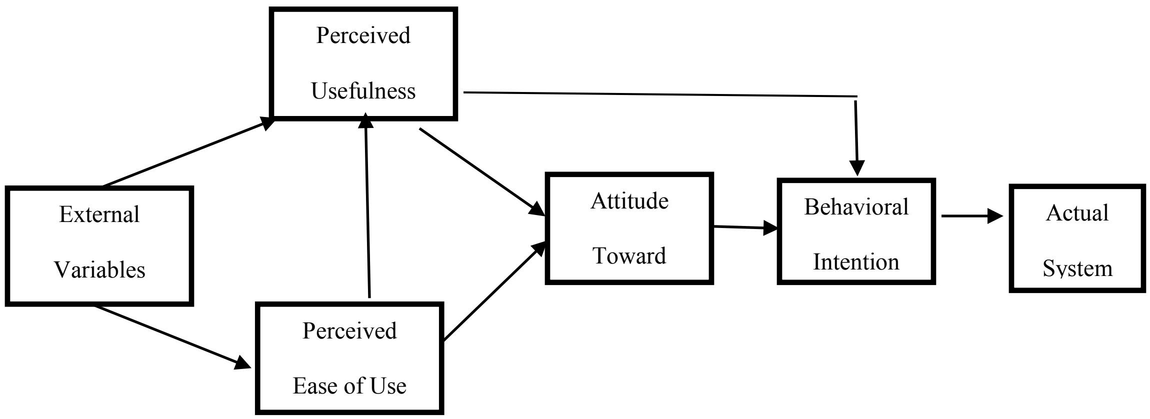


Figure 1. Technology acceptance model (Adapted from Davis, Bagozzi & Warshaw, 1989)

Perceived ease of use and external variables such as system features, training, documentation, and user support are the major determinants of the users or whether the user believes using a particular system would be easy to use or free of effort. In their expectancy-value theory, Ajzen and Fishbein (1980) explained that external variables influence a person's beliefs about outcomes associated with executing a behavior, which shapes the person's attitude in performing that behavior. This idea was also present in the TAM when it comes to understanding the attitude a person holds when using technology. The attitude construct in TAM represents the attitude toward the behavior of using technology.

Ease means freedom from difficulty (Davis, Bagozzi, & Warshaw, 1989). With all things equal, ease of use means if one system is easier to use, the person will be more likely to use that system. Robey (as cited by Davis, Bagozzi, & Warshaw, 1989) theorized that if a system does not help the person perform his/her job effectively, then that system will not be viewed in a positive manner no matter how that system is implemented. However, the TAM model presents that the user's attitude toward using technology is determined by the perceived usefulness and the perceived ease of use, which in many technology acceptance studies seem to prevail with user's intent to use technology (Davis, Bagozzi, & Warshaw, 1989; Teo, 2011). The TAM model targets the relationship between users perceived usefulness and perceived ease of use when using technology.

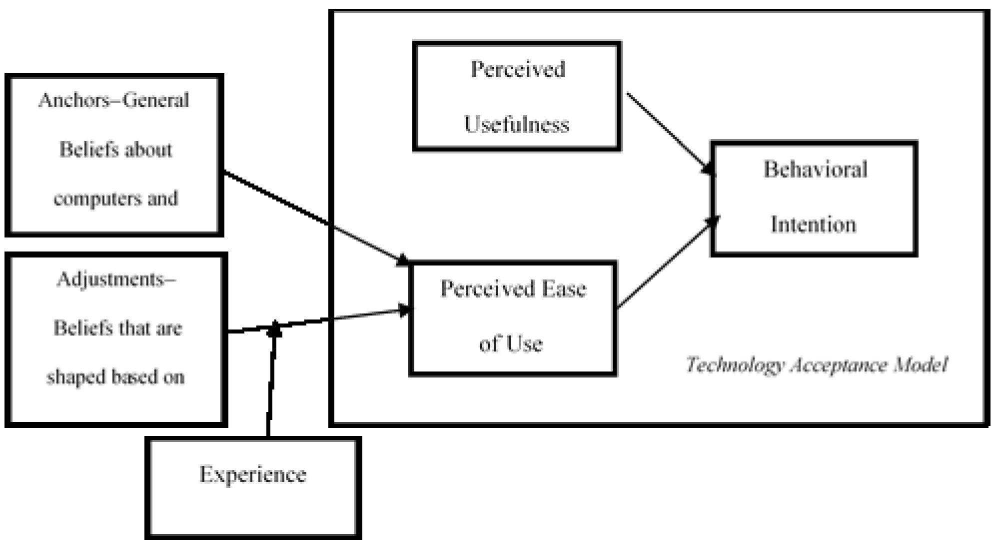


Figure 2. Theoretical Framework for the determinants of Perceived Ease of Use

In the TAM model, perceived usefulness was theorized to have a direct effect on perceived ease of use. Wixom and Todd (2005) examined the external variables of the TAM that they described as antecedent to or moderating the influence of ease of use and usefulness of the TAM described as personality traits and demographic characteristics.

The TAM was criticized by Venkatesh (2000) for its prudence. In addition to the generic TAM model, Venkatesh (2000) stated that Davis failed to include the user's attitude toward using a technology due to the weak impact that beliefs had on intention by attitude, and the strong direct link between perceived usefulness and behavioral intention. The weakness of TAM does not provide system designers with the information necessary to create user acceptance for new systems. Wixom and Todd (2005) confirmed "Nor does it explain acceptance in ways that guide development beyond suggesting that system characteristics impact ease of use" (p. 344). Another limitation regarding ease of use and usefulness was stated by Wixom and Todd alluded to the fact that designers receive feedback in the general sense but they do not receive actionable feedback about the important aspects of the IT system itself in terms of flexibility, integration, etc. The authors expound on the importance of user satisfaction and technology acceptance, which will not be discussed in this research.

Venkatesh (2000) added to the TAM (see Figure 2), specifically to the perceived ease of use. Before users have direct experience with the system, they are expected to anchor their perceived ease of use to the new system to their general beliefs about computers and using computers. As the users gain more experience with the system, the users are expected to adjust their perceived ease of use to reflect their interaction with the system. Venkatesh specified that anchoring and adjustment is supported by empirical evidence that when the user does not have direct contact with the new system, the user's perception regarding ease of use is not distinct across various new systems.

During the early stages of the user's experience with the new system, there is a set of common determinants for system specific ease of use. The initial anchors for system-specific perceived ease of use of a new target system is expected to be based on the individual's prior experience with computers, software, and other systems within the organization. Compeau and Higgins (1995) supported this line of thinking by stating that before users have hands-on experience with the target system, general computer self-efficacy is a strong determinant of perceived ease of use. Teacher self-efficacy will be discussed in a later section in this chapter. Since technology integration has been defined and is important in the classroom, it is important to identify any technology integration barriers teachers may face.

Technology Integration Barriers

According to national surveys and reports, Cuban (2001) noted technology leaders made up a small portion of school faculties. These early adopters of technological innovation differed greatly from their colleagues in their frequency of computer usage in their classrooms and in the way they teach. Cuban stated that, "Teachers and senior high school students across the country report they use machines mostly for word processing" (p. 72). Across the country, teachers and their students are nonusers or occasional-to-rare users of these technologies in their classroom.

Technology integration is more than using the computer as a tool. Morton (as cited in Dias, 1999) suggested that technology integration is not viewing the computer as a tool because it promotes the notion of the computer as an "add on" (p. 11). For example, taking students to the computer lab once or twice a week is not technology integration. Ertmer, Ottenbreit-Leftwich & York (2007) indicated teachers that have access to computers and support may not integrate technology in meaningful ways. Dunleavy, Dexter, and Heinecke (2007) affirmed in one-to-one computing classrooms, educators have found an increase in management problems in their workload, issues linking laptop use to learning outcomes and standards, limited desk space, short battery life, software deficiencies, data loss, and unreliable Internet access.

Other constraints included computers housed in labs or media center, negative attitudes toward computers, and change. Clark (2006) contributed to these factors by asserting that the lack of progress integrating technology is because of limited up-to-date hardware, software, limited infrastructure and lack of technology support staff, ineffective integration of technology into the curricula, lack of computer capability, and lack of staff development. However, on the opposite end of the spectrum, McCain (as cited in Ertmer, 2012) stated:

> "the use of technology in the classroom is not the critical issue facing education in the 21st century. Rather, the issue of foremost importance is to develop thinking skills in our students so that they will be able to utilize the power of technical tools to solve problems and do useful work" (p. 424).

Once students can develop their thinking skills, they will be able to utilize technology to communicate, collaborate, and solve problems like professionals do.

However, government officials and educators advocate the need to emphasize technological skills so students will be able to use technology as a tool to communicate, conduct research, and solve problems (Hew & Brush, 2007). Technology cannot be used to replace critical thinking and problem-solving but the appropriate use of computer tools is, however, primary to effective learning (Elliott & Hall, 2002). Since technology has become an integral part of business, it seems that it should also play an equally important role in education; therefore, barriers must be identified and addressed.

First- and Second-order Barriers

There are two types of changes in the U.S. schools that Cuban (1986) discussed in *Teachers and Machines: The Classroom Use of Technology Since 1920*: fundamental and incremental. Cuban (1988) described incremental and fundamental changes, or first- and second-order change, as applied to school reform. Incremental changes, or first-order change, are reforms that assume the existing organizational goals focused on improved efficiency and effectiveness within the existing environment without disrupting the basic organizational structure (e.g., classroom instruction). These environments were sound but needed improvement to become more effective and efficient. Fundamental changes, or second-order changes, are those that required restructuring of a system. Cuban defined second-order change as transforming the organizational structure because the entire structure is defective at the core. The focus of the change seeks to transform the systems mission and goals as well as the roles and responsibilities of those who work in the system. Cuban mentioned that he obtained the terms “first-order” and “second-order” change from Watzlawick *et.al.,* (as cited in Cuban 2013).

Examples of fundamental or second-order change are: creating open classrooms (informal education) or giving vouchers to parents to use in choosing a school. These types of change involve visions of what ought to be different from the way they are currently (Cuban, 1988). As described above, Cuban distinguished the difference between first- and second-order change relating to school reform. His explanation about first- and second-order change does not mean he favors one over the other, but showed his involvement with the various types of change.

Brickner (1995) reported the evolution of first- and second-order barriers to change developed from change theories posited by Cuban. Brickner defined first- and second-order barriers as they related to teacher training on using the computer as an instructional tool. First-order incremental change applied to computer implementation is extrinsic in nature. These external changes include “access to computers, software availability and quality, planning time, and technical support” (p. 38), which could be resolved through a technological fix. Brickner posited that first-order change was a process that occurred incrementally and teachers could implement computers into their curriculum if they proceeded through the process one step at a time.

The way the change occurred would be through persistence, fortitude, and time. Unfortunately, the first-order barrier does not consider teacher anxiety (second order barrier) when going through the implementation process. Anxiety is intrinsic and may be grounded within the teacher, which is a fundamental issue for the teacher because the teacher must think about effective teaching methods and the best way to use the computer as an instructional tool. Anxiety overcome by persistence, fortitude, and time may change the teacher’s epistemological and pedagogical beliefs because the teacher’s role would be that of a facilitator instead of as a knowledge source (Brickner, 1995). The teacher then becomes a learner along with the students.

This may cause the teacher to be affected subconsciously and may affect their efforts in implementing computers in their classrooms.

The major hypothesis identified by Brickner was a teacher's degree of computer use versus teacher gender. Brickner's research showed that teacher age, education level, and years of teaching experience had no relationship to teacher's use of computers during instruction. As a part of Brickner's research a series of six Technology Implementation Project (TIP) workshops was offered for teachers, and the workshops were effective in assisting teachers in their computer implementation efforts. Teachers became more committed to implementing computer use when they knew they were not alone in their efforts. Some teachers used and implemented computers while others did not until certain intrinsic (perceived) barriers were overcome. Bricker asserted that future technology implementation will contribute to the operational definition for implementation. Those teachers who experienced second-order barriers also believed first-order barriers stopped them from using computers.

Ertmer (1999) addressed first- and second-order barriers as it related to pre-service and in-service teachers who faced barriers while they worked to achieve technology integration. Ertmer provided strategies for dealing with first- and second-order barriers to change for pre- and in-service teachers so they could become effective users of technology. Ertmer (2012) posed the following questions: Do external constraints exert the same influence over teachers' technology practices as was true 10 or more years ago? To what extent do external or first-order barriers constrain teacher integration? Fabry and Higgs (as cited in Keengwe, 2002) somewhat address

Ertmers questions regarding the use of computers. In order for computers to be used in the classroom effectively, administrators must begin to invest time, money, and resources in their faculty not just provide more computers.

Research by Hew and Brush (2007) identified 127 barriers from past empirical studies and classified them into six main categories: (a) resources, (b) knowledge and skills, (c) institution, (d) attitudes and beliefs, (e) assessment, and (f) subject culture. These barriers, though listed separately, were interrelated. These classifications seem to align with first- and second-order barriers listed by Brickner (1995) and Ertmer (1999).

I described the different first- and second-order barriers as it related to teachers integrating technology into their curriculum and the effects these barriers had on teachers technologically preparing students to become 21st century professionals. The next section discusses the types of first and second order barriers beginning with availability and accessibility of computers in the classroom.

Availability and Accessibility

Availability and accessibility refers to the technological infrastructure related to technology needed to implement technology in the classroom that should be easily accessible (Ensminger, 2008). Barriers in this category include “limited access to useful, relevant, and appropriate hardware and software, the availability of the hardware or software to teachers, and the quality of the hardware or software” (Lowther, Inan, Strahl, & Ross, 2008; Rogers, 2000, p. 459). There should also be support personnel on-site to handle possible issues or problems. Inan and Lowther (2009) pointed out that teaching practice with the integration of technology into the classroom does not necessarily improve with the increased availability of technology. For example, a New York City high school was wired for Internet access but most classrooms did not have a computer. The school had three mobile laptop carts with 20 computers on each cart for each floor in the school. One cart was shared by ten teachers and was unavailable for daily use. The computers available for daily use were in the computer lab, which required the teacher to take class time to relocate the learning environment to the computer lab if he/she wanted students to have access to the computer (Kress, 2011). To find out if teachers still experience this barrier, I will ask questions about computer access.

Access to technology was historically measured as the number of computers in a school or Internet access in a school. Bakia, Means, Gallagher, Chen, and Jones (2009) stated: in 2007 teachers in high- and low-poverty schools reported that students had high-speed Internet access in their classrooms. This information was necessary during the early stages of technology acquisition but this information does not address the "availability of technology for instructional purposes" (p. 9). Another example of technology access but lack of availability of technology to teachers and students is the case that Kress (2011) described where one New York City high school used technology seamlessly by integrating it as a means of surveillance. This negatively impacted learning because it deterred teachers from relocating to the learning environment (the computer lab). Students were brought to the lab only to type papers or create end-of-term projects, therefore technology became an add-on instead of being integrated. On paper, the school was fully wired for Internet access with a 5:1 student to computer ratio; however, ethnographically technology was not often integrated into learning. In the context of this research, there may be schools that are faced with this barrier of availability. I will not ask questions in the survey regarding technology being used as a surveillance mechanism.

Making technology available is crucial in the 21st century; however, implementing technology without taking the teacher into consideration would be futile. Chen (2013) stated that teachers realize that technology implementation is important, but stated: "the value of a computer depends upon what purpose it serves and how well it is utilized" (p. 7). Students use technology, but what about those students living in rural areas and the inner city? Are teachers in these schools trained to use technology? Bakia, Means, Gallagher, Chen, and Jones (2009) reported that teachers in high poverty districts who used technology to enhance student learning in math and English Language Learning (ELL) classes were more likely to report needing additional professional development related to the use of technology than those in low poverty schools. One of the objectives of the Enhancing Education Through Technology (EETT) program was for teachers in high poverty schools to have access to educational technology in the same manner as that of students and teachers in low poverty schools. The EETT report stated that equivalent technology access has been achieved except for the availability of laptop computers and professional development.

Buckenmeyer (2010) noted that teachers in high poverty schools had significantly less training to use technology than teachers in more affluent schools. In 2006–2007 teachers in high poverty schools consistently requested technology-related professional development (Bakia, Means, Gallagher, Chen, & Jones, 2009). The challenge for the less affluent schools was getting the teachers in the classrooms prepared to use technology with willingness to incorporate "changing technologies as they emerged" (p. 27). Other challenges teachers and students faced were the perpetuation of inequitable education. Inequitable education means students and teachers continued to lack up-to-date facilities, financial resources, hardware, and software. Other factors of inequitable education are the absence of technology initiatives due to other pressing issues such as overcrowded classrooms, teacher and administrator turnover, insufficient Annual Yearly Progress (AYP), high dropout rates, curriculum reforms, and school safety (Kress, 2011). Although the student-to-computer ratio has dropped, and more students have access to an Internet-connected computer, there are no guarantees that teachers have easy access to the resources or to a supportive school administration. The next barrier that arises is funding.

Funding

In many schools, funding may be an issue contributing to the lack of technical support, hardware and software purchases, and teacher technology integration. Rogers (2000) proposed that inadequate funding may reflect an individual choice by the administrator to allot funds to areas other than technology. Maintaining up-to-date software can be expensive and schools cannot always afford to purchase updated software (Chen, 2013). If the teacher is not a part of the software selection process, the appropriate software may not be purchased. The cause for this may be due to an administrator's attitude toward technology instead of student needs.

Administrator Support

Not all administrators are supportive of technology integration but want teachers to be as competent as possible using technology. Bauer and Kenton (2005) affirmed: “unless administrators take the lead and make a difference, schools will continue to lag behind other sectors in society” (p. 539). Administrators need to consider the importance computers play within the structure of the school’s curriculum and allow teachers to be trained. Training is not the only factor that has to be considered for teachers to incorporate technology into their curricula, but support is also important. Koehler and Mishra (2009) acknowledged that institutional contexts are often unsupportive of teacher efforts to integrate technology into their classrooms. Teachers often do not have adequate digital technologies for teaching and learning.

Lack of adequate support for the use of Information and Communication Technology (ICT) also cause obstacles for teachers. The term support as defined by Ronnkvist, Dexter, and Anderson (1998) includes but is not limited to: “facilities, presence of support staff, personal help and guidance, professional development, and professional incentives” (p. 2). Attitudes toward technology in relation to administrator support and technology integration determine teacher roles in whether they will adopt or reject technology integration. If teachers believe the use of technology is not important, they will not use technology. Chen (2008) asserted that administrators should pay attention to teacher beliefs because these beliefs influence their decision-making processes regarding technology use.

Administrators must support teacher efforts by developing new settings in which the teacher's work will not constrain or limit their hard work (Ertmer & Ottenbreit-Leftwich, 2010). Not only do teachers have to change the way they do things within their classrooms, they must change the way they think about how they are going to incorporate technology. Brickner (1995) suggested that technology alone is not the answer to computer implementation. Koehler and Mishra (2009) affirmed that for teachers to acquire a new knowledge base is challenging, especially if it is a time-intensive activity that must fit into their busy class schedules. The teachers are often not provided with adequate training and their professional development often is a one-size-fits-all approach to technology integration when they need a more context-specific training related to the classes they teach. Teachers trained in the effective use of computers is of paramount importance. Bakia, Means, Gallagher, Chen, and Jones (2009) expressed that professional development should engage teachers with topics that could change their instructional practice, such as learning to use technology to support new teaching methods or teaching concepts in specific subjects. Koehler and Mishra (2009) stated that teachers need to be provided with a way to combine what they know and how to apply what they know in the "unique circumstances or contexts within their classrooms" (p. 62). A paradigm shift must take place for teachers to incorporate technology into their classes.

As mentioned in an article by Dias (1999), change is a barrier that is often ignored. Teachers are asked to adopt new teaching tools like computers and the Internet as part of their repertoire as well as change the way they teach their students. This has been quite an adjustment from using the chalkboard, overhead projector, or television. Technology integration requires teachers to go through a process that can take years to complete. In order for teachers to change their beliefs about technology integration, their classroom practices and existing pedagogical beliefs must be taken into account (Ertmer, 2005). Providing teachers with technology uses that would support their immediate needs may be more effective than trying to change their beliefs. In order for teachers to develop confidence and competence with technology, they need technical and pedagogical support.

Technical Support

Teachers need adequate technical support when using and maintaining technology. When schools have limited or no support, this hinders technology adoption by the teacher (Bauer & Kenton, 2005; Chen, 2008; Chen, 2013; Clark, 2006; Cuban et al., 2001; Hew & Brush, 2007; Rogers, 2000). Technical support should have the necessary skills to troubleshoot and remedy hardware and software problems followed by a quick response time to meet the needs of the faculty (Hew & Brush, 2007). For example, teachers can use telephones in their classrooms to get answers to technical related questions. Another suggestion would be for administrators to provide enough personnel on-site to assist teachers. Teachers with a class of 20 or more students do not have time to manage technology resource breakdowns (Bitner & Bitner, 2002). If technical glitches occur frequently without technical assistance, teacher confidence in technology integration will dissipate. However, the technical support would need to have the technical skills to meet the needs of the faculty. If technical support is not available, the teacher may become frustrated and give up, especially if it is the teacher's first time integrating technology into the classroom. Another external barrier for teachers is the lack of time.

Time Constraints

Time constraints occur when teachers need to develop new curricula and new skills. Lack of advanced training for teachers poses a barrier to the school and teacher, especially if the teacher is new to technology integration. Fear may cause teachers not to incorporate technology into their curriculums and provide them with an excuse not to use technology (Rogers, 2000). In other studies, researchers found that teachers did not integrate technology consistently as a teaching and learning tool because their students did not have enough time to use computers. Also, teachers need additional planning time to incorporate technology into their lessons (Bauer & Kenton, 2005; Chen, 2008). Teachers also need clear direction for integrating technology into their instruction. If teachers lack clear direction for incorporating technology into their classrooms, they will not use technology. If teachers are not comfortable using technology in their classrooms, they will not use technology. Teachers need to feel confident when using technology. They want to know that their students are learning because of using technology. Teachers who are not comfortable with integrating technology may have second-order barriers of negative perceptions, beliefs, and self-efficacy.

Teacher Perceptions, Beliefs, and Self-Efficacy

Teacher perceptions, beliefs, and self-efficacy represented another obstacle when integrating technology into instruction. These intrinsic second order barriers affect teachers mentally and emotionally. Nespor (as cited in Pajares, 1992) provided resources from the following authors who defined beliefs. Nespor suggested:

- "Beliefs have stronger affective and evaluative components than knowledge and affect typically operates independently of the cognition associated with knowledge" (p. 309).
- Abelson (1992) defined beliefs in terms of people manipulating knowledge for a purpose or under a necessary circumstance.
- Brown and Cooney (1992) explained that beliefs are dispositions to action and major determinants of behavior.
- Sigel (1992) defined beliefs as "mental constructions of experience…" (p. 313).
- Harvey (1992) defined beliefs as an "individual's representation of reality, which has enough validity, truth, or credibility to guide thought and behavior" (p. 313).

Teacher beliefs are related to their teaching practices and some practices are more resistant to change. Pajares (1992) emphasized that teachers hold more than beliefs in regard to their work, students, and subject matter. Teachers have educational beliefs that encompass: (a) pedagogy, (b) efficacy, (c) epistemological beliefs, (d) attributions, (e) locus of control, (f) motivation, (g) perceptions of self, and (h) feelings of self-worth. If teachers are required to incorporate technology into their instruction, they may have to reconsider their pedagogical beliefs.

The following quotes from a body of literature concerning teacher beliefs cited from research conducted by Hermans, Tondeur, vanBraak, & Valcke (2008) centered on teacher educational beliefs:

1) Individual conceptions about desirable ways of teaching and conceptions about how students come to learn. (Beijaard, 1998, p. 1500).

2) Beliefs are grounded in teachers' personal belief systems and represent psychologically held understandings, premises, or propositions felt to be true. (Richardson, 2003, p. 1500).

3) The set of someone's beliefs about the physical, the social world, and the self is clustered in a belief system. (Rokeach, 1976, p. 1500).

4) The main contention is that teachers' classroom use of computers cannot be fully understood without taking their underlying educational beliefs into consideration. (Becker, 2001; Dede, 2000, p. 1500).

Teacher attitudes and beliefs towards technology play an important role in what they do in their classrooms. Schrum and Glassett (2006) asserted: "Teachers' technology beliefs are influenced by their teaching philosophy" (p. 44). If teachers resist technology, it is because of their existing teaching beliefs. Bitner and Bitner (2002) deduced that teacher attitude toward using technology within their classroom was a key factor in integration.

Ertmer (1999) noted that teacher beliefs are based on second-order (personal) barriers that hinder the implementation of technology into their classroom. She stressed that teachers will run into these barriers while trying to implement technology into their classrooms and will need to find ways to overcome these obstacles. Strategies and discussions will need to occur for teachers to clearly define and identify the role technology will need to play when incorporating technology into their curriculum. Ertmer (2000) also noted that teacher beliefs regarding their ability to use technology in the classroom may be key, especially since the role of self-efficacy plays a vital role in determining behavior.

Schrum and Glassett (2006) noted that teachers felt that teacher identity (including role of the teacher and the student-teacher relationship) have to be more clearly defined, that administrative support was essential, and having relationships with decision makers are essential. Teachers also want administrators to understand that adopting technology is a significant challenge. Teacher attitudes toward their colleagues, school, and the purpose for them to use technology influences their implementation of technology. Their perception of their environment and the support they receive will affect long-term technology implementation. Bahr, Shaha, Farnsworth, Lewis, and Benson (as cited in Schrum and Glassett (2006) affirmed that introducing technology effectively into instruction is a struggle. The important factors that need to be considered are teacher's perceptions about ways to incorporate technology into their instruction. If teacher's attitudes are not positive towards the usefulness of technology in instruction, or using technology for instruction technology will not be used.

Teacher Perceptions

There was no clear description of teacher beliefs or perceptions toward technology integration in research literature. Hutchinson and Reinking (2011) reported in a national survey exploring literacy teachers' perceptions of integrating Information Communication Technologies (ICTs) into instruction, that teacher perceptions are consistent regarding obstacles to technology integration. Teacher perceptions, beliefs, and self-efficacy an intrinsic barrier, should be considered when integrating technology into instruction. If teachers find no connection between using technology and the subject matter they are teaching, it will be difficult for them to incorporate technology into their instruction. Pajares (1992) described teacher beliefs a "messy construct" (p. 307) and teacher beliefs influenced their perceptions and judgments and affect their behavior in the classroom. Hutchinson & Reinking (2011) stated: "If teachers have shallow definitions or incomplete perceptions of integrating ICTs into instruction—or perhaps oppositional stances—they are not likely to achieve an authentic curricular integration of ICTs" (p. 315). When teachers see a connection between the content and technology they are more likely to integrate technology.

Further research indicated the difference between beliefs and knowledge that must be taken into consideration when dealing with teachers. Nesbitt and Ross (as cited in Pajares, 1992) asserted: "conceptualized generic knowledge as a structure composed of a cognitive component, schematically organized, and a belief component, possessing elements of evaluation and judgment" (p. 310). Knowledge has to do with understanding something mentally, whereas beliefs influence how an individual makes sense of the world. Bandura (1997) acknowledged that teachers who believed in their ability affected their general orientation toward the educational process and their instructional activities.

Teachers were the ones who were receptive to and adopted educational technology. Oliver (as cited in Bandura, 1997) brought up an interesting point. Bandura said, "Teachers of low-perceived mathematical efficacy distrust their capacity to make good instructional use of computers" (p. 241). Teachers who do not believe in their ability as a teacher or to use technology in the classroom find themselves distressed and probably would not choose teaching as a profession if they had it to do over again. Bandura (1997) stated that teacher's efficacy beliefs can influence students' intrinsic and academic self-directedness. Students learned more from teachers with high self-efficacy than from those with ensuing doubts about their ability as a teacher.

Beliefs play a critical role when it comes to how individuals think about and behave toward using technology. Knowledge systems are open to evaluation and critical examination whereas belief systems are not flexible or dynamic (Pajares, 2008). Wachira and Keengwe (2011) expressed that teachers who have not personally experienced technology-infused classrooms are limited in finding appropriate ways to use technology to enhance learning.

Many educators ask "But what if the technology breaks down? What will we be able to do then?" These are questions many educators ask and it causes them to develop a negative perception toward technology when the questions cannot be answered. Hill (as cited in Davis,

1999) postulated that both self-efficacy and outcome beliefs have influence on decisions to learn a computer language. From interviews conducted by Wachira and Keegwe (2011), they asserted that "teachers did not know how to take advantage of technology as powerful tools to strengthen students' understanding . . ." (p. 23). Teacher's lack of confidence using technology may cause them to be reluctant to ask for assistance for fear of being thought of as incompetent.

Teacher attitudes regarding technology integration was conceptualized by Hew and Brush (2007) as ". . . teachers liking or disliking the use of technology" (p. 229). Koehler and Mishra (2009) explained that teachers need content knowledge, pedagogical knowledge, instructional resources and materials, and the ability to change the way they think about how to use technology. As previously stated, knowledge of technology and content is not enough if teachers do not have confidence in themselves to facilitate student learning when using technology. Teacher self-efficacy plays an important role when it comes to teaching, student learning, and using technology. In the next section, I will discuss the definition of self-efficacy as postulated by Albert Bandura and relate that definition to teachers' self-efficacy regarding the use of computers.

Teacher Self-efficacy

Self-efficacy is an internal perception of the individual. Bandura (1986) defined self-efficacy as: People's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses (p. 391). Self-efficacy perceptions influence a person's decisions about what behaviors to carry out. Gong, Xu, and Yu (2004) asserted:

> "Self-efficacy perceptions have been found to influence decisions about what behaviors to undertake: the effort exerted and persistence in attempting those behaviors, the emotional responses (including stress and anxiety) of the individual performing the behaviors, and the actual performance attainments of the individual with respect to the behavior" (p. 366).

Therefore, if a teacher has a high self-efficacy toward using computers or mastering a new technology, then he/she believes they will be effective using the computer or mastering that new technology.

Feltz (1982) affirmed that performance-based procedures are more effective than other methods in producing behavioral change. She asserted that "perceived self-efficacy influences not only choice of activities but also persistence of coping efforts in the face of anxiety-provoking situations" (p. 764). As with TAM, computer self-efficacy acts as a determinant of perceived ease of use before and after using the computer or mastering the technology (Venkatesh, 2000; Gong, Xu, & Yu, 2004). A teacher with high computer self-efficacy has a positive perception of his/her ability to use computers to accomplish the tasks they set out to do. Compeau and Higgins (1995) discussed computer self-efficacy as an individual's self-judgement based on what they can do using a computer, not what they did in the past with the computer. This means the person is not focused on the basics of using a computer, such as turning it on or creating documents and spreadsheets, but on analyzing data and creating reports. Chen (2008) reported the relation between teacher beliefs and teacher practices should shed light on their technology-integration decisions.

The following example provides information regarding student use of computers some teachers experienced. In the 1:1 laptop initiative study by Dunleavy, Dexter, and Heinecke (2007), they discovered the overall use of the 1:1 laptops appeared to contribute to the learning environment, but online research presented unique challenges for the teachers and detracted from effective teaching and learning. Although the school had adequate availability and accessibility to use technology, teachers were concerned about student access to inappropriate materials (e.g., games, pornography, etc.) and wasting time doing ineffective searches on the Internet. Although the concerns of these teachers are valid, Cope and Ward (2002) asserted teachers who perceive learning as an accumulation of information are likely to be those teachers who use the teaching-centered approach. These teachers are the talking heads or the teacher who imparts information to students and use assessment techniques that encourage tests and rote learning.

Teachers must know how to teach software to students, select the right applications to meet the instructional needs of the curriculum and learning needs of their students while managing the hardware and software (Coppola, 2004, as cited in Ertmer & Ottenbreit-Leftwich, 2010). Not only do teachers feel the pressure about acquiring technology-related management skills, but they need to feel confident using this knowledge to facilitate student learning. Ertmer et al., (2012) explained: “Teachers noted that the strongest barriers preventing other teachers from using technology were their existing attitudes and beliefs toward technology, as well as their current levels of knowledge and skills (p. 423). Like in the TAM, teachers who believed that technology can improve learning are more than likely to implement technological innovations that are in line with their beliefs about teaching methods and student learning.

Bandura (1977) maintained his support for self-efficacy by stating that the relationship between efficacy expectations and performance are give-and-take: “Mastery expectations influence performance and are, in turn, altered by the cumulative effects of one’s efforts” (p. 194). Therefore, self-efficacy and behavior are reciprocal. Yi and Hwang (2003) reported findings regarding goal orientation, intrinsic motivation, and self-efficacy. They reported the three play an important role in determining a person’s behavior.

Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, and Sendurur (2012) described how one teacher had her first-grade students collaborate with other students around the world using blogs to find out what they had for breakfast. Hew and Brush (2007) admitted that teachers who used technology to keep students busy did not believe technology was important and failed to see the value of technology for educating their students. Knowledge of technology is not sufficient if teachers are not self-confident using technology. Abbitt (2011) denoted self-efficacy beliefs will “influence decisions and behaviors” (p. 136) while being influenced by other characteristics and prior behaviors within a given domain. Ertmer (2000) simply summarized Bandura’s self-efficacy definition: “. . . self-efficacy is thought to mediate the relationship between skill and action” (p. 115). Ertmer further stated: “Without skill, performance isn’t possible; yet without self-efficacy, performance may not be attempted" (p. 115). As discussed in the prior section about the basis of TAM, we can see here that self-efficacy plays a role in technology usage, acceptance, and technology integration. Chen (2008) highlighted a few factors regarding teachers and technology integration.

The teacher must believe that: (a) using technology can help them reach higher level goals, (b) technology will not deter students from reaching higher level goals, and (c) teachers will have the ability to use technology and have sufficient resources to use technology within the classroom. Self-efficacy influences teachers' decisions about using technology in the classroom. Teachers with high self-efficacy use technology in the classroom based on knowledge and pedagogy. Penuel (2006) acknowledged that teachers who received frequent professional development felt prepared to use technology with students. Teachers who spent more than nine hours in educational technology activities felt "well prepared to use computers and the Internet for instruction" (Penuel, 2006, p. 333). Teachers who found professional development relevant and useful to their teaching were more likely to integrate technology into their classrooms.

Chen (2008) asserted, "To implement national plans for technology integration, policy makers must know how teacher beliefs influence teacher practices regarding technology integration" (p. 65). Teacher high self-efficacy toward using technology is an essential factor for integrating technology into their classroom. Integrating technology into the classroom influences their students' attitudes toward using technology. While teacher self-efficacy plays an important role in their integrating technology into their classrooms and influences student use of technology, Holden and Rada (2011) concluded that high technology acceptance may alleviate second-order barriers. Having a positive attitude toward technology usage allows for successful integration of technology into the classroom.

Successful Integration of Technology

Integration of technology into the classroom means the computer is actively used by the teacher interacting with the content spontaneously while students ask questions, conduct individual and small group projects, and do hands-on work and computer activities. Davies (2011) claimed that successful integration of learning technologies in the classroom would lead to enhanced learning outcomes. Successful technology integration is the ability to use technology to facilitate learning. Using technology as a part of the instructional condition and as a key teaching tool within the school to enhance instruction impacts learning (Brickner, 1995). Computer usage should be used with a plan or rationale for its use, not just an add-on to instruction.

Kumar, Rose, and D’Silva (2008) in their study of teacher computer acceptance and Actual Usage of Computer (AUC) in Malaysia, found that AUC among mathematics, science, and English language (MSE) teachers were at the moderate level. They claim there is resistance among teachers using technology in education even though there is a demand for IT usage by business leaders. Kumar et al., asserted that the challenge for technology use among many individual teachers created a challenge for school administrators, technology advocates, and policy makers. Kumar, et al., noted there are several factors that influence teacher use of technology.

These factors are labeled as technology acceptance constructs, which are personal and behavioral in nature and include the areas of attitude, perceived usefulness, perceived ease of use, job relevance, and computer compatibility. Kumar et al. (2008) posited from their research on technology acceptance constructs that the cause for teachers using the computer moderately was due to their acquiring the knowledge and skills pertaining to computer technology but not owning a computer. Until teachers see that AUC is beneficial, interesting, easier to teach, and exciting, it will be difficult for them to see how AUC is job-related and useful (Kumar et al., 2008). It is important to note that when teachers do not use technology on their own consistently, it is harder for them to support the use of technology in the classroom.

Dias (1999) maintained that successful technology integration is a seamless process that will support the curriculum and engage students in meaningful learning. Students can demonstrate what they learned in new and creative ways. Davies (2011) concluded that to use technology effectively, the teacher must understand the learning goals and the function of the technology to accomplish these goals. Technology permeates daily routines and work, and is not an end but a means to an end.

Technology Integration and the 21st Century Student

Baytak (2011) points out very little research has been done on student perception of technology in education. Researchers who explored elementary, middle, and high school student stated that research on student perceptions are few. Baytak reported that researchers found students have a positive attitude toward computers and perceive computers as a part of their life. The Secretary's Commission on Achieving Necessary Skills (SCANS) reported: "Every student should graduate from high school ready for college and a career." (1991, p. 7). The primary focus of my research is on teacher perceptions and beliefs about technology integration barriers and whether students are prepared technologically as 21st century professionals.

Voogt, Erstad, Dede, and Mishras (2013) described 21st century competencies and the specific role technology takes in the learning process. Their research showed that teachers are not using strategies to assist students in obtaining those competencies (e.g., collaboration, communication, digital literacy, citizenship, problem-solving, critical thinking, creativity, productivity, digital literacy), which are essential for the 21st century student. The way students learn is related to the way teachers teach. The reason for the lack of integration is due to insufficient preparation of teachers and the absence of any systematic attention to innovative strategies in their teaching practice. Teachers that use more constructivist ways in their teaching seem to provide an enhanced learning outcome for students. Per Chen (2008), learning with technology can foster higher order thinking skills, self-regulated and collaborative learning in students.

When computers are integrated into the classroom, they can be used in various ways (e.g., research, word processing, computations, slide shows, and other visual presentations). The use of computers can give students direct access to ideas, facts, and primary sources by linking images and concepts to sound and film. Students can create professional presentations; work in groups or pairs on long term projects. The teacher may then move into the role of facilitator to support and challenge students. With the use of computers, students can demonstrate their knowledge and understanding of the school standards set by teachers.

In their book *Integrating Technology for Meaningful Learning* (3rd ed.), Grabe and Grabe (2001) discussed the importance of standards and how these standards can influence classroom practice. The International Society for Technology in Education (ISTE) established standards and benchmarks that defined what a student should know and can do with technology. For this paper, I will list the foundation standards for students and benchmark standards for grades 9–12.

Technology Standards for Grades 9–12

Foundation Standards for Students

1. Basic operations and concepts
    - Students demonstrate a sound understanding of the nature and operation of technology systems.
    - Students are proficient in the use of technology.
2. Social, ethical, and human issues
    - Students understand the ethical, cultural, and societal issues related to technology.
    - Students practice responsible use of technology systems, information, and software.

- Students develop positive attitudes toward technology uses that support life-long learning, collaboration, personal pursuits, and productivity.

3. Technology productivity tools

- Students use technology tools to enhance learning, increase productivity, and promote creativity.
- Students use productivity tools to collaborate in constructing technology-enhanced models, preparing publications, and producing other creative works.

4. Technology communication tools

- Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
- Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

5. Technology research tools

- Students use technology to locate, evaluate, and collect information from a variety of sources.
- Students use technology tools to process data and report results.
- Students evaluate and select new information resources and technological innovations based on the appropriateness to specific tasks.

6. Technology problem-solving and decision-making tools

- Students use technology resources for solving problems and making informed decisions.
- Students employ technology in the development of strategies for solving problems in the real world.

Communication Tools (Benchmarks)

Grades 9–12

- Use technology tools and resources for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, and correspondence).
- Routinely and efficiently use online information resources to meet needs for collaboration, research, publications.
- Select and apply technology tools for research, information analysis, problem-solving, and decision-making in content learning (p. 38).

When standards are in place, the implication is that students will meet essential knowledge and skills that, at a minimum, schools will help students to achieve. Sharpe (2014) indicated that, “educators generally want technology integrated into the classroom but there are no firm guidelines for accomplishing this task” (p. 441). Technology is developing faster than teachers can keep up with and they must continually change and develop themselves to adapt and take advantage of new technologies. Morrison and Lowther (2002) specified the overriding agreement between education reform and educational technology is the relationship between the two. When those in authority restructured the schools, they failed to consider the use of technology when designing new programs.

Likewise, instructional technologists failed to consider the redesign of the school when implementing technology (e.g., location of printers, computers, and use of laptops). The issue could be the type of technology available and the way it is used. For example, the use of drill and practice software that emphasizes rote memorization when it is based upon a behavioral approach to teaching. This approach is inconsistent with today's student-centered approach to learning in an open-ended environment and not supported by the traditional uses of technology. Instead of educational reform and educational technology being at odds with each other, if the teacher changes his/her view of computers as a tool to solve problems instead as a means to deliver instruction, agreement could result between the two factors. The authors Morrison and Lowther (2002) believe that using computers for more than a delivery device but integrating computers into the curriculum as a tool for solving real-world problems would start a revolution that could affect how students learn.

Making computers readily available to students during the school day allows students to use computers as a tool and teachers to take different approaches to using computers as tools. This paves the way for computers to be integrated into the classroom so the student will know when and how to use computers to solve problems. Students can use the computer to "apply solutions used in the real world to analyze and manipulate real-world problems" (2002, p. 15). Students and teachers can use the computer to search beyond the classroom for answers.

Technology and Student Learning

Children have accepted and learned to use the technology incorporated into their lives. By the time children turn four, they can turn on a stereo and play video games. Does this mean students are technologically competent? Clements, Nastasi, and Swaminathan (as cited in Wright & Shade, 1994) claimed that computers enhance or augment children's school learning (p. 24). By using a computer, they gain a new opportunity for understanding—they can link what they already know and thereby cement new knowledge in place. For example, students are given a project to work on. Using a computer graphics program, they gain an ability to focus their attention on relationships they may have had difficulty seeing together (such as number and size). This activity presents children with new opportunities for understanding. Their interest and understanding linked with their understanding of the new relationship between number and size enlarges what they already know, cementing their new knowledge.

Technologically preparing students can be a challenge for teachers who do not know the nature and implications of the change. Solomon and Gardner (as cited in Wright & Shade, 1994) offered that "computers alone do not act to affect children's learning; they act in concert with the competencies of the individual and the aspects of the social system in which they are embedded" (p. 26). Therein, the determination of technology's appropriateness should be judged by the task to be accomplished. Bowman and Beyer (as cited in Wright & Shade, 1994) identified three learning experiences teachers could develop for their students: (a) focus on the task and learning assumed to be the by-product. The teacher oversees all the activities for quality and quantity; (b) the teacher is responsible for setting cognitive goals that refer to children's prior knowledge, asking questions to stimulate discussion, and monitoring their comprehension process. The teacher focuses on setting cognitive goals and focuses on the students understanding. The teacher will encourage the student while maintaining control over the learning process; and (c) the teacher turns control of the learning process over to the student who is encouraged to ask questions, determine his/her need for information, and monitor his comprehension. The teacher therefore plays a part in the student's learning process acting as a facilitator and guide.

Donaldson (1993) affirmed through his research that children's own motivations and concerns shape their learning process as well. Engaging learning experiences occur when a learner is interested and can control the pace and type of information to be processed. Bowman and Beyer (as cited in Wright & Shade, 1994) asserted, the best computer tool for a student to learn is when he/she can control the way he/she experiences new information or knowledge.

Computer use is not a panacea, however, certain types of thinking work in conjunction with technology such as: linear and sequential organization of ideas, expression of symbolic and abstract thought and discrete categorical systems. Bowman and Beyer assessed that: "Computer technology is not a single tool but rather a continuum of tools having in common a small microchip that permits humans to expand greatly their power over the environment and over ideas" (p. 19). Computers should be used as a tool for thinking. It will be up to the teacher to integrate computers as a problem-solving tool, which will take more time, commitment, and vision.

For technology to be successfully integrated into the classroom, Hooper and Rieber (as cited in Ornstein & Behar, 1995) believed two things must happen: first, the classroom must become learner-centered. Second, students and teachers will need to be able to collaborate with technology and create a community that nurtures and supports the learning process. Ornstein and Behar (1995) considered: "If teachers themselves become models of exploration and inquiry, children are likely to follow. Technology is an area of the curriculum as well as a tool for learning in which teachers must demonstrate their own capacity for learning" (p. 61). When integrating technology, it may mean that the curriculum and setting may also have to change to meet the learning opportunities that present themselves. Ornstein and Behar (1995) made a valid point that doctors and dentists with skills from the 1950s would not be capable of practicing using today's medical and dental technology, but teachers from that era would probably feel comfortable using today's classrooms.

Today's teachers will need to move beyond the student-as-bucket and teacher pouring in knowledge metaphor. In this aspect learning is viewed as a consequence of receiving information. Students should be able to remember, understand, and use information, which students regularly leave school unable to achieve. Without meaningful learning (the ability to build external connections between existing and new information), students are doing mindless tasks that have no meaning. Teachers must prepare for technology to become a part of their future by keeping up with change. They must adopt effective strategies by reading technical and educational publications, attending professional development sessions, and perusing various websites to keep as current as possible with technology. For learning with technology to be meaningful, teachers will need to design lessons based on instructional principles and effective pedagogy and not focus strictly on the technology.

The following principles that teachers should consider when using technology in the classroom are: Effective learners actively process lesson content by actively seeking and generating relationships between lesson content and prior knowledge. Teachers will need to find the right blend of appropriate technology and pedagogy to encourage students to engage in deeper cognitive activity; and, presenting information from multiple perspectives increases the durability of instruction. For example, in cooperative learning the students are teaching each other in small groups and students are responsible for each other's learning. Ornstein and Behar (1995) stated, "Cooperative learning and hypermedia represent technologies with significant potential for developing multiple perspectives" (p. 258). Hypermedia is a technology that organizes information non-sequentially. The students browse through an information base to construct relationships between their personal knowledge/experiences and the lesson. This allows the student to obtain information in a logical fashion, explore and discover interrelationships often missed in the traditional presentation of the lesson.

The teacher must manage this learning carefully and individual accountability must be maintained. Effective instruction should build upon student knowledge and experiences and be grounded in meaningful contexts. While instruction should attempt to build upon student's experiences, the role of technology should be flexible enough to adapt to the student's ongoing instructional needs. Because of using the above principles as possible guidelines for incorporating technology into instruction, teachers must be willing to venture into re-conceptualizing their roles in the classroom and work at trying to create environments where students can actively engage in "cognitive partnerships with technology" (Ornstein and Behar, 1995, p. 262). For technology integration to work, teachers will need to have vision and be active in building what is needed for change and growth.

Technology integration strategies and approaches can be used as a remedy to assist students to learn prerequisite skills in a more efficient manner using drills and tutorials to help teachers provide individualized instruction. Drill and practice programs could replace worksheets while a tutorial can offer instruction. Self-instructional materials and simulations can be used to assist self-motivated students to pursue skills they believe are related to what they are learning or provide a foundation for later concepts. For example, a simulation can let students repeat an experiment without using hazardous materials.

Word processing programs help students to overcome logistical hurdles by allowing students to rewrite papers more quickly and efficiently without the labor of handwriting. Computer Assisted Design (CAD) software programs allow students to try different house designs to see how they look before building actual models. Multimedia and videos can prove helpful when trying to capture the attention of some at-risk students. To get students to think about how they think, problem-solving courseware and multimedia applications could be used.

Teachers who work with students in the areas of math and science may find it useful to use video programs that help students build mental models of problems to be solved.

Creating collaborative efforts among students gives them the opportunity to make contributions to their projects on their own terms. Students who work together in collaborative groups find it more motivating and easier to accomplish projects using technology resources (Robler & Edwards, 2000). This has the implication of enhancing students' self-esteem, increase their willingness to spend more time on learning tasks, as well as give them an opportunity to learn from each other, the teacher, and the media. Students can practice using modern methods of communicating information (e.g., using presentation software to present a report instead of using cardboard charts). Robler and Edwards conceded: "Using technology to communicate visually represents Information Age skills students will need both for higher education and the workplace" (p. 71). Student's use of technology in preparation for the workforce or for college is important for the economy.

The 21st Century Workforce

Technology is one discipline that influences economic progress. The global economy is driven by technological innovation and there is a need for technology education in K–12 school programs. Bybee and Starkweather (2006) indicated that business and industry recognized that technology education should be viewed as fundamental to achieving workforce competencies.

The SCANS (1991) report discussed designing classroom activities using technology to motivate students to increase their technology skills and help them obtain jobs in the future. This report suggested the need for students to be technologically developed. However, in today's classrooms, students do not seem to be experiencing this. Jacobsen, Clifford, and Friesen (2002) asserted that technology integration is not used as a seamless process for students to think and learn but "standardized, secured, preconfigured, and locked down" (p. 365). They further explain that there is a growing digital divide for students in what they know and what they are permitted to do in schools. Education has not kept up with the growth of technology the way businesses have. Clark (2006) confirmed that technology has a greater impact on business than in education.

Technology has affected every sector in society: Retail, manufacturing, government, nonprofits, communications, and sales, to name a few. Each of these sectors has been affected by technological advances. As technology became more influential in our society, education has faced more problems. On a global scale, it appears students in the United States have fallen behind in our technologically rich environment. Effective infusion of technology must be developed and guided by teachers because it has never been done before (Elliott & Hall, 2002). Educators are faced with challenges integrating technology because they were not prepared to create meaningful learning opportunities for students.

Today's workforce requires that workers be equipped with knowledge and skills. From a business perspective, there has always been a need to find and use information quickly and efficiently. Technology has allowed this to happen at warp speed. This is the Information Age. Information has become a vital part of our society. Administrators, government officials, and many educators have high hopes to close the gap between the haves and the have-nots in relation to technology. Gerstner Jr., former Chief Executive Officer of IBM (as cited in Cuban, 2001) expounded on this by suggesting that we need to recognize that our public schools are l*ow-tech* institutions operating in a high-tech society. The same changes that cataclysmically affects businesses to change, should be used to teach students and teachers which will also improve the way our schools are operated.

Therefore, I believe when teachers begin integrating technology into the classroom, they will raise the standards of education and will build workplace skills in their students. Students involved in a skills-based, vocationally driven curriculum known as a working-class school learn skill sets that will enable them to obtain jobs once they complete high school. In a study completed by Santa Maria (2010) described these jobs as hybrid technology employment jobs that will have a working and business class status that allow the student to be employed in various settings, such as industry without doing manual labor.

These workers, defined as hybrid technologists, are considered knowledge workers and they work closely with management on technology related projects. They gain respect of their peers and those around them because of their technical abilities, their skill sets, and ability to use, offer services, or perform essential tasks using technology. These workers can troubleshoot, install, repair, and program, or perform some tasks that others within their work environment may be unable to do (Santa Maria, 2010). Due to the increase in technological innovation, there is a demand for competitive workers, which has impacted the educational system.

The SCANS (2000) report was designed to help educators make high school courses more relevant to the needs of today's workforce. They will see in the report, illustrative tasks for each skill that are generic to many jobs. For example, educators can use the report to gain knowledge of the SCANS competencies and foundations to ensure these skills are taught in their courses. The report also provides examples of how it can be used by a curriculum developer, job counselor, and training director.

A National Education Technology Plan (NETP) was distributed by the U.S. Department of Education stated: "We want to foster excellence that flows from the ability to use today's information, tools, and technologies effectively and a commitment to lifelong learning" (U.S. Department of Education, 2010, p. 1). The plan also expressed a need for schools to be incubators of exploration and invention. Teachers must be more than collaborators in learning; they must seek new knowledge and consistently acquire new skills along with their students. Students must be engaged in school intellectually, socially and emotionally. These students will need to have a network of adults and peers to support their intellectual growth. For education to meet the technological demands of the workplace and outside competitive forces, educational technologies need to be embedded into school curricula.

The NETP proposed that the education system and its stakeholders begin to think differently about education because of the technologically competitive and global environment. The education system must become interdependent for individuals and nations to work together and solve many of today's challenges and problems. Our educational system is failing because we have not engaged the hearts and minds of our children. The learning experiences we provide for our students should change. We need to re-evaluate how we assess our children and improve learning in the moment. We need to integrate the data we gather about student learning and make it available to decision makers at all levels of our education system—individual educators, schools, districts, states, and the federal government. We need to focus on extended teams of connected educators in different roles to collaborate within and outside of schools who use technology resources and tools to augment human talent.

Effectively training and preparing our teachers and leaders will guide the type of learning we want in our schools. Making learning experiences and resources engaging and available to all learners requires state-of-the-art infrastructure, which includes technology, people, and processes that ensure continuous access. Businesses can teach educators about leveraging technology to improve learning outcomes while increasing productivity of our education system. The government has a role to play in funding and coordinating some of the R and D challenges associated with leveraging technology to ensure maximum opportunities for learning.

The NETP also assumed that powerful learning resources and assessments could be developed by using technology. Assumptions were made in the plan to improve student learning by stating: "With technology-based learning and assessment systems, we can improve student learning and generate data that can be used to continuously improve the education system at all levels" (U. S. Department of Education, 2010, p. 6). These identified assumptions would require a lot of collaboration and investment by the United States education system. The purpose of mentioning these assumptions in this research is to show the magnitude of issues our education system is facing. It will take multiple types of research to address even a small portion of the assumptions identified by the U.S. Department of Education in this paper. However, I hope to add to the research by attempting to identify if teachers are facing barriers integrating technology into their classrooms, if they perceive that high school students are technologically prepared for the workforce, and if they feel prepared to integrate technology into the classroom.

In her research, Hernandez (2007) alluded to the fact that teachers are under pressure to meet multiple goals (e.g., integrating technology, addressing required curriculum goals, assist learners in their learning process, and develop clear evidence that students are meeting their achievements). Regardless of the current requirements, more should be done regarding technology integration. Hernandez stated that substantive changes related to the way we approach technology requires a behavioral change, employment readiness for future job-seekers in the 21st century is at risk. Hernandez emphasized: "Staff development in technology would help educators answer the following questions: (a) What do we most want job-seekers to understand, (b) What can teachers do to assist job-seekers to develop and demonstrate understanding in technology, (c) How can teachers assess and support job seekers' learning technology, and (d) How might new technologies improve teaching and learning?" (p. 76). Not only does technology integration need to be taken into consideration, but teaching with technology will become important.

Technology itself should be used to improve student learning and depending on how educators use it, it can be a useful tool. Schrum and Glassett (2006) confirmed that “technology by itself is not good or bad but it all depends on how it is used by educators” (p. 46). Teachers who use technology because it is required of them to do so by administration will not necessarily use technology for curriculum-related purposes, but only for documentation of grades, and/or creation of documents for their classes (e.g., handouts, worksheets, and quizzes).

Although the subject of the digital divide was mentioned briefly, I recognize that it is imperative that adequate resources be provided to all school districts, not just the affluent school districts. Mason and Dodd (as cited in Schrum & Glassett, 2006) corroborated the following: “Failure to provide adequate technological resources for all translates into failure to provide quality education, creating an even greater divide between affluent and poor school districts” (p. 48). Consideration must be made for students to use technology, especially in poor school districts. If a student does not have a computer or access to the Internet at home, school may be the only place he/she has access. Other areas for consideration are teachers’ pedagogy and instructional practices. Teachers may not feel the need to use technology because the technology changes so frequently. The schools and educators cannot keep up with it and the teachers begin to feel overwhelmed and will not use it.

According to the U.S. Department of Education (2004) an update was requested from Congress regarding educational technology. Although the development of technology was thriving, the reverse was happening in the schools. Schools have been connected to the Internet with a 5:1 student to computer ratio but technology used for education has not been realized. The issue is training the teachers to incorporate technology into the curriculum. This has not been effectively managed. The focus was on providing computers rather than transforming education. The unfortunate part was students were using computers at home and not in school. As a matter of fact, the report completed by the U.S. Department of Education revealed that: a) teens spend more time online using the Internet than watching television, b) 94 percent of online teens use the Internet for school-related research, c) twenty four percent have created their own web pages, and d) ninety percent of children between the ages 5 and 17 use computers (p. 8). The report revealed that there is a gap between what teens are doing at home versus school and this seems to be an ongoing challenge for educators.

The challenges integrating technology into the P–12 classrooms are extensive per Schrum and Glassett (2006) and the results from surveys that were conducted, found that fewer than twenty percent of current teachers reported feeling comfortable and prepared to use technology in their classrooms. They also noted that even though computer technology has increased, a very low number of teachers used computers to teach concepts during math, or do collaborative projects where students shared data and responded to each other. These activities turn out to be nothing more than traditional assignments and handouts with instructions.

The subject of the usefulness of technology in the classroom is still under investigation. Paige, the U.S. Secretary of Education from 2001 until 2005, alluded to the following: “Education is the only business still debating the usefulness of technology. Schools remain unchanged for the most part despite numerous reforms, and increased investments in computers and networks" (U.S. Department of Education, 2004, p. 9). Research undertaken by the Center for Applied Research in Educational Technology (CARET), a joint project between the International Society for Technology in Education (ISTE) and Educational Support Systems (ESS) established that the research examined by CARET was descriptive and based on surveys, interviews, and ethnographies and case studies. Although there was educational significance in the studies, the research methodologies didn't meet the NCLB standards. The rigorous studies in which the use of appropriate statistical methods demonstrated that large groups of students using computers or videos significantly, in the statistical sense, out-performed their randomly selected control-group counterparts. Per Cradler, Cradler, and Clarke (as cited in Schrum & Glassett, 2004) the difficulty with many of the statistical studies is that they do not provide a sufficient basis for consumers (e.g., school districts) to evaluate the educational relevance of the results. Not only do research studies need to consider educational institutions, but software developers need to consider surveying teachers before developing educational software for the classroom.

Software developers may need to consider working with the educational community before developing their educational technology to ensure that it meets the standards that are in place and meets the needs of the teachers and students. There is no purpose to having software and computers if the software does not meet the needs of the students and the teachers. Although this research doesn't address the use of educational technology in the classroom it is important to understand that teachers need to have access to up to date and effective software with educational relevance and they need to be able to can choose the type of software to use in their classrooms.

Summary and Conclusions

Teachers must be able to effectively integrate and facilitate technology use in their classrooms. They will need to be able to identify and overcome their first and second order barriers when integrating technology by developing creative ways of using technology in their classroom. Understanding if teachers are confronted with first order or second order barriers will help them to determine ways to overcome the barriers and begin integrating technology into their classes. They will need to find ways to work with their principals and administrators to work out a plan to work with their students to use technology for learning. Not only will students need to be able to use technology, but they will need to develop workforce skills. understand the role technology has on the global economy. In the Chapter 3, I will discuss the research methods used in this study.

Chapter 3: Research Method

The purpose of this quantitative study was to determine whether charter school educators face technological barriers hindering them from incorporating technology into their classrooms, educators have self-efficacy issues integrating technology in their classes, and educators are preparing their students for being globally competitive as 21st century professionals. I developed the research questions to address making these determinations. I will begin this chapter by providing the rationale for selecting a quantitative research design and a justification for the design followed by an in-depth discussion universality, replication, control, measurement, survey research, internal validity, external validity, geographic location, informed consent and confidentiality, sample size, data collection, and the relationship of survey questions to research questions used in the study.

Research Design and Rationale

I used the research questions, survey constructs, and findings from the review of the literature to develop an initial pool of survey items. Items not found in the review of literature were added to the survey to better identify the barriers teachers experience by providing respondents with broader response options. A pilot survey was used to test the validity of the questions and refine the initial survey items. The survey was a Likert scale that I analyzed each question using a *t* test. There were 10 questions within the survey that addressed significant barriers high school educators face that hinder them from integrating technology into their classes, 15 questions to address negative factors high school educators may have experienced when incorporating technology into their classrooms, and 13 questions to find out if educators believe their high school students are technologically prepared as 21st century professionals

I created a self-reporting survey on SurveyMonkey.com for the participants of my study--educators in North Carolina. The boundaries of this study were the areas the research covered regarding the high schools. I only conducted the surveys within the high schools that principals provided approval in. The study was limited to high school educators and did not include all K–12 educators due to the enormity and expense this type of research would take on. Students were not surveyed due to the nature of the research.

I e-mailed an online survey link using SurveyMonkey.com to a sample of charter high school teachers in North Carolina. The total number of participants who responded to the survey were 61 ($N = 61$). The survey results were downloaded into an Excel spreadsheet before being cleaned up, coded, and then data analyzed. After exporting data, I cross-tabulated the data by charter schools and stratified them on separate spreadsheets by the charter schools' geographic locations according to north, south, east, west. I labeled each charter school strata by color (East, Southeast, and Northeast) to keep the participating schools' anonymity.

Justification for the Research Design

Initially I considered a mixed method approach for this study. Due to the difficulty, I could have possibly faced with obtaining the data from the charter high schools, I decided to conduct a quantitative study by having the teachers complete a survey. I decided to use my own questions because I thought I would be able to get truthful answers from the teachers and I wanted to show that the data were being handled only by me. Leedy and Ormrod (2010) suggested that data is information provided to the observer that is derived from certain situations. Data, in its reality, cannot be documented; data are elusive and transient. For example, I wanted to know how prepared students were for using technology at the high school level. I could not observe the high school students during their classes or know what those students learned while they were taking their classes. To capture this information and document it, I needed detailed and specific questions to ask each student in the class, which was not realistic. In this case, Leedy and Ormrod were correct when they say data are elusive and transient.

I had to trust that the teachers would be honest in their evaluation of their students and they would have enough data in the form of assignments and assessments to determine best if their students were technologically prepared. Thus, the data I obtained were secondary and valid according to the teachers' overall perceptions of his/her students when they filled out the survey. The research design criteria described by Leedy and Ormrod (2010) for good research is universality, replication, control, and measurement.

Universality, Replication, Control, and Measurement

Generally, universality in research means any researcher can conduct the research, and if the original researcher is unable to complete the research, he/she can be replaced by another researcher and that researcher will derive the similar results. In quantitative research, the options have been predetermined using many respondents. Therefore, researchers conducting quantitative studies use formulas and seek sample sizes that will yield findings with at least a

95% confidence interval. This means if the survey was repeated 100 times, 95 of those times would produce the same response, making the research universal and replicable.

Research should have the ability to be replicated. In the case of quantitative research, another competent researcher should be able to follow the research and achieve the same results previously documented. In quantitative research, I, as the researcher, should have been able to isolate or control the factors involved pertaining to the research problem. Control is important to replication because if the factors pertinent to the research problem have been isolated, a researcher should be able to repeat the experiment and derive the same results originally documented. Research is valid only when there is enough data to support it. Data should be measured even though measurement is less precise and less accurate (Leedy & Ormrod, 2010). However, there are strategies that will augment measurement procedures, but first an understanding of the variables used in quantitative research must be determined.

There are a few differences between categories and attributes. A category is a group of people or things that have similar characteristics. For example, male and female are categories that describe the variable of gender. Attributes are the characteristics used to describe a group of people, a person, or thing. For example, a sophomore is an attribute or category of a variable academic class. In a quantitative study, variables consist of numbers. Leedy and Ormrod (2010) defined a variable as ". . . any quality or characteristic in a research investigation that has two or more possible values" (p. 224). There are many types of variables: explanatory, extraneous, independent, and dependent. For the purpose of this study, I focused on defining the last two terms: independent and dependent variables.

The independent variable (cause) influences the dependent variable (effect) in a cause-and-effect relationship. For example, in this study, the dependent variable was students being technically prepared as 21st century professionals. The independent variables were teacher use of technology, the barriers they faced using and integrating technology into their classrooms, and their self-efficacy pertaining to integration of technology into their classroom.

In this study, technology was delineated by the classroom use of computers (desktops, laptops, tablets, and smartphones). Using the studies of Cuban (1986), Ertmer (1999), and Brickner (1995) on first- and second-order barriers to change and first- and second-order barriers to technology use, respondents were asked questions ranging from computers working adequately, their ability to work through any issues that may arise while using computers in the classroom without assistance, to barriers that may cause them not to incorporate technology in their classrooms. Regarding student technological preparedness as 21st century professionals, teachers were asked questions related to student ability to use technology in various modes ranging from using e-mails, blogs, and wikis to creating videos and/or movies using technology.

Survey Research

In this study, I surveyed charter high school educators within North Carolina. Conducting survey research does not require that experimental variables be manipulated as Wiersma (2000) concluded that variables are studied as they exist within a natural environment. A survey gives the researcher the ability to study large and small populations through the study of samples chosen from the population. This type of survey research is called sample surveys because the researcher cannot survey an entire population but only a sample of that population, with the expectation that the sample will be representative of the total population. Kerlinger (1973) stated, “The survey researcher is interested in the accurate assessment of the characteristics of whole populations of people” (p. 411). Survey research is a part of social scientific research and the researcher looks to infer characteristics from the targeted population, which could provide the same information as a census could from an entire population with less cost. Survey research focuses on vital facts of people, their beliefs, opinions, attitudes, motivations, and behaviors (Kerlinger, 1973). There are various types of surveys: personal interview, mail questionnaire, panel, telephone, and controlled observation. I used an e-mail Likert scale survey.

Although this type of survey is popular, it has many weaknesses (e.g., lack of response and ability to check the survey responses given). However, as Dillman (2000) pointed out, the issues that arise as a result of using electronic surveys are the issues of security and confidentiality, which raises an issue of trust among the participants. In this study, I expected at most a 40–50% return rate of survey responses. Some things that could have possibly brought a higher return are follow-up questionnaires, enclosing money, interviewing a random sample of nonrespondents, which can be costly and ineffective (Kerlinger, 1973). Even with the weakness of mail surveys, it has provided much to the methodology of the social sciences due to the rigorous sampling procedures, design, and the implementation of the design. Survey samples provide a unique advantage in being able to check the validity of the survey data.

My reason for using an electronic survey was due to cost considerations and the efficiency of using this method. Per Dillman (2000), the electronic survey method brings efficiencies that include "the nearly complete elimination of paper, postage, mail out, and data entry costs" (p. 352). These types of surveys also have the potential to overcome international boundaries, time, and the reduction of sample size and survey costs. This means that the costs that would be involved with telephone interviews or postal procedures are virtually eliminated.

Although web surveys provide more capabilities than any other self-administered questionnaire, there is also an increased risk of survey error. The surveys can be designed with such sophistication the respondents will not be able to receive or respond to them. The screen configurations can be different or the computers can be older and slower, which would not allow the participant to view or download the survey. Quantitative researchers need to verify and demonstrate the reliability and validity of their studies.

Based on the review of literature, three major hypothesis areas guided my analysis of data. I used three *t* tests with an equal weighted score across the survey that were categorized by barriers, perceptions, and technology integration. I used a purposive sample of charter school teachers in this study. Regarding the sample size of 175, I considered the margin of error (or confidence interval) to allow on my survey results. Per Schrijver (2013), I needed to set my margin of error 5% in hope that 85% (90% -5) and 95% (90% +5) of the teachers faced barriers, were not prepared to integrate technology into their classroom, and whose high school students were not technologically prepared as 21st century professionals. As noted by Schrijver, a 95% confidence level of the survey research is standard in quantitative research. The margin of error defines the lower and upper bounds of the confidence interval. The greater difference between the means, the greater the statistically significant mean difference exists. When determining the measurement instruments, the researcher must have a reasonable degree of validity and reliability. Once the survey was created, I performed a pilot study with teachers to check for validity of the survey.

Internal Validity

In quantitative studies, there are two types of validity: internal validity and external validity. When the researcher is able to determine with accuracy conclusions about cause and effect relationships, the research is considered to have internal validity. The idea behind internal validity is whether the changes observed were attributed to the program or intervention. External validity involves generalizations.

External validity

External validity is determined by three commonly used strategies: a) a real-life setting, b) use of a representative sample, and c) replication in a different context (Leedy & Ormond, 2010). In a test-retest method when the results are similar, reliability equals stability. When the results of a study are repeatable there is a high degree of reliability. The data collected must in some way be measured. A researcher is interested in reaching a conclusion about the participants and the places in the sample. Cook and Campbell, 1979; Shadish, Cook, and Campbell, 2002 (as cited in Trochim & Donnelly, 2008) ". . . external validity is the degree to which the conclusions in your study would hold for other persons in other places and at other times (p. 34). A representative sample of the participants to be studied should be diverse enough to generalize the findings to fit the general population. To enhance external validity, I should "incorporate design features . . . such as the use of multiple testing sites . . . or the use of probability sampling" (Singleton & Straits, 2010, p. 201). External validity is useful when conducted in a more natural and complex environment.

When similar research studies are done in different contexts, the research is considered to have validity and applicability (Leedy & Ormond, 2010). In quantitative studies, the researcher attempts to disassociate him/herself as much as possible from the research process because otherwise it would reduce the validity of the research. Only what can be measured or quantified is considered in quantitative research. Therefore, external validity is the extent to which the results can be generalized and applied to other populations. Although there are differences in the way qualitative and quantitative researchers view validity, it is important that the research is validated in order to eliminate any ethical issues in the research.

In the case of this project, I believe I collected a representative sample, but I am unable to tell if that sample was diverse due to anonymity of the survey. I was able to measure and quantify the data and I believe that the conclusions discussed in this study can be held for other people in other places at other times. Del Siegle (2013) stated the sample size is important in determining the significance of the difference between means. With an increased sample size, the means becomes a more stable representation of the group performance.

Sample Size

I did not know how large or small the schools were. I initially set my sample to be 100 participants. The sample size calculator in SurveyMonkey.com was used to determine the sample size. A population size of 100 was entered with a ninety-five percent confidence level and five percent margin of error and, with a normal distribution of fifty percent, the sample size calculated to be 80. Individuals who participated in this study were charter high school educators currently teaching in a high school. I wanted only high school educators to participate in the study since they had access to high school students starting or graduating. This was the only information the researcher knew about participants. No demographic data about participants were collected to keep the survey anonymous as mentioned earlier in this paper and the sampling procedure is as follows.

Sampling Procedure

When I was preparing the survey questions, additional assistance was needed to ensure question clarity. I gathered a focus group consisting of three classroom teachers who were asked to read over the survey questions to ensure clarity and provide feedback. This was done to obtain "feedback from a representative group for whom the survey was intended" (Hutchinson & Reinking, 2011, p. 317). The survey items were revised because of feedback provided by the focus group through email. Clarification of survey terminology was made based on input provided by the educators. After the survey was revised, it was sent to dissertation committee members via email for approval.

Once survey questions were approved by committee members, it was provided to another pilot study where survey questions were administered to check for validity. Kerlinger (1973) stated that when checking attitude responses, the reliability of average responses is greater than individual responses. I sent out an email asking for the assistance of my colleagues who were teachers and educators to review my abstract and survey questions to make sure the survey: a) took fewer than 15 minutes to complete, b) the survey questions were easy to understand, c) grammatically correct, and d) the questions related to the research categories. I received six responses with various suggested corrections related to grammar and one question about an incorrect sentence structure. This process was used to ensure that the survey contained validity and reliability to the respondents. The charter school principals were contacted by email and many of them responded positively to my request to submit my survey to them to distribute to the teachers in their schools.

Informed Consent and Confidentiality

I received University Research Review (URR) and Institutional Review Board (IRB) approval (IRB# 07-22-15-0072369) from Walden University and submitted my application to the school districts in the various regions of North Carolina. High school educators were selected because their pedagogical culture differs from elementary and middle school teachers and that may have an impact on their ability to integrate technology into their classrooms. These teachers are preparing graduates for the 21st century workforce and higher education and therefore are under more pressure to use technology in their classrooms.

The survey provided instructions about the importance of the study and how the teachers could participate in the study. The consent form informed participants about the voluntary nature of the study and by answering the questions in the survey they would not receive compensation for taking the survey, and responses would be anonymous. In relation to the confidentiality of the respondent's answers, I did not ask any demographic questions. Whatever demographics were collected were in relation to the geographic area of the schools as posted online through the Department of Public Instruction charter school and public school websites. I stored the data on my computer, which will be stored for at least three years. The survey was password-protected and as per the IRB application, the difference between confidentiality and anonymity is: the former contains one or more identifiers that are kept private by the researcher; the latter means the data contain no identifiers so it is impossible to determine who participated in the study and who did not. Participants were assured there would be no risks to their safety or well-being, and all information they provided would be kept anonymous. I told principals of participating schools the results of the research would be sent to them as a customized report.

Data Collection

As stated, the survey was piloted by several teachers from schools that were not a part of the study to ensure the reliability of the instrument. Fink (2006) asserted that survey reliability provided "a consistent measure of important characteristics despite background fluctuations" (p.

38). Nineteen charter high schools were contacted in the state of North Carolina. Principals at nine charter high schools responded and allowed their teachers to participate in the study. Five principals said they would not be able to participate in the study because they had a lot of projects going on. Five principals did not respond, even after multiple e-mail requests were sent to them.

My e-mail to principals assured them the survey would be anonymous, and I would identify neither school nor teachers by name. The e-mail pointed out the importance of gathering data to address the president's technology initiative. I asked principals if they would be willing to write a letter to their teachers with their approval of me administering the survey at their school. Survey questions were uploaded to an online format using SurveyMonkey (www.surveymonkey.com), a web-based application for developing online surveys. This method was recommended by Mills (2003) who stated that "for busy teachers, it may be a far more effective use of time to engage in an ongoing conversation using e-mail" (p. 63). Administrators forwarded surveys to teachers and I waited for teacher response. After a period, I contacted my mentor and he suggested that I close the survey.

Data Analysis Plan

Hypothesis testing is used to determine if there is enough evidence in a sample of data to deduce that a certain condition is true for the entire population. Hypothesis testing examines two opposing hypotheses about a population, rejection at a specified significance level of the hypothesis; and a failure to reject the null hypothesis at that level. Failure to reject the null hypothesis is true when no significant difference is found. However, one cannot conclude that the null hypothesis is true, but the null hypothesis may be true or false, it may be rejected or fail to be rejected. Statistical significance tests of differences between the means Nickerson (2000) stated that significance is based on a measure of variability across samples, with a measure of variability within samples, weighted by the number of items in the samples. In order for there to be statistical significance, a difference between the sample means has to be large, if the within sample variability is large and the number of items is small. If the within sample variability is small and the number of items per sample is large, even a small difference between sample means may attain statistical significance.

I analyzed the data using the statistical package for the social sciences (SPSS) software. I exported the data to an Excel spreadsheet to perform a more detailed analysis. I calculated the mean of each of the individual respondents for each group of research questions. The scores from the individual mean responses were used to calculate the total mean. The standard deviation of the responses was calculated and a parametric *t* test with a probability level of $p < .05$ used to determine the null or alternative hypothesis.

The Relationship of Survey Questions to Research Questions

For each of the three research questions there were survey questions associated with them. The research questions were to determine if teachers believed they faced technology barriers, if they believed they could integrate technology into their classrooms, and if they believed their students were technologically prepared as 21st century professionals. I used an electronic web survey (SurveyMonkey.com) containing 38 questions measuring levels of technology integration barriers, teacher self-efficacy toward integrating technology in their classrooms, and if barriers do exist, do they affect student's ability to be proficient using technology. The items in this scale (*n* = 5), ranging from "strongly agree" to "strongly disagree," were administered in a purposive manner. Based on a 5-point Likert scale, the teacher had the opportunity to provide one of the following answers to each of the questions: 1) Strongly Disagree, 2) Disagree, 3) Neither Agree nor Disagree, 4) Agree, and 5) Strongly Agree. If teachers decided against taking the survey, they only needed to exit.

Research Question 1 was: What indicators cause high school educators to believe they face barriers hindering them from incorporating technology into their classes? Educators were asked 10 questions relating to computer access, current software being installed on their classroom computers, their ability to integrate technology into their classroom without assistance, the professional development training they received to assist them with integrating technology into their classroom, the time or budget constraints they may have had integrating technology into their classroom, and the skills their students had using computers in their classroom.

Research Question 2 was What elements lead high school educators to believe they are not prepared to integrate technology in their classrooms? Educators were asked 15 questions about their perceptions about integrating technology into their classrooms. They were asked questions regarding their beliefs: if they believed they had the necessary skills to integrate technology into their classroom, if they believed they could enrich student learning by integrating technology into their classroom, if they believed they could successfully evaluate software relating to teaching and learning, and if they were comfortable integrating technology into their classroom. They were also asked questions about helping students use technology, if faced with system constraints would they be able to creatively use available technology, and if they believed it was important to have professional development training.

Research Question 3 was: What indicators show high school educators their students are technologically prepared as 21st century professionals? Educators were asked 13 questions relating to high school student preparedness as 21st century professionals using technology. Most questions related to educator perception of student use of technology and software in the classroom. For example, teachers were asked if their students could contribute to blogs, wikis, surveys, or play educational video games using the computer. Teachers were asked if students could create graphics, movies, or YouTube video clips related to instructional objectives. Other questions related to students being able to complete assignments using software applications such as word processing, database management, spreadsheets, and presentations; if they believed students were able to evaluate information online, formulate questions to research online, and collaborate online with students from other classes.

Summary

In this study, I used a quantitative research design. I created a survey in SurveyMonkey.com to measure educator's technology barriers, their perceptions about using technology in their classrooms and their perceptions relating to their students' technological preparedness to use technology. I discussed how I will analyze the survey using a *t* test, the research design by developing my questions instead of using predeveloped questions by another author. In this chapter, I provided a discussion about universality, replication, control, and measurement, which were strategies used to assist me with measurement procedures to follow when conducting a quantitative study using surveys. Survey research using sample surveys was also discussed, along with the pros and cons of using surveys, and the types of surveys a researcher could use, the most popular being an electronic survey which was used in the current study. The increased risk of survey error requires the researcher to take internal and external validity into consideration. In Chapter 4, I will discuss the results of the data collection.

Chapter 4: Results

In this quantitative study, I analyzed whether charter school educators faced technological barriers hindering them from incorporating technology into their classrooms, educators have self-efficacy issues integrating technology in their classes, and educators are preparing their students for being globally competitive as 21st century professionals. Within North Carolina there were 31 prospective high schools where I wanted to conduct the research. I needed to obtain approval from each of the county's boards of education by filling out an online or paper application to conduct research. When I began this research, I planned to survey public high schools in North Carolina. Since the state of North Carolina is large, I narrowed my research down to two major cities. In one city, the public high school told me I had to go through the board of education and apply. I found the names of the principals at the high schools in those cities and e-mailed letters requesting to administer my survey at their school. One principal agreed to let me perform the survey at his school and since his school was located among two other public high schools, he would talk to the principals at those schools for me.

When I submitted the IRB application, I contacted the principal and he never responded. I followed up with him four times by phone, and two times by e-mail and he did not respond. I sent e-mails to principals at six high schools in the two cities and received no response from them. In one of the cities, I was informed I would need to fill out a 10-page application to the school board, with no guarantee I would hear back from the school board in a timely fashion. In fact, I was further informed I would probably be rejected because my research might shed a negative light on high schools in that city. At that point, I became frustrated with the public high school system in the city and decided to come up with another strategy. Before I submitted the application, I wanted to widen the survey to include charter schools because I was not sure how long the approval process would be for each school.

I spoke to an administrator in a charter high school who said I would not have as difficult a time to complete my research in the charter high schools. I decided to focus on the charter schools because I did not have to go through such an extensive, time-consuming process. I contacted my mentor and explained what I had experienced and the new direction I decided to take. I contacted the principals of 19 charter high schools in the state of North Carolina. Since the population changed in this research, my mentor contacted the program manager to ask if I would need to send the proposal through the URR to be reapproved. The program manager indicated to me that I would not need to resubmit to the IRB because I included charter high schools in the original application.

In this chapter, I will review the data gathering procedure, missing data, data analysis, followed by survey participants' demographic classifications, the research questions, hypothesis findings, and chapter summary. The data gathering process will be discussed in the first section of this chapter.

Data Gathering

In this study, I surveyed educators using a 5-point Likert scale. After closing the survey in Survey Monkey, I exported the data to Excel spreadsheets to create cross-tab data collection reports. This information was and is password protected on my home computer and laptop. The total number of participants who responded to the survey were 61 (n = 61). I exported survey data to Excel and cleaned them up. After exporting data, I cross-tabulated the data by charter schools and stratified them on separate spreadsheets and color coded each stratum as East Charter Schools, Northeast Charter Schools, and Southeast Charter Schools to protect the schools' anonymity. Tables were developed from the coded spreadsheets and will be presented later in this chapter. I duplicated each school's spreadsheet so I could make the statement corrections on numbers 6, 7, 9, and 10, and prepare each of the spreadsheets to be coded. I duplicated spreadsheets to ensure accuracy of the data from text to numbers, especially after reversing the statements and the associated participant answers. I also checked for any missing data, which I discuss in further detail in the following section.

Missing Data

After exporting the data into Excel, stratifying the charter schools into three groups made it easier for me to locate missing data. There were participants in each group who filled out the first part of the survey but did not fill out the rest of the survey, possibly because they grew tired of answering questions or felt the questions were too sensitive for them to answer. Whatever the reason, I included their responses in the t test for the first section. I did not include them in the t

test in the second and third sections of the survey, the sections that were not answered by those participants.

Collection and Conversion of Data

Before coding the data, I looked for errors. I noticed in the survey that Question 6 was duplicated and I deleted it. The original format for the statements in the survey was for all of them to be answered in one direction from “Strongly Disagree” to “Strongly Agree” with Strongly Disagree = 1, Disagree = 2, Neither Agree nor Disagree = 3, Agree = 4, and Strongly Agree = 5. All questions were coded from lowest to highest. During a final review of the questions, I noticed that Questions 6, 7, 9, and 10 needed to be reversed to correctly match the answer direction of the rest of the questions. Table 2 shows the original questions and the changed questions.

Table 2

Changes to Survey Questions

Statement #	Original Question:	Incorrect direction if answered "Strongly Agree" or "Agree"	Question Changed to:	Correct direction if answered "Strongly Agree" or "Agree"
6	It takes a lot of time to use technology in my classroom.	Barrier	It does not take a lot of time to use technology in my classroom.	No Barrier
7	Budget constraints hinder me from incorporating technology in my classroom.	Barrier	Budget constraints do not hinder me from incorporating technology in my classroom	No Barrier
9	The students I teach do not have the necessary skills to use the technology in my class.	Barrier	The students I teach have the necessary skills to use the technology in my class.	No Barrier
10	The school I work for does not have enough equipment for me to use in order to incorporate technology into my classroom.	Barrier	The school I work for has enough equipment for me to use in order to incorporate technology into my classroom.	No Barrier

In Question 6, the original statement read: "It takes a lot of time to use technology in my classroom." If the respondent replied "Strongly Agree" or "Agree," it meant there was a barrier, and hence, did not match up with the original intent of statements all going in the same direction. For the answer to show up as a barrier, the respondent would need to "Strongly Disagree" or "Disagree." Therefore, I changed the question to read as follows: "It does not take a lot of time to use technology in my classroom." Since the statement was reversed, the participant's answer was reversed, from "Strongly Agree" or "Agree" to "Strongly Disagree" or "Disagree," which shows as a barrier or a negative perception. Question 7 read: "Budget constraints hinder me from incorporating technology in my classroom." If the respondents answered "Strongly Agree" or "Agree," this meant there was a barrier, and showed the statement needed to be reversed. I changed the statement to: "Budget constraints do not hinder me from incorporating technology into my classroom." If the participant "Strongly Agrees" or "Agrees" the response showed there is no barrier. If the participant "Strongly Disagrees" or "Disagrees," the response showed there is a barrier.

Statement 9 read: "The students I teach do not have the necessary skills to use technology in my class." As stated previously, if the response is "Strongly Agree" or "Agree," there is a barrier, and if the response is "Strongly Disagree" or "Disagree" there is no barrier. I changed the question to: "The students I teach have the necessary skills to use technology in my class." When the response is "Strongly Agree" or "Agree," there is no barrier, and if the response is

“Strongly disagree” or “Disagree” there is a barrier, and meets the direction the statement requires.

The last statement, number 10, read: “The school I work for does not have enough equipment for me to use in order to incorporate technology into my classroom.” I changed the statement to “The school I work for has enough equipment in order for me to incorporate technology into my classroom.” Adhering to the above reasons, this statement meets the requirements for the direction of the responses in the rest of the survey. Table 2 shows the changes made to the original statement. Once the statements were changed to match the direction of the other questions, I began the data analysis process.

Survey Participant Demographic Data

Survey participants were comprised of 61 charter high school teachers who independently chose to participate in the study by responding to an e-mail that was provided by me and sent to them through a listserv by the principal at their respective schools. Since I indicated to the principal that I would keep the survey totally anonymous, I did not ask for demographic information in the survey. The charter schools were located throughout North Carolina. To increase the survey population and make the data more meaningful, I stratified the schools into three strata. I looked for similarities in the schools, and labeled each school as East Charter School, Southeast Charter School, or Northeast Charter School. I labeled the schools to protect the anonymity of the school names and locations. When I send the final report with the results to principals, they will see only the data and will be unable to identify their school with any certainty. I will provide a discussion of the descriptive analysis of the survey charter school demographics in the following section.

Descriptive Analysis of Demographic Data

The East Charter school stratum are in rural areas in the state of North Carolina. Figure 3 shows these charter schools are small with a student population between 75 and 110 students in each school. There were approximately 15 teachers in each school and per the data provided by the Department of Public Instruction website for Charter Schools, 1.2 students had access to the Internet in each of these schools.

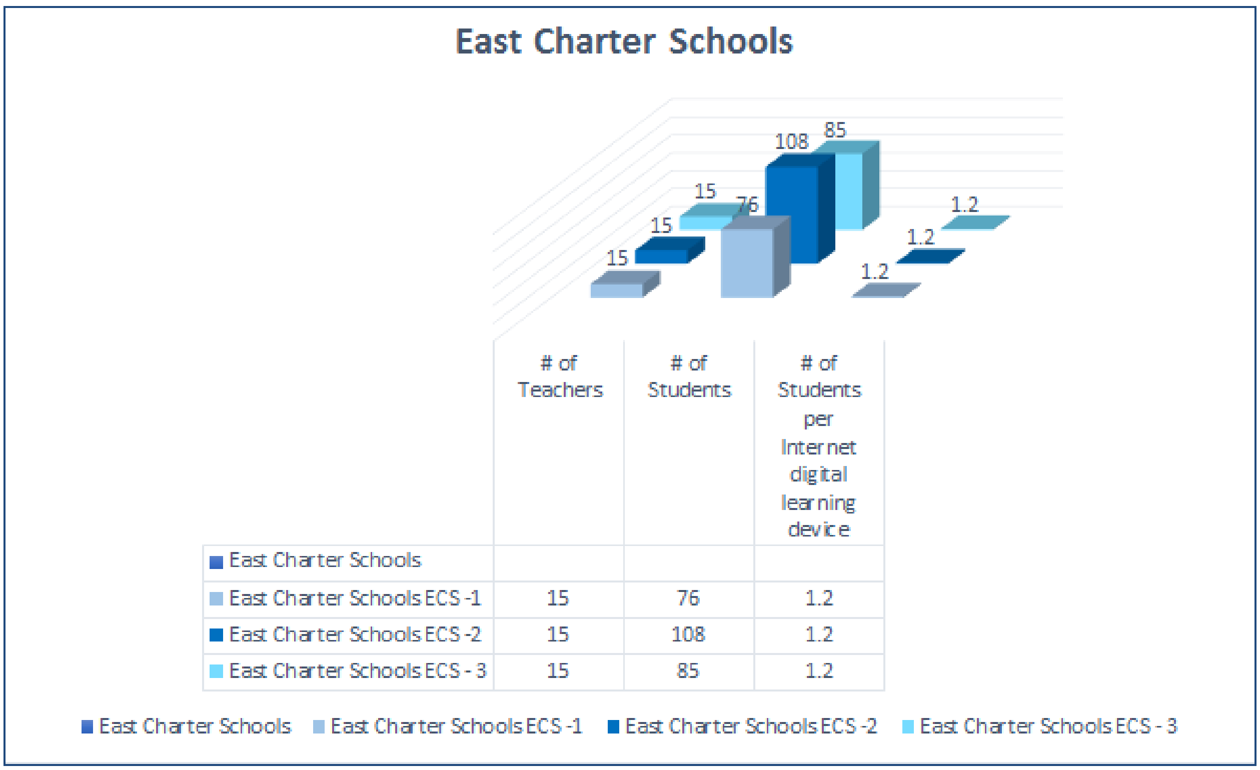
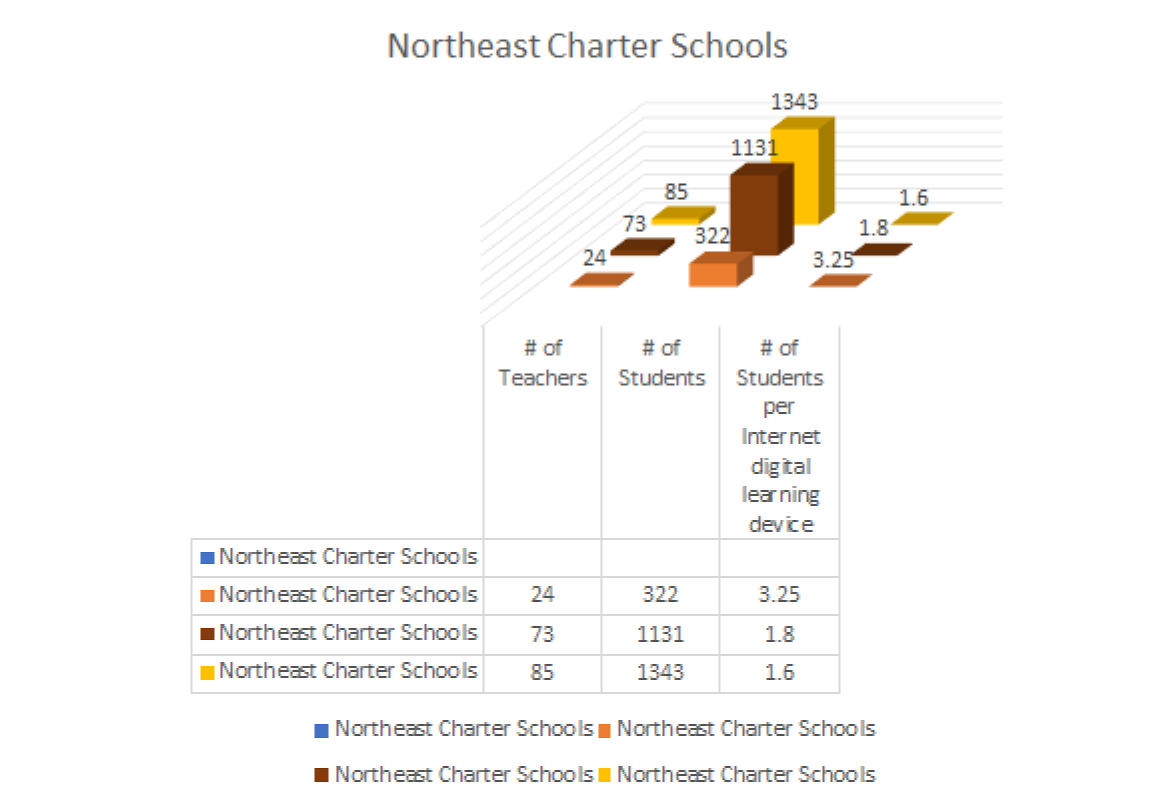


Figure 3. Column chart showing the total number of teachers and students in the East Charter School strata with the number of students per Internet digital learning device.

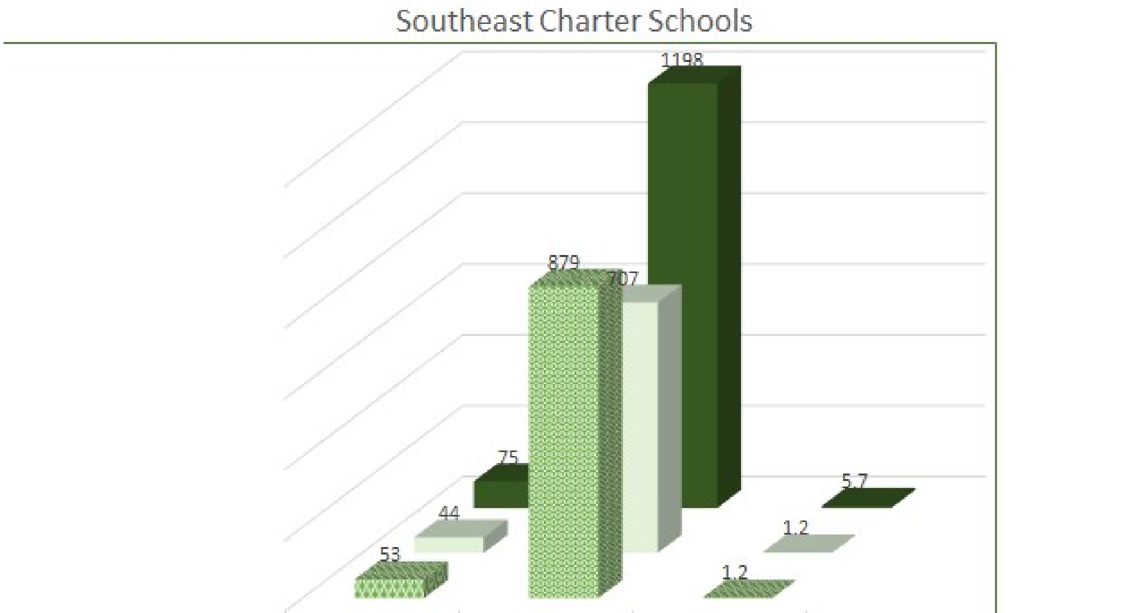
The Northeast Charter Schools were located in an urban area of North Carolina and the locations of the schools were between 45 and 80 minutes apart. Figure 4 shows the student population ranged from 300 to 1,300 students with 24 to 85 teachers in each school. The school with the least number of students and teachers had a 3.25 student ratio of access per Internet digital learning device as compared with the larger schools in this stratum.



	# of Teachers	# of Students	# of Students per Internet digital learning device
Northeast Charter Schools			
Northeast Charter Schools	24	322	3.25
Northeast Charter Schools	73	1131	1.8
Northeast Charter Schools	85	1343	1.6

Figure 4. Column chart showing the total number of teachers and students in the Northeast Charter School strata with the number of students per Internet digital learning device.

The Southeast Charter Schools (see Figure 5) were also located in an urban area in North Carolina and each school had a student population of 700–1,220 students with a 53 to 75 teacher ratio. The charter school with the highest student population also had the highest number of students that had access to each Internet digital learning device (5.7), whereas the other two schools showed that 1.2 students had access to each Internet digital learning device.



	# of Teachers	# of Students	# of Students per Internet digital learning device
Southeast Charter Schools	53	879	1.2
Southeast Charter Schools	44	707	1.2
Southeast Charter Schools	75	1198	5.7

Figure 5. Column chart showing the total number of teachers and students in Southeast Charter School strata with the number of students per Internet digital learning device.

Assumptions

I assumed that the survey instrument I developed for this study was appropriate and the respondents understood the questions and made their responses accordingly. I assumed initially that public school teachers faced barriers incorporating technology into their classrooms, that they had a negative perception of integrating technology into their classrooms, and that they believed their students were not technologically prepared as 21st century professionals due to time factors, budget constraints, and lack of technology to handle the large class sizes the teachers had. Since this population could not be accessed, I had to revert to conducting my survey with charter school teachers and my perceptions concerning the hypothesis were reversed. I believed that charter school teachers did not have barriers or have negative perceptions regarding technology integration and they believed their students were prepared as 21st century professionals. The reason for my perceptions was due to charter school teachers being able to operate independent of the public-school district; they are held accountable by the State Board of Education and the parents and they controlled their own curriculum, staffing, organization, and budget. They do not have local bond funds or Education Lottery funds. They are governed by their own school board. Charter schools are held to a higher academic accountability than traditional public schools but have more freedom in their financial operations.

Other assumptions of this study are the respondent's answers to the survey questions. They may have answered with positive instead of negative responses because they didn't think they could be honest with their answers to the questions. Low or no-response rates and teacher attitudes regarding online surveys may be a factor for educators not answering the survey. Low response rates may be due to the proliferation of junk mail and the survey may be deleted. The participant may not be aware they are asked to participate in the survey and delete the survey. The length of the survey may have bearing on a low response rate as well. To address some of the limitations to this study, I included a cover letter with the survey that was approved by the IRB. I explained the purpose of the survey and how their answers could benefit students in the future with possible internships or jobs.

Limitations

The boundaries of this study were the areas the research will cover regarding the high schools. I conducted the surveys only within the charter high schools where principals provided approval. The study was limited to high school educators and did not include all K–12 educators in the state due to the enormity and expense this type of research would take on. Students were not surveyed due to the nature of the research.

The problem that occurred when I tried to obtain permission to conduct my study in the public high schools was the principals not responding to my letters after providing me with prior verbal approval. When I called, I spoke with them personally, they told me they consulted with their technology professional and was advised against allowing me to conduct the survey with the teachers at the school. I spoke with a few administrators and they said that some of the schools may be facing some issues they do not want exposed especially if they did not know if I was going to be honest with keeping the results of the research confidential. Even though I explained that I was going keep the survey results confidential, I was told if the principal did not know me, they would not trust me.

Limitations of this research include the limits of time. I was not able to conduct a mixed-method research due to the time constraints I am faced with and the area in North Carolina where

I conducted the study. I would not be able to conduct any structured interviews or travel to the many areas where the research took place. Another limitation to my study was the subject of professional development. This is an area that will require further research to answer questions that arise about professional development and the lack or impact it has on the teacher and the student.

Some questions about professional development I had while I was doing my research that will not be addressed in this study were:

- What impact does professional development activities have on pedagogical change or student learning?
- What are the effects of professional development on student learning?
- What is a clear articulation of intended outcomes of professional development?
- What are appropriate evaluation strategies that must be implemented to assess the effects of professional development?
- What are teacher's motivations to learn?
- What is teacher's commitment to change?
- What is teacher's willingness to be risk takers?
- What are teachers learning when they participate in professional development activities?
- Do professional development sessions change teacher pedagogies?
- How does professional development change their pedagogy?

A more in-depth evaluation of professional development activities is critical if there is to be any growth in the knowledge base. Lawless and Pellegrino (2007) assessed that “A more systematic study of how technology integration occurs within our schools, what increases adoption by teachers, and the long-term impacts that these investments have on both teachers and students” (p. 575). Therefore, I will not try to answer these questions in this study due to the research required to find out the long-term impact that professional development has on the teacher and student. I have mentioned the issue of professional development because it is a part of the teacher’s ongoing education. The following section will discuss my data analysis for this project.

Data Analysis

The total of 61 participants were surveyed and each participant answered 38 questions about three research questions: a) Potential challenges educators face that hinder them from integrating technology into their classes, b) Educators’ perception related to technology integration, and if c) Educator’s believed their high school students were technologically prepared as 21st century professionals. I performed the data analysis using the statistical package for the social sciences (SPSS) software. To ensure my findings, I created a new spreadsheet from the coded Excel spreadsheet discussed in the data gathering section of this chapter to perform a more detailed analysis. I calculated the mean of each of the individual respondents for each group of research questions. The scores from the individual mean responses were used to calculate the total mean. The standard deviation of the responses was calculated and a parametric *t* test with a probability level of $p < .05$ used to determine if the null or alternative hypothesis was proven.

Research Findings

Research Question 1—East Charter School

There were 10 questions and three strata related to Research Question 1. I will discuss each stratum separately to bring clarity to the findings. Table 3 shows the data for the East Charter School coded and separated by Questions (Q1–Q10) listed vertically and Respondents (R1–R18) listed horizontally. In all of the following tables I followed the same format. A row labeled *Count* was of the number of respondents that answered each question and a *Count* of the number of questions answered by each respondent. A row labeled *Sum and Count* was added to calculate the mean score for each respondent. A row labeled Mean calculated the total mean, and a row labeled Standard Deviation calculated the standard deviation for each of the respondents. The hypothesis mean was 3 and the degrees of freedom were 17. The null hypothesis being tested was to test if the mean is less than or equal to 3. I used a one-tailed test to test my hypothesis, which is shown in Appendix C and discussed in the Summary Hypothesis for East Charter School section of this chapter.

There were 18 respondents who answered the 10 questions in the East Charter School strata. There was a total of 180 responses (18 respondent's x 10 questions) documented. Research Question 1 asked: What indicators cause high school educators to believe they face barriers hindering them from incorporating technology into their classes? As shown in Table 4, there were five items with a point range between 1 and 5 coded as follows: Number 1: *Strongly Disagree*, 2: *Disagree*, 3: *Neither Disagree nor Agree*, 4: *Agree*, 5: *Strongly Agree*. The hypothesis test indicated that, on average, most of the participants responded between Agree and Strongly Agree on all 10 items. Out of a total of 180 responses, there were seven responses (4%) of *Strongly Disagree*, 31responses (17%) of *Disagree*, 15 responses (8%) *Neither Agree nor Disagree*, 78 responses (43%) *Agree*, and 49 responses (27%) *Strongly Agree* to the 10 questions.

Table 3

Coded Table for Research Question 1East Charter School Responses for Questions 1–10

RQ 1: What indicators cause high school educators to believe they face barriers hindering them from incorporating technology into their classes?

East Charter School Respondents

Questions	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	count	
Q1	4	4	3	5	4	5	5	5	5	5	5	4	5	5	4	5	2	4	18	
Q2	2	2	2	5	4	5	4	5	5	5	5	4	5	5	5	4	1	5	18	
Q3	2	2	3	5	4	5	4	5	5	5	5	4	5	5	1	4	4	5	18	
Q4	4	1	4	4	4	5	2	4	5	4	4	4	4	4	2	4	4	4	18	
Q5	4	2	3	4	5	5	4	5	4	5	5	4	4	5	4	4	5	5	18	
Q6	4	1	4	3	3	2	2	4	2	4	3	3	4	4	2	2	4	2	18	
Q7	3	5	2	5	4	3	4	3	4	5	4	3	4	4	4	4	1	4	18	
Q8	4	2	4	2	4	4	2	4	4	4	4	4	4	4	5	4	2	4	18	
Q9	4	2	3	3	4	1	2	2	3	4	2	4	2	4	5	4	2	5	18	
Q10	2	1	4	5	4	4	4	5	4	5	3	4	4	5	2	2	2	2	18	
Sum	33	22	32	41	40	39	33	42	41	46	40	38	41	45	34	37	27	40	180	
Count	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10		
Mean	3.3	2.2	3.2	4.1	4	3.9	3.3	4.2	4.1	4.6	4	3.8	4.1	4.5	3.4	3.7	2.7	4	3.73	**Mean**
Std. Dev	0.95	1.32	0.79	1.101	0.47	1.45	1.1595	1.033	0.99	0.52	1.05	0.42	0.88	0.53	1.5	0.95	1.42	1.15	0.613	**Std. Dev.**
Tail 1																			0.144	**Std. Err.**
Count	**18**																		5.034	***t* Test**
Hyp mean	**3**																			
df	**17**																			
α	**.05**																			

The responses indicated that the highest area where the respondents faced barriers for the East Charter school was Questions 6, which stated, “It takes a lot of time to use technology in my classroom,” seven respondents face barriers in this area. Question 9 stated, “The students I teach have the necessary skills to use the technology in my class”; seven respondents perceive that their students didn’t have the necessary skills to use the technology which created a barrier for the teacher. Question 10 stated, “The school I work for has enough equipment for me to use to incorporate technology into my classroom”; six respondents disagreed and strongly disagreed with this question and this created a barrier for the teacher.

Table 4

Summary of Responses for East Charter School for Research Question 1

East Charter School Responses
Total # of Respondents = 18
Questions 1–10

RQ1: What indicators cause high school educators to believe they face barriers hindering them from incorporating technology into their classes?	Strongly Disagree 1	Disagree 2	Neither Agree nor Disagree 3	Agree 4	Strongly Agree 5
1. I have computers in my classroom.	0	1	1	6	10
2. The computers in my classroom work adequately.	1	3	0	4	10
3. The software installed on my classroom computers is current.	1	2	1	5	9
4. I am able to successfully integrate technology in my classroom without assistance from others.	1	2	0	12	2
5. I receive professional development training to assist me with integrating technology in my classes.	0	1	1	8	8
6. *It does not take a lot of time to use technology in my classroom.	1	6	4	7	0
7. * Budget constraints do not hinder me from incorporating technology in my classroom.	1	1	4	9	3
8. I have enough time to incorporate technology in my classroom.	0	4	0	13	1
9. *The students I teach have the necessary skills to use the technology in my class.	1	6	3	6	2
10. *The school I work for has enough equipment for me to use in order to incorporate technology into my classroom.	1	5	1	7	4
n(%)	7(3.89%)	31(17.22%)	15(8.33%)	78(43.33%)	49(27.22%)

Summary Hypothesis for Research Question 1: East Charter School

The hypothesis becomes: Ho: $\mu \leq 3$ - teachers face barriers incorporating technology into their classes and H1: $\mu > 3$ - teachers do not face barriers incorporating technology into their classes. The means and standard deviations were calculated related to the technology integration barrier items in the scale. Table 5 shows the total mean score of 3.7277 (*SD* = 0.6133) suggests that the respondents tended to select a *neutral, agree* or *strongly agree* rating with a test statistic of 5.0339 allows the null hypothesis to be rejected. Appendix C shows the visual results.

Table 5

Hypothesis Testing—Population Mean—East Charter School

Sample Size = *n*	Sample Mean=*x-bar*	St. Dev.=*s*	*t* statistic	Ho: $\mu \leq 3$	Accept or Reject at an α 5%
18	3.7277	0.6133	5.0339	0.0001	Reject

Research Question 1—Northeast Charter School

The second stratum is Northeast Charter School. Table 6 is in the same order as Table 3: Questions listed vertically and responses listed in columns horizontally. This stratum shows that all questions were answered by all 25 participants. There were 25 respondents who answered the 10 questions in the Northeast Charter School strata. There was a total of 250 responses (25 respondent's x 10 questions) documented. Research Question 1 asked: What indicators cause high school educators to believe they face barriers hindering them from incorporating technology into their classes? Table 7 shows how the 25 respondents answered each of the questions. I completed the calculations using an Excel spreadsheet and copied and pasted the results in the table format. Analysis indicated that, on average, most of the participants responded between Agree and Strongly Agree on all ten items. Out of a total of 250 responses, there were 18 responses (7%) of *Strongly Disagree*, 37responses (15%) of *Disagree*, 44 responses (18%) *Neither Agree nor Disagree*, 87 responses (35%) *Agree*, and 64 responses (26%) *Strongly Agree* to the 10 questions.

Table 6

Coded Table for Research Question 1

Northeast Charter School Responses for Questions 1–10

RQ 1: What indicators cause high school educators to believe they face barriers hindering them from incorporating technology into their classes?

Ques. #	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	count	
Q1	5	5	5	5	5	5	5	5	5	5	5	4	4	4	5	1	3	5	1	4	2	4	2	3	4	25	
Q2	5	5	5	5	3	4	5	4	5	5	4	3	4	2	5	2	4	2	1	4	3	4	3	4	2	25	
Q3	5	5	5	4	4	5	5	4	5	5	4	2	4	4	5	2	4	4	2	4	3	4	3	4	4	25	
Q4	2	5	5	5	3	4	3	4	5	4	4	4	3	4	4	4	3	3	3	5	2	4	4	4	4	25	
Q5	2	5	5	4	4	4	4	4	5	5	4	1	2	2	4	2	2	3	2	3	3	4	4	2	1	25	
Q6	1	5	3	3	1	2	4	4	2	2	1	2	4	2	3	3	3	1	3	3	4	4	4	3	1	25	
Q7	4	5	5	5	2	5	3	5	4	5	4	1	2	3	4	3	4	2	2	3	1	4	4	3	3	25	
Q8	1	5	5	4	2	4	4	4	4	4	3	2	4	4	3	4	2	3	4	4	1	4	4	3	2	25	
Q9	4	5	4	4	3	3	3	4	1	5	4	3	4	4	5	3	2	4	5	4	5	3	2	5	2	25	
Q10	5	5	4	5	3	5	4	5	5	5	4	1	2	1	5	1	3	3	5	4	2	5	2	5	4	25	
Sum	34	50	46	44	30	41	40	43	41	45	37	23	33	30	43	25	30	30	28	38	26	40	32	36	27	250	
Count	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10		
Mean	3.4	5	4.6	4.4	3	4.1	4	4.3	4.1	4.5	3.7	2.3	3.3	3	4.3	2.5	3	3	2.8	3.8	2.6	4	3.2	3.6	2.7	**3.568**	**Mean**
Std. Dev	1.713	0.000	0.699	0.699	1.155	0.994	0.816	0.483	1.449	0.972	1.059	1.160	0.949	1.155	0.823	1.080	0.816	1.155	1.476	0.632	1.265	0.471	0.919	0.966	1.252	**0.745**	**Std. Dev.**
																										0.149	**Std. Err.**
Count	25																									**3.813**	***t* Test**
Hyp. mean	3																										
df	24																										
α	0.05																										
tails	1																										

The responses indicated that the highest area where the respondents faced barriers for the Northeast Charter School was Question 5, which stated “I receive professional development training to assist me with integrating technology in my classes,” two respondents strongly disagreed and seven responded with disagree. Question 6, which stated, “It takes a lot of time to use technology in my classroom,” five respondents strongly disagreed, five respondents disagreed, and six respondents neither agreed nor disagreed, and faced barriers in this area. Question 7 stated, “Budget constraints do not hinder me from incorporating technology in my classroom.” Two respondents strongly disagreed, five disagreed, while six respondents neither agreed nor disagreed with budget constraints hindering them from integrating technology into their classrooms. Question 8 stated, “I have enough time to incorporate technology in my classroom,” two respondents strongly disagreed and four respondents disagreed, and four respondents neither agreed nor disagreed with this question and this created a time barrier for the teacher.

Table 7
Total Responses for Northeast Charter School for Research Question 1

Northeast Charter School Responses
Total # of Respondents = 25
Questions 1–10

RQ1: What indicators cause high school educators to believe they face barriers hindering them from incorporating technology into their classes?	Strongly Disagree 1	Disagree 2	Neither Agree nor Disagree 3	Agree 4	Strongly Agree 5
1. I have computers in my classroom.	2	2	2	6	13
2. The computers in my classroom work adequately.	1	4	4	8	8
3. The software installed on my classroom computers is current.	0	3	2	12	8
4. I am able to successfully integrate technology in my classroom without assistance from others.	0	2	6	12	5
5. I receive professional development training to assist me with integrating technology in my classes.	2	7	3	9	4
6. *It does not take a lot of time to use technology in my classroom.	5	5	8	6	1
7. *Budget constraints do not hinder me from incorporating technology in my classroom.	2	4	6	7	6
8. I have enough time to incorporate technology in my classroom.	2	4	4	13	2
9. *The students I teach have the necessary skills to use the technology in my class.	1	3	6	9	6
10. *The school I work for has enough equipment for me to use in order to incorporate technology into my classroom.	3	3	3	5	11
n(%)	18(7%)	37(15%)	44(18%)	87(35%)	64(26%)

Summary Hypothesis for Research Question 1: Northeast Charter School

The hypothesis becomes: Ho: $\mu \leq 3$ - teachers face barriers incorporating technology into their classes and H1: $\mu > 3$ - teachers do not face barriers incorporating technology into their classes. In Table 7, Research Questions 1–10 for the Northeast Charter School strata, there were a total of 25 respondents in this stratum who answered the 10 questions. The means and standard deviations were calculated on the technology integration barrier items of the scale. Table 8 shows the total mean score of 3.568 (*SD* = 0.7448) suggests that the respondents tended to select *Agree* or *Strongly Agree* rating. Thus, with confidence we can reject the null hypothesis. Appendix D provides the visual of the hypothesis test results.

Table 8

Hypothesis Testing—Population Mean—Northeast Charter School

Sample Size=*n*	Sample Mean=*x-bar*	Standard Dev.=*s*	*t* statistic	Ho: μ ≤ 3	Accept or Reject at an α 5%
25	3.568	0.745	3.8121	0.0004	Reject

Research Question 1—Southeast Charter School

Table 9 shows the third school, the Southeast Charter School, stratum. As stated earlier, the mean, standard deviation, and *t* test was calculated using the Excel spreadsheet functions and the visual data are shown in Appendix E. There were 18 respondents who answered the 10 questions in the Southeast Charter School strata. There was a total of 180 responses (18 respondent's x 10 questions) documented. Research Question 1 asked: "What indicators cause high school educators to believe they face barriers hindering them from incorporating technology into their classes?" Table 10 summarizes how the 18 respondents answered each of the questions. As mentioned in the previous stratum there were five items with a point range between 1 and 5, the number 1 being *Strongly Disagree*, 2: *Disagree*, 3: *Neither Disagree nor Agree*, 4: *Agree*, 5: *Strongly Agree*.

I completed the calculations using an Excel spreadsheet and copied and pasted the results in the table format. Analysis indicated that, on average, the participants responded higher in Agree and Strongly Agree on all 10 items. Out of a total of 180 responses, there were 30 responses (17%) of *Strongly Disagree*, 33 responses (18%) of *Disagree*, 30 responses (17%) *Neither Agree nor Disagree*, 48 responses (27%) *Agree*, and 39 responses (22%) *Strongly Agree* to the 10 questions. The percentage of participants who answered strongly disagreed, disagreed, and neutral were similar, which indicates they experienced some barriers.

The question that had the highest number of strongly disagree, disagree, and neutral for the Southeast Charter School was Questions 2, which stated, “The computers in my classroom work adequately”; a total of eight respondents face barriers in this area. Question 5 stated, “I receive professional development training to assist me with integrating technology in my classes”; 11 respondents perceive that the computers in their classrooms do not work adequately, which created a barrier for those teachers. Question 6 stated, “It does not take a lot of time to use technology in my classroom.” Eight respondents disagreed with this question and this created a barrier for the teacher. Question 7 stated, “Budget constraints do not hinder me from incorporating technology in my classroom.” Ten participants responded with either Strongly Disagree or Disagree, which means that it took a lot of time for the teachers to use technology in their classrooms, which coincides with the barriers they faced in their previous answers to

Questions 2, 5, 6, 7, and 10. Question 10 stated "The school I work for has enough equipment for me to use in order to incorporate technology into my classroom." This question, as with the previous question, aligns with the participants' answers to having barriers integrating technology into their classrooms.

Table 9

Coded Table for Research Question 1

Southeast Charter School Responses for Questions 1–10

RQ 1: What indicators cause high school educators to believe they face barriers hindering them from incorporating technology into their classes?

Questions	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	count	
Q1	5	5	1	5	4	1	4	4	5	2	5	5	2	4	5	5	1	3	18	
Q2	1	4	1	1	4	1	2	2	5	2	5	5	3	4	5	4	1	4	18	
Q3	3	4	1	3	5	4	4	3	5	4	5	5	4	4	5	5	1	4	18	
Q4	3	3	1	4	5	1	2	4	5	4	5	5	4	4	5	5	4	3	18	
Q5	3	2	1	3	2	1	4	2	2	1	2	5	1	4	3	2	1	3	18	
Q6	3	2	3	4	2	4	2	2	5	2	5	2	3	4	3	2	3	2	18	
Q7	5	4	1	2	1	1	2	1	1	1	5	5	2	5	4	3	1	3	18	
Q8	5	2	2	4	3	5	3	3	4	2	5	4	4	3	4	3	4	3	18	
Q9	3	3	4	4	3	5	4	4	5	4	4	4	2	4	2	4	2	4	18	
Q10	3	4	3	1	2	1	2	1	1	2	5	5	1	5	4	4	1	2	18	
Sum	34	33	18	31	31	24	29	26	38	24	46	45	26	41	40	37	19	31	180	
Count	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10		
Mean	3.4	3.3	1.8	3.1	3.1	2.4	2.9	2.6	3.8	2.4	4.6	4.5	2.6	4.1	4	3.7	1.9	3.1	**3.183**	**Mean**
																			0.823	**Std. Dev.**
Count	18																		**0.194**	**Std. Err.**
Hyp mean	3																		**0.945**	***t* Test**
df	17																			
α	0.05																			

Table 10

Total of Responses for Southeast Charter School for Research Question 1

Southeast Charter School Responses
Total # of Respondents = 18
Questions 1–10

RQ1: What indicators cause high school educators to believe they face barriers hindering them from incorporating technology into their classes?	Strongly Disagree 1	Disagree 2	Neither Agree nor Disagree 3	Agree 4	Strongly Agree 5
1. I have computers in my classroom.	3	2	1	4	8
2. The computers in my classroom work adequately.	5	3	1	5	4
3. The software installed on my classroom computers is current.	2	0	3	7	6
4. I am able to successfully integrate technology in my classroom without assistance from others.	2	1	3	6	6
5. I receive professional development training to assist me with integrating technology in my classes.	5	6	4	2	1
6. *It does not take a lot of time to use technology in my classroom.	0	8	5	3	2
7. * Budget constraints do not hinder me from incorporating technology in my classroom.	7	3	2	2	4
8. I have enough time to incorporate technology in my classroom.	0	3	6	6	3
9. *The students I teach have the necessary skills to use the technology in my class.	0	3	3	10	2
10. *The school I work for has enough equipment for me to use in order to incorporate technology into my classroom.	6	4	2	3	3
n(%)	30(17%)	33(18%)	30(17%)	48(27%)	39(22%)

Summary of Hypothesis 1 for Southeast Charter School

The hypothesis mean is: Ho: $\mu \leq 3$ - teachers face barriers incorporating technology into their classes and H1: $\mu > 3$ - teachers do not face barriers incorporating technology into their classes. In Table 11, research questions 1–10 for the Southeast Charter School strata, there were a total of 18 respondents in this stratum who answered the 10 questions. The mean and standard deviation were calculated on the technology integration barrier items of the scale. Table 8 shows the total mean score of 3.183 (SD = 0.8234) suggests that a little more than half (93) of the respondents had some barriers or were neutral in their responses, which show that the null hypothesis cannot be rejected with any high degree of confidence. Appendix E provides the visual of the hypothesis test results.

Table 11

Hypothesis Testing—Population Mean—Southeast Charter School

Sample Size=n	Sample Mean=*x-bar*	Standard Dev.=*s*	*t* statistic	Ho: $\mu \leq 3$	Accept or Reject at an α 5%
18	3.1833	0.8234	0.9445	0.1791	

Research Question 2—East Charter School

There are 15 questions related to Research Question 2. Table 12 shows the coded table of each respondent answer. Table 13 summarizes those responses. There were 18 participants who answered the 15 questions in the East Charter School strata. There was a total of 270 responses (18 respondent’s x 15 questions) documented. Research Question 2 asks: “What elements lead high school educators to believe they are not prepared to integrate technology in their classrooms?" The interesting point about the set of responses was that no one responded *Strongly Disagree*. There were only five participants who responded with the answer *Disagree* (3%) of which three participants did not believe they could successfully evaluate software for teaching and learning, and one of those participants believed he/she could not successfully use computer terminology when directing students while they are using technology; another of those three participants believed he/she could not consistently use educational technology effectively to enrich learning in their classroom or appropriately incorporate technology into instruction based on curriculum standards. One teacher believed she/he could not successfully assist students when they needed help with using the computer in the classroom for their assignments. And the last participant believed using technology in class was unnecessary. There were 21 responses of *Neither Agree nor Disagree* (8%), 184 responses of *Agree* (68%), and 57 responses of *Strongly Agree* (21%). Many of the teachers believed they could successfully integrate technology into their classrooms. Therefore, we can reject the null hypothesis. Some of the charter school teachers who experienced barriers integrating technology into their classrooms also answered with *Disagree* to at least one of the 15 questions related to integrating technology into their classrooms.

Table 12

Coded Table for Research Question 2

East Charter School Responses for Questions 11–25

RQ 2: What elements lead high school educators to believe they are not prepared to integrate technology in their classrooms?

Question	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	COUNT	
Q11	5	4	4	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	18	
Q12	4	4	4	4	4	5	4	3	4	4	4	4	4	5	4	4	5	4	18	
Q13	4	4	5	4	3	5	3	4	5	4	4	4	4	5	4	4	4	4	18	
Q14	4	3	4	4	2	5	2	4	5	4	4	4	4	5	4	4	2	4	18	
Q15	4	3	4	3	4	4	3	3	5	4	4	3	4	5	4	4	2	4	18	
Q16	4	2	4	4	4	5	4	3	5	4	4	4	4	4	4	4	5	4	18	
Q17	4	4	4	4	4	5	2	4	4	4	4	4	4	5	4	4	4	4	18	
Q18	4	4	5	4	4	5	2	4	4	4	4	4	4	5	4	5	5	4	18	
Q19	4	4	4	3	4	5	3	4	4	4	4	4	4	5	4	4	5	4	18	
Q20	4	4	4	3	4	5	4	4	5	3	4	3	4	5	5	4	5	4	18	
Q21	4	4	5	5	4	5	4	3	5	4	4	4	4	4	5	4	5	4	18	
Q22	4	4	3	3	3	4	4	4	5	4	4	3	4	4	4	4	4	4	18	
Q23	4	4	4	4	4	4	5	5	5	4	4	4	4	5	4	4	5	4	18	
Q24	4	4	4	5	3	4	4	5	5	4	4	4	5	4	5	2	5	4	18	
Q25	4	4	4	5	4	4	4	4	5	4	4	4	4	4	5	5	5	4	18	
Sum	61	56	62	59	55	70	52	58	71	59	60	57	61	69	64	60	66	60	270	
Count	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15		
Mean	4.07	3.73	4.13	3.93	3.67	4.67	3.47	3.87	4.73	3.93	4.00	3.80	4.07	4.60	4.27	4.00	4.40	4.00	**4.074**	**mean**
																			0.346	**std. dev.**
Count	**18**																		**0.082**	**Std. Err.**
Hyp mean	**3**																		**13.172**	***t* Test**
df	**17**																		**0.000**	**p. value**

Table 13

Total of Responses for East Charter School for Research Question 2

East Charter School Responses Total # of Respondents = 18 Questions 11–25					
RQ2: What elements lead high school educators to believe they are not prepared to integrate technology in their classrooms?	Strongly Disagree 1	Disagree 2	Neither Agree nor Disagree 3	Agree 4	Strongly Agree 5
11. I possess the necessary skills to incorporate technology into my classroom.	0	0	0	14	4
12. I believe I have the necessary computer skills to maximize the use of technology in my classroom.	0	0	1	14	3
13. I believe I can enrich learning of content through the use of technology.	0	0	2	12	4
14. I believe I can successfully evaluate software for teaching and learning.	0	3	1	11	3
15. I believe I can successfully use computer terminology when directing students while they are using technology.	0	1	5	10	2
16. I believe I can successfully assist students when they need help with using the computer in my classroom for their assignments.	0	1	1	13	3
17. I believe I can consistently use educational technology effectively to enrich learning in my classroom.	0	1	0	15	2 Table continues

RQ2: What elements lead high school educators to believe they are not prepared to integrate technology in their classrooms?	Strongly Disagree 1	Disagree 2	Neither Agree nor Disagree 3	Agree 4	Strongly Agree 5
18. I believe I can appropriately incorporate technology into instruction based on curriculum standards.	0	1	0	12	5
19. I believe I can select appropriate technology for instruction based on curriculum standards.	0	0	2	13	3
20. I believe I can use technology resources (such as electronic portfolios, digital documents/artifacts) to collect and analyze data from student tests and products to improve instructional practices.	0	0	3	10	5
21. I am comfortable using technology in my teaching.	0	0	1	11	6
22. When faced with system constraints (such as budget cuts), I believe I can develop creative methods that will enable me to use the technology available.	0	0	4	13	1
23. I believe it is important for me to have professional development training regarding integration of technology into my classroom.	0	0	0	13	5
24. I believe using technology in my class is necessary.	0	1	1	10	6
25. I am prepared to teach students the skills they need to complete various online projects.	0	0	0	13	5
n(%)	0(0%)	8(3%)	21(8%)	184(68%)	57(21%)

Summary of Hypothesis Research Question 2: East Charter School

The research question related to the following hypothesis is: "What elements lead high school educators to believe they are not prepared to integrate technology in their classrooms?" The null and alternate hypothesis are as follows: The hypothesis mean is Ho: $\mu \leq 3$ – High school educators are not prepared to integrate technology into their classrooms. The alternate hypothesis is: H_1: $\mu > 3$ – High school educators are prepared to integrate technology into their classrooms, where m=3 is the average of the scores for the related questions. In Table 14, the mean and standard deviation was calculated based on teacher belief of being prepared to integrate technology into the classroom. The table shows a total mean score for the East Charter School of 4.07407 (*SD* = 0.34594) and the test statistic shows (13.1725), which suggests that we can reject the null hypothesis with a high level of confidence. Appendix G provides the visual of the hypothesis test results.

Table 14

Hypothesis Testing—Population Mean—East Charter School

Sample Size=n	Sample Mean=*x-bar*	Standard Dev.=*s*	*t* statistic	Ho: $\mu \leq 3$	Accept or Reject at an α 5%
18	4.0740	0.3459	13.1725	0.0000	Reject

Research Question 2—Northeast Charter School

There are 15 questions related to Research Question 2. There were 24 respondents who answered the 15 questions in the Northeast Charter School strata. There was a total of 359 responses (24 respondent's x 15 questions) documented. Research Question 2 in the Northeast Charter School strata is the same as the East Charter School strata. Table 15 shows how the participants answered each of the questions. Table 16 summarizes the responses of *Strongly Disagree* was zero (0) in the same manner as the East Charter School strata for this question. There were 28 responses with the answer *Disagree* (8%), 75 responses were *Neither Agree nor Disagree* (21%), 192 responses were *Agree* (53%), and 64 responses were *Strongly Agree* (18%). This indicates that many of the teachers believed they could successfully integrate technology into their classrooms.

Table 15
Coded Table for Research Question 2
Northeast Charter School Responses for Questions 11-25
RQ 2: What elements lead high school educators to believe they are not prepared to integrate technology in their classrooms?

Question	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	COUNT	
Q11	2	5	4	4	3	4	4	4	5	4	4	4	4	3	4	4	4	4	4	5	4	4		4	4	24	
Q12	2	5	4	4	3	3	4	2	5	2	4	4	3	3	2	4	4	4	4	5	4	4		3	4	24	
Q13	2	5	5	4	4	3	4	4	5	4	4	4	5	5	4	4	4	3	4	5	4	4		4	4	24	
Q14	2	4	4	4	3	3	3	2	5	4	2	3	3	4	4	4	2	3	4	4	3	4		3	4	24	
Q15	2	4	4	4	3	3	3	3	5	4	4	4	4	5	4	4	3	3	4	5	3	4		4	4	24	
Q16	2	4	4	4	3	3	2	4	5	4	4	4	4	4	5	4	3	4	4	5	3	4		4	4	24	
Q17	2	5	5	4	3	3	4	3	5	4	4	3	4	3	4	4	4	4	4	5	4	4		3	4	24	
Q18	3	5	5	4	3	3	4	3	5	4	4	3	4	4	4	4	4	4	4	5	4	4		3	4	24	
Q19	2	5	5	4	3	3	3	4	5	4	4	2	4	4	4	4	4	4	4	5	4	4		3	4	24	
Q20	2	4	5	4	3	3	4	2	5	3	4	4	4	4	2	2	3	3	4	5	3	4		4	4	24	
Q21	2	5	5	4	3	2	4	3	5	3	4	4	4	4	4	4	4	2	4	5	4	4		3	4	24	
Q22	3	5	4	4	3	3	4	4	5	4	4	2	3	4	5	4	3	4	3	4	3	3		3	3	24	
Q23	4	5		5	3	4	4	5	5	4	4	5	4	5	5	5	4	5	4	3	5	4		4	5	23	
Q24	2	5	5	4	3	4	4	5	5	4	4	4	5	4	5	5	4	5	4	4	4	4		4	3	24	
Q25	2	5	5	4	3	2	4	4	5	4	4	4	4	3	5	2	3	3	4	4	3	4		3	3	24	
Sum	34	71	64	61	46	46	55	52	75	56	58	54	59	59	61	58	53	55	59	69	55	59		52	58	359	
Count	15	15	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15		15	15		
Mean	2.27	4.73	4.57	4.07	3.07	3.07	3.67	3.47	5.00	3.73	3.87	3.60	3.93	3.93	4.07	3.87	3.53	3.67	3.93	4.60	3.67	3.93		3.47	3.87	**3.815**	**Mean**
																										0.574	**Std. Dev.**
Count	**25**																									**0.115**	**Std. Err.**
Hyp mean	**3**																									**7.100**	***t* Test**

df	24
α	0.0
5	
tails	1

Table 16

Total of Responses for Northeast Charter School for Research Question 2

Northeast Charter School Responses Total # of Respondents = 24 Questions 11–25					
RQ2: What elements lead high school educators to believe they are not prepared to integrate technology in their classrooms?	Strongly Disagree 1	Disagree 2	Neither Agree nor Disagree 3	Agree 4	Strongly Agree 5
11. I possess the necessary skills to incorporate technology into my classroom.	0	1	2	18	3
12. I believe I have the necessary computer skills to maximize the use of technology in my classroom.	0	4	5	12	3
13. I believe I can enrich learning of content through the use of technology.	0	1	2	15	6
14. I believe I can successfully evaluate software for teaching and learning.	0	4	8	11	1
15. I believe I can successfully use computer terminology when directing students while they are using technology.	0	1	7	13	3
16. I believe I can successfully assist students when they need help with using the computer in my classroom for their assignments.	0	2	4	15	3
17. I believe I can consistently use educational technology effectively to enrich learning in my classroom.	0	1	6	13	4
18. I believe I can appropriately incorporate technology into instruction based on curriculum standards.	0	0	6	14	4

Table continues

RQ2: What elements lead high school educators to believe they are not prepared to integrate technology in their classrooms?	Strongly Disagree 1	Disagree 2	Neither Agree nor Disagree 3	Agree 4	Strongly Agree 5
19. I believe I can select appropriate technology for instruction based on curriculum standards.	0	2	4	14	4
20. I believe I can use technology resources (such as electronic portfolios, digital documents/artifacts) to collect and analyze data from student tests and products to improve instructional practices.	0	4	6	11	3
21. I am comfortable using technology in my teaching.	0	3	4	13	4
22. When faced with system constraints (such as budget cuts), I believe I can develop creative methods that will enable me to use the technology available.	0	1	10	10	3
23. I believe it is important for me to have professional development training regarding integration of technology into my classroom.	0	0	2	10	11
24. I believe using technology in my class is necessary.	0	1	2	13	8
25. I am prepared to teach students the skills they need to complete various online projects.	0	3	7	10	4
n(%)	0(0%)	42(11%)	110(29%)	273(73%)	101(28%)

Summary of Hypothesis for Research Question 2—Northeast Charter School

The hypothesis mean is Ho: $\mu \leq 3$ – High school educators are not prepared to integrate technology into their classrooms. The alternate hypothesis is: H1: $\mu > 3$ – High school educators are prepared to integrate technology into their classrooms, where m=3 is the average of the scores for the related questions in the same manner as the East Charter School. In Table 17 the mean and standard deviation was calculated based on the teachers' beliefs of being prepared to integrate technology into their classrooms. The table shows a total mean score for the Northeast Charter School of 3.80375 (SD=0.55898) and the test statistic shows (7.0442), which suggests that we can reject the null hypothesis with a high degree of confidence. Appendix H provides the visual of the hypothesis test results.

Table 17

Hypothesis Testing—Population Mean—Northeast Charter School

Sample Size=n	Sample Mean=*x-bar*	Standard Dev.=*s*	*t* statistic	Ho: $\mu \leq 3$	Accept or Reject at an α 5%
24	3.80375	0.55898	7.0442	0.0000	Reject

Research Question 2—Southeast Charter School

The Southeast Charter School strata has the same 15 questions related to Research Question 2. There were 18 respondents who answered the 15 questions in the Southeast Charter School strata. There was a total of 270 responses (18 respondent's x 15 questions) documented. Research Question 2 in the Southeast Charter School strata is the same as the East and Northeast

Charter school's strata. Table 18 shows how the participants answered each of the questions. Table 19 shows the response summary of *Strongly Disagree* at zero (0) in the same manner as the East and Northeast Charter School strata for these questions. There were 10 responses with the answer *Disagree* (4%), 19 responses were *Neither Agree nor Disagree* (7%), 154 responses were *Agree* (57%), and 87 responses were *Strongly Agree* (32%). This indicates that many of the responses by the teachers (89%) of the Agree/Strongly Agree, the teachers believed they could successfully integrate technology into their classrooms.

Table 18

Coded Table for Research Question 2

Southeast Charter School Responses for Questions 11–25

RQ 2: What elements lead high school educators to believe they are not prepared to integrate technology in their classrooms?

Question	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	COUNT	
Q11	5	3	4	4	5	5	4	4	4	4	4	5	4	4	4	4	4	4	18	
Q12	5	4	3	4	5	5	4	4	4	4	4	5	4	4	4	4	4	4	18	
Q13	5	4	5	4	4	5	4	4	5	4	5	5	4	4	5	5	5	4	18	
Q14	5	5	4	4	5	5	4	2	4	4	5	4	2	4	3	4	4	3	18	
Q15	4	4	4	4	5	4	4	2	4	4	5	5	4	4	4	4	3	3	18	
Q16	4	4	4	4	5	5	4	4	4	4	4	5	5	4	4	4	3	4	18	
Q17	5	3	4	4	5	5	4	4	4	4	5	5	5	4	5	5	4	4	18	
Q18	5	4	4	4	4	5	4	4	4	4	5	5	2	4	5	5	4	4	18	
Q19	5	4	4	4	5	5	4	4	4	4	5	5	2	4	5	5	2	4	18	
Q20	4	3	4	3	4	5	4	4	4	4	4	4	2	4	5	3	4	4	18	
Q21	5	2	4	4	5	5	4	4	4	5	5	5	4	4	4	4	4	4	18	
Q22	4	4	4	4	5	5	4	2	5	4	4	5	4	4	4	3	4	3	18	
Q23	3	5	5	5	5	5	4	5	5	4	5	5	5	4	4	5	5	4	18	
Q24	3	3	3	4	5	5	4	2	5	4	5	5	3	4	5	5	5	4	18	
Q25	5	4	4	4	5	5	4	4	4	4	4	5	3	4	4	5	4	4	18	
Sum	67	56	60	60	72	74	60	53	64	61	69	73	53	60	65	65	59	57	270	
Count	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15		
Mean	4.47	3.73	4.00	4.00	4.80	4.93	4.00	3.53	4.27	4.07	4.60	4.87	3.53	4.00	4.33	4.33	3.93	3.80	4.178	**Mean**
																			0.428	**Std. Dev.**
Count	18																		0.101	**Std. Err.**
Hyp mean	3																		11.664	***t* Test**
df	17																		0.000	**p. value**
α	0.05																			
tails	1																			

Table 19

Total of Responses for Southeast Charter School for Research Question 2

Southeast Charter School Responses Total # of Respondents = 18 Questions 11–25					
RQ2 - What elements lead high school educators to believe they are not prepared to integrate technology in their classrooms?	Strongly Disagree 1	Disagree 2	Neither Agree nor Disagree 3	Agree 4	Strongly Agree 5
11. I possess the necessary skills to incorporate technology into my classroom.	0	0	1	13	4
12. I believe I have the necessary computer skills to maximize the use of technology in my classroom.	0	0	1	13	4
13. I believe I can enrich learning of content through the use of technology.	0	0	0	9	9
14. I believe I can successfully evaluate software for teaching and learning.	0	2	2	9	5
15. I believe I can successfully use computer terminology when directing students while they are using technology.	0	1	2	12	3
16. I believe I can successfully assist students when they need help with using the computer in my classroom for their assignments.	0	0	1	13	4
17. I believe I can consistently use educational technology effectively to enrich learning in my classroom.	0	0	1	9	8
18. I believe I can appropriately incorporate technology into instruction based on curriculum standards.	0	1	0	10	6
19. I believe I can select appropriate technology for instruction based on curriculum standards.	0	2	0	9	7
20. I believe I can use technology resources (such as electronic portfolios, digital documents/artifacts) to collect and analyze data from student tests and products to improve instructional practices.	0	1	3	12	2
21. I am comfortable using technology in my teaching.	0	1	0	11	6
22. When faced with system constraints (such as budget cuts), I believe I can develop creative methods that will enable me to use the technology available.	0	1	2	11	4

Summary of Hypothesis for Research Question 2—Southeast Charter School

Table 20 shows the mean and standard deviation calculated based on teacher belief of being prepared to integrate technology into their classrooms. The table shows a total mean score for the Southeast Charter School of 4.17722 (SD=0.42926) and the test statistic shows (11.6351), which suggests that we can reject the null hypothesis with a high degree of confidence. Appendix I provides the visual of the hypothesis test results.

Table 20

Hypothesis Testing—Population Mean—Southeast Charter School

Sample Size=n	Sample Mean=*x-bar*	Standard Dev.=*s*	*t* statistic	Ho: $\mu \leq 3$	Accept or Reject at an α 5%
18	4.17722	0.42926	11.6351	0.0000	Reject

Research Question 3—East Charter School

For the three Charter School strata (East, Northeast, Southeast), Table 21 shows there are 13 questions (26–38 including b & c in #26 and b, c, & d in #35) related to Research Question 3, out of those 13 questions, two questions had additional response associated with the question. Question 26 asked “My students are able to contribute to: a) blogs; b) wikis; c) surveys, and Question 35 asked “My students can complete assignments using various software applications: a) Word processing; b) Database management; c) Spreadsheet(s); d) Presentation(s). In the analysis, the responses for 26b, 26c, 35b, 35c, and 35d were counted as separate answers and brought the total count to 18 instead of 13. There were 16 participants instead of 18 who answered 18 questions in the East Charter School strata. There was a total of 288 responses (16 respondent's x 18 questions) documented. Research Question 3 asks: "What indicators show high school educators their students are technologically prepared as 21st century professionals?" Table 22 shows how the participants answered each of the questions. There were 12 responses of *Strongly Disagree* (4%), 57 (20%) responses were *Disagree*, 61 (21%) responses *Neither Agree nor Disagree*, 115 (40%) responses were *Agree* and 43 (15%) responses were *Strongly Agree*. This indicates that many of the responses (55%) were positive about students being technologically prepared as 21st century professionals.

Table 21

Coded Table for Research Question 3

East Charter School Responses for Questions 26–38

RQ 3: What indicators show high school educators their students are technologically prepared as 21st century professionals?

Question	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	COUNT	
Q26	2	1	2	4		3	2	4	4	4		3	3	4	4	4	5	5	16	
Q26B	2	1	2	3		3	2	3	4	2		3	3	4	4	4	4	5	16	
Q26C	2	1	3	4		3	2	4	4	4		3	3	4	5	4	5	5	16	
Q27	2	1	3	3		4	4	3	5	4		2	3	3	4	4	2	5	16	
Q28	2	1	3	4		4	4	3	5	4		3	3	4	4	4	4	4	16	
Q29	2	1	3	4		4	2	3	4	4		3	3	4	4	4	4	4	16	
Q30	2	1	2	5		4	4	3	5	4		3	3	3	4	4	2	5	16	
Q31	4	3	4	5		4	2	4	5	4		3	3	5	5	5	5	5	16	
Q32	2	2	2	1		4	4	4	5	4		3	3	3	5	5	5	5	16	
Q33	2	1	2	5		4	4	4	4	4		3	3	5	5	4	4	4	16	
Q34	2	1	2	3		4	2	3	3	2		3	3	5	4	4	2	4	16	
Q35	2	4	3	5		4	4	4	4	4		3	3	5	5	4	4	5	16	
Q35B	4	2	4	3		4	4	3	3	2		2	3	5	4	2	2	4	16	
Q35C	2	2	3	5		4	2	2	3	2		2	3	5	4	2	1	4	16	
Q35D	4	4	4	5		4	4	4	4	4		3	3	5	5	4	4	5	16	
Q36	4	2	4	5		4	2	2	4	3		2	3	5	4	4	4	5	16	
Q37	4	2	3	4		4	2	2	4	3		2	3	4	2	4	4	4	16	
Q38	2	1	2	2		4	2	4	4	4		2	3	3	4	2	4	5	16	
SUM	46	31	51	70		69	52	59	74	62		48	54	76	76	68	65	83	288	
COUNT	18	18	18	18		18	18	18	18	18		18	18	18	18	18	18	18		
MEAN	2.56	1.72	2.83	3.89		3.83	2.89	3.28	4.11	3.44		2.67	3.00	4.22	4.22	3.78	3.61	4.61	**3.417**	**mean**
																			0.764	**Std. dev.**
Count	18																		**0.180**	**Std. Err.**
Hyp mean	3																		**2.313**	***t* Test**

df

α

tails

0.

01

7

Table 22

Total of Responses for East Charter School for Research Question 3

East Charter School Responses
Total # of Respondents = 16
Questions 26–38

RQ3: 3. What indicators show high school educators their students are technologically prepared as 21st century professionals?	Strongly Disagree 1	Disagree 2	Neither Agree nor Disagree 3	Agree 4	Strongly Agree 5
26. My students are able to contribute to:					
a. blogs	1	3	3	7	2
b. wikis	1	4	5	5	1
c. surveys	1	2	4	6	3
27. My students are able to create graphics using the computer.	1	3	5	5	2
28. My students are able to create movies using the computer.	1	1	4	9	1
29. My students are able to create music using the computer.	1	2	4	9	0
30. My students are able to create YouTube video clips related to instructional objectives to complete assignments.	1	3	4	5	3
31. My students are able to conduct Internet research related to instructional objectives.	0	1	3	5	7
32. My students are able to correspond via email once they have completed their class assignments.	1	3	3	4	5
33. My students are able to correspond via discussion boards and chats when working on class assignments.	1	2	2	8	3
34. My students are able to correspond via video chat when they are working on class assignments.	1	5	5	4	1
35. My students are able to complete assignments using various software applications:					
a. Word processing	0	0	3	8	4
b. Database management	0	5	4	6	1
c. Spreadsheet(s)	1	7	3	3	2
d. Presentation(s)	0	0	2	10	4
36. My students are able to question/evaluate research online.	0	4	2	7	3
37. My students are able to synthesize information online.	0	5	3	8	0
38. My students are able to collaborate online with students from other classes.	1	6	2	6	1
n(%)	12(4%)	57(20%)	61(21%)	115(40%)	43(15%)

Summary of Hypothesis for Research Question 3 for East Charter School

Research Question 3 asks: “What indicators show high school educators their students are technologically prepared as 21st century professionals?” The hypothesis for this question becomes: Ho:$\mu \leq 3$ – High school students are not technologically prepared as 21st century professionals; the alternate hypothesis becomes: H1: $\mu > 3$ – High school students are technologically prepared as 21st century professionals, where m=3 is the average of the scores for the associated questions. Table 23 shows the mean 3.4162, standard deviation 0.76351, and t statistic of 2.1807 and confirms that we can reject the null hypothesis. Appendix J provides the visual of the hypothesis test results.

Table 23

Hypothesis Testing—Population Mean—East Charter School

Sample Size=n	Sample Mean=*x-bar*	Standard Dev.=*s*	*t* statistic	Ho: $\mu \leq 3$	Accept or Reject at an α 5%
16	3.41625	0.76351	2.1807	0.0228	Reject

Research Question 3—Northeast Charter School

Table 24 shows results for the Northeast Charter School Research Questions 36–38 and the participants answered each of the questions in the following manner. The table shows there were 25 participants who responded to the survey, however two participants did not complete this section of the survey and one respondent did not answer Question 29, “My students are able to create music using the computer” and Question 32 “My students are able to correspond via email once they have completed their class assignments." This may suggest the teacher did not know or allow students to create music in the classroom and the students may not have emailed the teacher, or perhaps the teacher just did not know how to respond to the questions. There was a total of 412 responses (23 participant's x 18 questions – 2 questions) documented. Table 25 shows there were seven responses (3%) who answered *Strongly Disagree*, 32 responses (13%) with the answer of *Disagree*, 150 responses (60%) *Neither Agree nor Disagree*, 152 responses (61%) with the answer of *Agree*, and 71 (28%) responses with the answer of *Strongly Agree*. The interesting point about these responses was the fact that the similar answers were given for *Neither Agree nor Disagree* (60%) and *Agree* (61%). The data show that the teachers were unsure as to whether their students were prepared as 21st century professionals. The responses for the teachers in this stratum regarding barriers integrating technology showed many them did not have barriers integrating technology into their classes and their perceptions related to technology integration shows they were positive in their perceptions related to integrating technology into their classrooms.

Table 24

Coded Table for Research Question 3

Northeast Charter School Responses for Questions 26–38

RQ 3: What indicators show high school educators their students are technologically prepared as 21st century professionals?

Question	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	COUNT	
Q26	3	4	5	4	3	3	4	3	5	4	4	3	3	3	4	4	3	3	4		3	4		4	4	23	
Q26B	3	3	5	3	3	3	3	3	5	3	3	2	3	3	4	2	4	3	3		3	4		3	4	23	
Q26C	5	5	5	5	3	4	4	4	5	4	4	4	3	4	5	4	3	3	5		4	4		4	5	23	
Q27	4	5	4	5	3	4	3	3	4	4	4	1	3	4	5	2	3	3	4		2	4		4	2	23	
Q28	3	4	3	4	3	3	2	3	4	2	4	1	3	4	3	1	3	3	4		2	4		3	4	23	
Q29	3	4		3	3	4	2	3	4	2	4	1	3	3	3	1	3	3	4		2	4		3	3	22	
Q30	3	4	4	4	3	3	3	3	4	5	4	2	3	4	4	4	4	3	4		4	4		4	4	23	
Q31	4	5	5	5	3	4	4	5	5	5	5	4	3	5	5	4	4	3	4		4	4		4	4	23	
Q32	4	5		5	3	4	4	5	5	5	5	4	3	5	5	4	4	3	4		4	3		4	4	22	
Q33	3	5	5	5	3	4	4	5	5	4	5	1	3	4	5	4	4	3	3		4	3		4	4	23	
Q34	3	2	4	2	3	3	3	2	4	3	4	3	3	3	3	2	4	3	3		3	2		3	4	23	
Q35	3	5	5	5	3	4	4	5	5	5	5	3	3	3	5	3	4	3	5		4	4		4	5	23	
Q35B	3	4	5	4	3	3	2	3	5	4	2	5	3	3	4	2	4	3	3		3	2		3	2	23	
Q35C	3	4	5	3	3	3	3	2	5	5	4	3	3	3	5	2	3	3	4		3	2		3	1	23	
Q35D	3	5	5	5	3	3	4	5	5	5	4	4	3	5	5	2	4	3	5		4	4		4	5	23	
Q36	3	4	4	4	3	3	4	4	5	4	4	3	3	3	3	2	4	3	4		4	4		3	4	23	
Q37	3	4	4	4	3	3	4	3	5	4	4	4	3	3	4	2	4	3	4		3	3		3	3	23	
Q38	3	5	3	4	3	4	4	2	5	4	4	4	3	3	3	2	4	3	4		2	2		4	4	23	
SUM	59	77	71	74	54	62	61	63	85	72	73	52	54	65	75	47	66	54	71		58	61		64	66	412	
COUNT	18	18	16	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18		18	18		18	18		
MEAN	3.27	4.27	4.43	4.11	3	3.44	3.38	3.5	4.72	4	4.05	2.88	3	3.61	4.16	2.61	3.66	3	3.94		3.22	3.38		3.55	3.667	**3.605**	**Mean**
																										0.540	**Std. Dev.**
Count	23																									**0.112**	**Std. Err.**
Hyp mean	3																									**5.374**	***t* Test**
df	22																										
α	0.05																										
tails	1																										

Table 25
Total of Responses for Northeast Charter School for Research Question 3

Northeast Charter School Responses
Total # of Respondents = 23
Questions 26–38

RQ3 - 3. What indicators show high school educators their students are technologically prepared as 21st century professionals?	Strongly disagree 1	Disagree 2	Neither Agree nor Disagree 3	Agree 4	Strongly agree 5
26. My students are able to contribute to:					
d. blogs	0	0	10	11	2
e. wikis	0	2	15	4	2
f. surveys	0	0	4	11	8
27. My students are able to create graphics using the computer.	1	3	6	10	3
28. My students are able to create movies using the computer.	2	3	10	8	0
29. My students are able to create music using the computer.	2	3	11	6	0
30. My students are able to create YouTube video clips related to instructional objectives to complete assignments.	0	1	7	14	1
31. My students are able to conduct Internet research related to instructional objectives.	0	0	3	11	9
32. My students are able to correspond via email once they have completed their class assignments.	0	0	4	10	8
33. My students are able to correspond via discussion boards and chats when working on class assignments.	1	0	6	9	7
34. My students are able to correspond via video chat when they are working on class assignments.	0	5	13	5	0
35. My students are able to complete assignments using various software applications:					
a. Word processing	0	0	7	6	10
b. Database management	0	5	10	5	3
c. Spreadsheet(s)	1	3	12	3	4
d. Presentation(s)	0	1	5	7	10
36. My students are able to question/evaluate research online.	0	1	9	12	1
37. My students are able to synthesize information online.	0	1	11	10	1
38. My students are able to collaborate online with students from other classes.	0	4	7	10	2
n(%)	7(3%)	32(13%)	150(60%)	152(61%)	71(28%)

Summary of Hypothesis 3 for Northeast Charter School

As with the East Charter School, research question 3 asks: "What indicators show high school educators their students are technologically prepared as 21st century professionals?" The hypothesis for this question becomes: Ho:$\mu \leq 3$ – High school students are not technologically prepared as 21st century professionals; the alternate hypothesis becomes: H1: $\mu > 3$ – High school students are technologically prepared as 21st century professionals, where m=3 is the average of the scores for the associated questions. Table 26 shows the mean 3.60326, standard deviation 0.53649, and *t* statistic of 5.3927 and confirms that we can reject the null hypothesis. Appendix K provides the visual of the hypothesis test results.

Table 26

Hypothesis Testing—Population Mean—Northeast Charter School

Sample Size=n	Sample Mean=*x-bar*	Standard Dev.=*s*	*t* statistic	Ho: $\mu \leq 3$	Accept or Reject at an α 5%
23	3.60326	0.53649	5.3927	0.000	Reject

Research Question 3—Southeast Charter School

Table 27 for the Southeast Charter School displays Research Questions 36–38 in the participants answered each of the questions in the following manner. There were 18 participants that took part in the survey from this stratum. One participant did not answer this section of the survey, and one participant did not answer Questions 34, 35a–d, 36, 37, and 38. This could be due to the participants being tired of answering the questions in the survey. Table 28 summarizes the data from Table 27. Of the 298 responses, 29 responses (10%) were *Strongly Disagree*, 34 responses (11%) *Disagree*, 89 responses (30%) *Neither Agree nor Disagree*, 85 responses (29%) were *Agree*, and 61 (20%) responses were *Strongly Agree*. The responses show the answers that were given for *Neither Agree nor Disagree* (30%) and *Agree* (29%) were similar as with the Northeast Charter School data. This data shows that the teachers in this stratum were unsure as to whether their students were prepared as 21st century professionals. The responses from the teachers in this stratum regarding barriers integrating technology showed a total of 35% teachers had barriers integrating technology into their classes, which may suggest the teacher uncertainty with knowing whether their students are technologically prepared as 21st century professionals. However, these same teacher perceptions related to technology integration showed they were very positive in their perceptions related to integrating technology into their classrooms.

Table 27

Coded Table for Research Question 3

Southeast Charter School Responses for Questions 26-38

RQ 3 What indicators show high school educators their students are technologically prepared as 21st century professionals?

Question	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	COUNT	
Q26	3		3	2	1	5	5	4	3	3	5	2	1	4	4	2	3	4	17	
Q26B	3		3	2	1	5	5	2	3	3	5	2	1	4	4	2	3	4	17	
Q26C	3		3	4	4	5	5	4	4	4	5	5	1	4	5	2	4	4	17	
Q27	3		3	3	3	5	5	4	4	3	4	5	1	4	5	4	2	4	17	
Q28	3		3	3	3	5	5	4	4	3	5	5	1	4	5	4	3	4	17	
Q29	3		3	3	3	5	4	4	3	3	5	5	1	4	4	4	2	4	17	
Q30	3		3	3	3	5	5	4	3	3	4	3	1	4	4	4	3	4	17	
Q31	3		3	4	3	5	5	5	4	4	5	5	1	4	4	4	5	4	17	
Q32	3		3	2	1	5	5	5	5	4	5	3	1	4	4	2	3	2	17	
Q33	3		3	2	1	5	5	5	4	4	5	3	1	4	3	2	2	4	17	
Q34	3		3	2	1		5	5	3	3	5	3	1	4	2	2	1	2	16	
Q35	3		3	4	3		5	5	5	4	5	5	1	4	4	3	4	4	16	
Q35B	3		3	2	1		5	3	3	3	3	2	1	4	4	4	1	5	16	
Q35C	3		3	2	2		5	4	2	3	4	2	1	4	3	2	1	5	16	
Q35D	3		3	4	3		5	4	5	4	5	5	1	4	3	4	2	5	16	
Q36	4		3	4	3		5	2	3	3	3	5	1	4	3	3	2	4	16	
Q37	3		3	4	3		5	3	4	3	3	4	1	4	4	3	2	4	16	
Q38	3		3	2	3		5	4	4	4	4	1	1	4	3	2	1	2	16	
SUM	55		54	52	42	50	89	71	66	61	80	65	18	72	68	53	44	69	298	
COUNT	18		18	18	18	10	18	18	18	18	18	18	18	18	18	18	18	18		
MEAN	3.06		3.00	2.89	2.33	5.00	4.94	3.94	3.67	3.39	4.44	3.61	1.00	4.00	3.78	2.94	2.44	3.83	**3.428**	**Mean**
																			0.990	**Std. Dev.**
Count	18																		**0.233**	**Std. Err.**
Hyp mean	3																		**1.835**	***t* Test**
df	17																		**0.042**	**p. value**
α	0.05																			
tails	1																			

Table 28

Hypothesis Testing—Population Mean—Southeast Charter School

Southeast Charter School Responses
Total # of Respondents = 17
Questions 26–38

RQ3: What indicators show high school educators their students are technologically prepared as 21st century professionals?	Strongly Disagree 1	Disagree 2	Neither Agree nor Disagree 3	Agree 4	Strongly Agree 5
26. My students are able to contribute to:					
a. blogs	2	3	5	4	3
b. wikis	2	4	5	3	3
c. surveys	1	1	2	8	5
27. My students are able to create graphics using the computer.	1	1	5	6	4
28. My students are able to create movies using the computer.	1	0	6	5	5
29. My students are able to create music using the computer.	1	1	6	6	3
30. My students are able to create YouTube video clips related to instructional objectives to complete assignments.	1	0	8	6	2
31. My students are able to conduct Internet research related to instructional objectives.	1	0	3	7	6
32. My students are able to correspond via email once they have completed their class assignments.	2	3	4	3	5
33. My students are able to correspond via discussion boards and chats when working on class assignments.	2	3	4	4	4
34. My students are able to correspond via video chat when they are working on class assignments.	3	4	5	1	3
35. My students are able to complete assignments using various software applications:					
a. Word processing	1	0	4	6	5
b. Database management	3	2	6	3	2
c. Spreadsheet(s)	2	5	4	3	2
d. Presentation(s)	1	1	4	5	5
36. My students are able to question/evaluate research online.	1	2	7	4	2
37. My students are able to synthesize information online.	1	1	7	6	1
38. My students are able to collaborate online with students from other classes.	3	3	4	5	1
n (%)	29(10%)	34(11%)	89(30%)	85(29%)	61(20%)

Summary of Hypothesis for Research Question 3—Southeast Charter School

As with the East and Northeast Charter School, Research Question 3 asked: "What indicators show high school educators their students are technologically prepared as 21st century professionals?" The hypothesis for this question becomes: Ho:$\mu \leq 3$ – High school students are not technologically prepared as 21st century professionals; the alternate hypothesis becomes: H1: $\mu > 3$ – High school students are technologically prepared as 21st century professionals, where *m*=3 is the average of the scores for the associated questions. Table 29 shows that the mean 3.42706, standard deviation 0.98971, and t statistic of 1.7791 confirms that we can reject the null hypothesis. Appendix L provides the visual of the hypothesis test results.

Table 29

Hypothesis Testing—Population Mean—Southeast Charter School

Sample Size=n	Sample Mean=*x-bar*	Standard Dev.=*s*	*t* statistic	Ho: $\mu \leq 3$	Accept or Reject at an α 5%
17	3.42706	0.98971	1.7791	0.0471	Reject

Summary of Findings

Table 30
Summary of Findings

RQ	Hypotheses	Results
RQ1	***H1₀**: High school educators believe they face barriers incorporating technology into their classes. ***H1₁**: High school educators do not believe they face barriers incorporating technology into their classes. * **Note: Appendix C** shows the hypothesis test rejecting the null hypothesis when the data is combined for all three charter schools.	In the East and Northeast charter high school strata, educators believed they did not face any barriers integrating technology into their classes, therefore the null hypothesis was rejected. There was little significance in educators' responses in the Southeast Charter School, therefore the null hypothesis was not rejected.
RQ2	**H2₀**: High school educators are not prepared to integrate technology into their classrooms. **H2₁**: High school educators are prepared to integrate technology into their classrooms.	In all three charter high school strata, educators believed they were prepared to integrate technology into their classrooms therefore the null hypothesis is rejected.
RQ3	**H3₀**: High school students are not technologically prepared to be 21st century professionals. **H3₁**: High school students are technologically prepared to be 21st century professionals.	In three charter high school strata, educators believed their students were technologically prepared to be 21st century professionals, therefore the null hypothesis is rejected.

The results of the findings in Table 30 presents the null hypothesis as related to their associated research questions. This quantitative study surveyed a total of 61 participants and each participant answered 38 questions about three research questions: a) What indicators cause high school educators to believe they face barriers hindering them from incorporating technology into their classes? b) What elements lead high school educators to believe they are not prepared to integrate technology in their classrooms? and c) What indicators show high school educators their students are technologically prepared as 21st century professionals?

I did a combined unweighted test of the number of teachers and students in each of the three charter school districts to serve as a crude proxy for the weights. However, the weights were not available as a proxy. To ensure the results were not masked, and show the importance of testing the hypothesis for each school in each of the regions. I tested each research question separately for each of the charter school regions. I tested if the hypothesis would be accepted or rejected in each research question for each school.

For Research Question 1, each stratum was tested to determine if charter high school educators faced barriers integrating technology into their classes. The East Charter School stratum (see Appendix C) showed there is very strong evidence ($p < .001$) against the null hypothesis in favor of the alternative. The Northeast Charter School stratum (see Appendix D) shows there is very strong evidence ($p < .001$) against the null hypothesis in favor of the alternative. The Southeast Charter School stratum (see Appendix E) indicated evidence that some charter school teachers faced barriers ($p < .179$), therefore, we fail to reject the null hypothesis. Thus, I found the Southeast charter school hypothesis test for Research Question 1 would have been masked if I combined the data for all three schools. Appendix F shows combined data for all three charter schools for Research Question1 indicated that the hypothesis would be rejected if the schools were not separated by stratum.

For Research Question 2, I tested the hypothesis for each stratum to determine if charter high school educators were not prepared to integrate technology into their classrooms. The East Charter School stratum (see Appendix G) shows there is very strong evidence ($p < .000$) against the null hypothesis in favor of the alternative. The Northeast Charter School stratum (see Appendix H) shows there is very strong evidence ($p < .000$) against the null hypothesis in favor of the alternative. The Southeast Charter School stratum (see Appendix I) shows there is very strong evidence ($p < .000$) against the null hypothesis in favor of the alternative.

For Research Question 3, the hypothesis was tested to find out if students were not prepared as 21st century professionals. The East Charter School stratum (see Appendix J) shows there is strong evidence ($p < .023$) against the null hypothesis in favor of the alternative. The Northeast Charter School stratum (see Appendix K shows there is very strong evidence ($p < .000$) against the null hypothesis in favor of the alternative. The Southeast Charter School stratum (see Appendix L) shows there is evidence ($p < .047$) against the null hypothesis in favor of the alternative.

Summary

The results that I presented in this chapter indicates that some Charter School teachers are overcoming barriers integrating technology in their classrooms while others are still experiencing barriers. Statistical significance has been identified related to Charter School teachers being confident integrating technology despite barriers they may face, and they believe their students are prepared as 21st century professionals. In Chapter 5, I will discuss the findings, interpretations, and recommendations for future research.

Chapter 5: Findings, Interpretations and Recommendations

Overview

In this study, I focused on whether teachers experienced intrinsic and extrinsic barriers that hindered them from integrating technology into their classes, their perceptions integrating technology into their classrooms, and their perceptions about their students being technologically prepared as 21st century professionals. I used a 5-point Likert scale that surveyed a total of 61 educators and each participant answered 38 questions associated with the following three research questions:

1. What are the indicators that cause high school educators to believe they face barriers hindering them from incorporating technology into their classes?
2. What elements lead high school educators to believe they are not prepared to integrate technology in their classrooms?
3. What indicators show high school educators their students are technologically prepared as 21st century professionals?

A combined unweighted test of the number of teachers and students were not available as a proxy.

I hypothesis tested each Charter School stratum in each region. Thus, 35% of teachers in the East Charter School stratum indicated barriers integrating technology into their classrooms. Overall, the teachers felt positive about their skills integrating technology into their classrooms and believed their students were technologically prepared using digital technology as a 21st century professional. Technology is a pervasive part of our society and it affects business and education in such a way that educators and managers will need to begin collaborating to ensure students are provided with the best possible experience using digital technology. In the next section, I will discuss my interpretation of the findings.

Interpretation of Findings

In all Charter School strata, teachers felt confident with their skills and abilities to accomplish the task of facilitating and integrating technology into their classrooms. When it came to teachers' perceptions about their students being technologically prepared as 21st century professionals, the questions in the survey addressed the students' technical skills and abilities to use technology and synthesize information using technology. In all three strata, the data showed there was significance in teachers' perceptions about their students having the necessary skills to succeed as 21st century professionals.

The low responses (n = 56) related to Research Question 3 of the survey could be due to class sizes being too large in some of the schools, the teachers not really able to tell if the students were technologically prepared because of the types of tests students were given that did not address their skills, or that the opportunities for educators to provide projects for the students to complete using technology may not have been offered, which aligns with what Cuban (2001) stated, "Teachers and senior high school students across the country report they use machines mostly for word processing" (p. 72). Technology integration is more than using the computer as a tool. Educators need the ability to pedagogically apply technology into specific areas of the curricula for students to use technology to communicate, collaborate, and solve problems.

The Southeast Charter School teachers faced barriers integrating technology into their classes causing me not to reject the null hypothesis. I identified statistical significance in teacher perceptions about not facing barriers integrating technology into their classrooms in the East and Northeast Charter School strata. Appendix F shows the hypothesis test combining the Charter School data for Research Question 1 and how the data were masked.

The Southeast Charter School stratum had a low number of teachers with a large student population. One of the schools had 75 teachers to 1,198 students and in that same school, there were 5.7 students per Internet digital learning device. This could be the cause of the data showing that teachers faced barriers. Teachers with large classes would experience first-order barriers because it would be difficult for them to incorporate technology when there is not enough technology available for all the students. In the EETT report, the question addressed was: “Are all high school students, regardless of economic status, receiving equal access to technology and technology-based support?” In the case of this Charter School, I wondered if this question could be answered in a positive light. This question would have to be further examined in another detailed research.

Implications for Positive Social Change

The results of this study contributed to positive social change by identifying whether Charter School teachers faced barriers that hindered them from integrating technology into their classes, whether these teachers had a positive or negative perception about integrating technology into their classes, and whether they felt they were being effective in training their students to use technology to the point they would be able to leave high school to get a job. Being able to point out educator strengths and weaknesses will aid college and university administrators in focusing on offering additional technology integration courses for preservice and in-service teachers. When administrators offer professional development opportunities to teachers and provide times for teachers to collaborate with each other to use technology, these actions show teachers they are being supported and this will help teachers to be prepared and confident using technology in their classrooms.

Students would benefit greatly when they are in schools where digital technologies are embraced, making learning more authentic, innovative, and diverse (Wallis & Steptoe, 2006). Students require learning that is accessible and multidimensional; they need to be provided with curricula that require interaction with technology and the teacher which helps students to develop their critical thinking skills. Teachers who are facilitators will guide students' learning experiences in the classroom to prepare them to thrive in the global economy.

Recommendations for Further Study

The first study I would recommend would be focused on determining cost effective ways for administrators to upgrade their digital technology tools in their schools and offer professional development courses for teachers, such as Integrating Digital Technology, Learning Through Technology, Instructional Strategies, that are dedicated to pedagogy and technology integration.

With technology changing at the pace it is, without these types of courses, technology integration could become even more of a barrier. The 21st century learner needs teachers that are using technology in the classroom and that support their students' use of technology in their classrooms. Teachers must become a part of the learning process and can facilitate their students' learning process without fear. If strategic plans do not include upgrading the digital tools in the schools, then students may not be able to obtain the critical tools they need in the current workforce to be global competitors and successful online learners.

I would also recommend a second longitudinal mixed method study regarding teachers accepting and adopting technology in relation to the TAM model along with identifying first- and second-order barriers they may have experienced integrating technology into their classrooms. This study could be conducted to determine if teachers are accepting and using technology because they believe that technology is an effective tool to use for learning. Providing insight on this question requires further in-depth study of teachers' perceptions about technology integration.

A third study I recommend could involve finding out detailed information from students regarding the types of technology they use, how they use it, and when they use it. This information would enhance the body of knowledge regarding technology use in schools. The results of this study did not provide any major insights regarding educator perceptions about their students being technologically prepared as 21st century professionals. However, if a qualitative study was conducted and if students were asked about their high school education technologically preparing them for the workforce, more insight would be given to this area of research.

The fourth qualitative study I recommend could provide details about the teacher's thoughts regarding the type of technology they used in their classrooms, if they experienced issues with time and place using technology, or if their students' experienced effective learning opportunities when they used a specific technology. Perhaps conducting in-depth interviews with teachers in public, private, and Charter Schools would provide a better understanding of the ways technology is integrated into their classrooms, how they assess their students use of technology, and their confidence levels when using certain technology.

Although the results of this study provided statistical significance ($p < .001$) for the East and Northeast Charter School teachers, the Southeast Charter School data showed that teachers are experiencing barriers ($p < .179$) relating to integrating technology into their classes. Teacher's self-efficacy ($p < .000$) and their perceptions about their students be technologically prepared ($p < .022, .000, .047$), showed significance, but additional professional development is needed for Charter School teachers to ensure that students will be a competitive addition to the workforce.

Concluding Remarks

The results of this study indicated a statistical significance in teacher perceptions about not facing barriers integrating technology into their classrooms in the East and Northeast Charter Schools which caused me to reject the null hypothesis. However, due to the stratum being tested separately instead of together, the results showed the teachers in the Southeast Charter School stratum experienced barriers and so I accepted the null hypothesis in that case. There was statistical significance in the teachers' perceptions about their ability to integrate technology into their classrooms for all the Charter School strata. The teachers' responses regarding their perception about their students being technologically prepared as 21st century professionals in the East and Northeast Charter School stratum showed a stronger statistical significance than the Southeast Charter School stratum.

I am aware that educators are at different levels of experience when it comes to using technology. There are some educators who still believe that technology does not have an effect on learning. These teachers will not use technology because they think they are the experts and believe this is their job and that learning takes place by being the information provider. I entered in this research with hopes that I would be able to survey public schools and Charter Schools and was willing to go to any lengths to get the data I needed. Unfortunately, I was unable to survey teachers from the public schools and I hope soon I will be able to continue my research in the public-school sector. I also recognized as I got further into this project, that student learning in relation to the use of technology is a goal that I would like to explore in the future. I would also like to do in-depth interviews with teachers to find out what pedagogical perspectives they think are needed for technology to be used and learning to take place and test their perspectives.

Technology is ubiquitous and has affected everything we do in society. Educators must be skilled learners and facilitators so students can develop their critical thinking skills in this digital society. Social change resulting from this study could include the funding of high schools by businesses. This type of funding could lead to high school students acquiring skills to work with supporting companies. Funding by businesses could support teacher access to professional development courses to help them pedagogically integrate technology into their classrooms, a win-win situation for teachers, students, and businesses.

Software companies may also be willing to provide students with training that would help them develop their computer skills and help educators align their technological and pedagogical knowledge to current business practices while addressing any possible barriers or self-efficacy issues. The findings from this research could lead to the implementation of a school workforce technology development summer program for high school juniors and seniors to ensure they are prepared to meet the required workforce standards.

Students need to be taught to be innovative at younger ages, but they need the support of their schools and communities and to be challenged by their parents and teachers to step outside the box. Society can no longer allow students to sit passively in the classroom and think they are listening to the teacher's every word. Students can be given credit for being smart and educators should not be afraid to allow them to access the Internet because of uninvited information they may be exposed to. They are being exposed anyway, whether educators or society likes it or not. Educators need to provide research-based strategies to gain our students' attention in the classroom. Teachers need to be supported in their schools and provided with relevant professional development opportunities to learn new technologies and how to integrate those technologies from a pedagogical perspective.

Administrators will need to provide teachers with opportunities to make software decisions when it comes to integrating technology into their classrooms. Teachers need not be hesitant to make mistakes in their classrooms but allow their students to learn from those mistakes. Therefore, the findings from this study have shown that charter high school educators, though some of them may have faced barriers integrating technology into their classrooms, have confidence in their skills and abilities to integrate technology and they believe their students are technologically prepared as 21st century professionals.

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Appendix A: Study Questionnaire for Participant Response

Survey Questions

Questions related to **Research Question 1:** Do high school educators face barriers that hinder them from integrating technology into their classes?

Instructions: Please rate if you agree or disagree. Have the following barriers hindered you from incorporating technology into your class? Mark the appropriate box with your answer choice with an "x" that best describes your response.

Potential challenges educators face that hinder them from integrating technology into their classes	Strongly Disagree 1	Disagree 2	Neither Agree nor Disagree 3	Agree 4	Strongly Agree 5
1. I have computers in my classroom.					
2. The computers in my classroom work adequately.					
3. The software installed on my classroom computers is current.					
4. I am able to successfully integrate technology in my classroom without assistance from others.					
5. I receive professional development training to assist me with integrating technology in my classes.					
6. *It takes a lot of time to use technology in my classroom.					
7. * Budget constraints hinder me from incorporating technology in my classroom.					
8. I have enough time to incorporate technology in my classroom.					
9. *The students I teach do not have the necessary skills to use the technology in my class.					

10. *The school I work for does not have enough equipment for me to use in order to incorporate technology into my classroom.					

* These are the reversed statements.

Questions related to **Research Question 2:** Are high school educators prepared to integrate technology in their classrooms?

Instructions: Please rate if you agree or disagree whether the following barriers have hindered you from incorporating technology into your class. Mark the appropriate box with your answer choice with an "x" that best describes your response.

Educators' perception related to technology integration	**Strongly Disagree** **1**	**Disagree** **2**	**Neither Agree nor Disagree** **3**	**Agree** **4**	**Strongly Agree** **5**
11. I possess the necessary skills to incorporate technology into my classroom.					
12. I believe I have the necessary computer skills to maximize the use of technology in my classroom.					
13. I believe I can enrich learning of content through the use of technology.					
14. I believe I can successfully evaluate software for teaching and learning.					
15. I believe I can successfully use computer terminology when directing students while they are using technology.					
16. I believe I can successfully assist students when they need help with using the computer in my classroom for their assignments.					

17. I believe I can consistently use educational technology effectively to enrich learning in my classroom.					
18. I believe I can appropriately incorporate technology into instruction based on curriculum standards.					
19. I believe I can select appropriate technology for instruction based on curriculum standards.					
20. I believe I can use technology resources (such as electronic portfolios, digital documents/artifacts) to collect and analyze data from student tests and products to improve instructional practices.					
21. I am comfortable using technology in my teaching.					
22. When faced with system constraints (such as budget cuts), I believe I can develop creative methods that will enable me to use the technology available.					
23. I believe it is important for me to have professional development training regarding integration of technology into my classroom.					
24. I believe using technology in my class is necessary.					
25. I am prepared to teach students the skills they need to complete various online projects.					

Questions related to **Research Question 3:** Are high school students technologically prepared as 21st century professionals?
Instructions: Please rate if you agree or disagree whether high school students have the following technological skills to show they are prepared as 21st century professionals. Mark the appropriate box with your answer choice

with an "x" that best describes your response.					
High school technological preparedness as 21st century professionals	**Strongly Disagree** **1**	**Disagree** **2**	**Neither Agree nor Disagree** **3**	**Agree** **4**	**Strongly Agree** **5**
26. My students are able to contribute to: a. blogs					
b. wikis					
c. surveys					
27. My students are able to create graphics using the computer.					
28. My students are able to create movies using the computer.					
29. My students are able to create music using the computer.					
30. My students are able to create YouTube video clips related to instructional objectives to complete assignments.					
31. My students are able to conduct Internet research related to instructional objectives.					
32. My students are able to correspond via email once they have completed their class assignments.					
33. My students are able to correspond via discussion boards and chats when working on class assignments.					

34. My students are able to correspond via video chat when they are working on class assignments.					
35. My students are able to complete assignments using various software applications: b. Word processing					
c. Database management					
d. Spreadsheet(s)					
e. Presentation(s)					
36. My students are able to question/evaluate research online.					
37. My students are able to synthesize information online.					
38. My students are able to collaborate online with students from other classes.					

Appendix B: Protecting Human Subject Research Participants

Protecting Human Subject Research Participants.html[2/1/2016 5:49:18 PM]

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Joy Pine-Thomas** successfully completed the NIH Web-based training course “Protecting Human Research Participants.”

Date of completion: 04/16/2015

Certification Number: 1746544

Appendix C: Hypothesis Test East Charter School Research Question 1

Hypothesis Testing - Population Mean

Sample	Data
3.3	2.2
3.2	4.1
4	3.9
3.3	4.2
4.1	4.6
4	3.8
4.1	4.5
3.4	3.7
2.7	4

Evidence

Sample size	18	*n*
Sample Mean	3.72778	*x-bar*
Sample Stdev.	0.61339	*s*

σ Unknown; Population Normal

Test Statistic 5.0339 *t*

At an α of

Null Hypothesis	*p*-value	5%
H0: μ = 3	0.0001	**Reject**
H0: μ ≥ 3	0.9999	
H0: μ ≤ 3	0.0001	**Reject**

Note. Ho: μ ≤ 3 – Teachers face barriers

Note. H1: μ > 3 – Teachers do not face barriers

Appendix D: Hypothesis Test Northeast Charter School Research Question 1

Hypothesis Testing - Population Mean

Evidence

Sample size	25	*n*
Sample Mean	3.568	*x-bar*
Sample Stdev.	0.745	*s*

σ Unknown; Population Normal

Test Statistic 3.8121 *t*

At an α of

Null Hypothesis	*p*-value	5%
H_0: μ = 3	0.0008	Reject
H_0: μ ≥ 3	0.9996	
H_0: μ ≤ 3	0.0004	Reject

Sample	Data
3.40	5.00
4.60	4.40
3.00	4.10
4.00	4.30
4.10	4.50
3.70	2.30
3.30	3.00
4.30	2.50
3.00	3.00
2.80	8.80
2.60	4.00
3.20	3.60
2.70	

3.2

Note. Ho:3.: μ ≤ 3 – Teachers face barriers

Note. H1: μ > 3 – Teachers do not face barriers

Appendix E: Hypothesis Test Southeast Charter School Research Question 1

Hypothesis Testing - Population Mean

Evidence

Sample size	18	*n*
Sample Mean	3.1833	*x-bar*
Sample Stdev.	0.8234	*s*

σ Unknown; Population Normal

Test Statistic 0.9445 *t*

Null Hypothesis	*p*-value	At an α of 5%
H_0: μ = 3	0.3582	
H_0: μ ≥ 3	0.8209	
H_0: μ ≤ 3	0.1791	

Sample	Data
3.40	3.30
1.80	3.10
3.10	2.40
2.90	2.60
3.80	2.40
4.60	4.50
2.60	4.10
4.00	3.70
1.90	3.10

Note. Ho: μ ≤ 3 – Teachers face barriers

Note. H1: μ > 3 – Teachers do not face barriers

Appendix F: Hypothesis Test (Combined) Charter School Data for Research Question 1

Evidence

Sample size	61	*n*
Sample Mean	3.58361	*x-bar*
Sample Stdev.	1.01377	*s*

σ Unknown; Population Normal

Test Statistic	4.4962	*t*

At an α of

Null Hypothesis	*p*-value	5%
H_0: μ = 3	0.0000	**Reject**
H_0: μ ≥ 3	1.0000	
H_0: μ ≤ 3	0.0000	**Reject**

Sample Data

3.3	2.7
2.2	5
3.2	4.4
4.1	4.1
4	4.3
3.9	4.5
3.3	2.3
4.2	3
4.1	2.5
4.6	3
4	8.8
3.8	4
4.1	3.6
4.5	3.4
3.4	1.8
3.7	3.1
2.7	2.9
4	3.8
3.4	4.6
4.6	2.6
3	4
4	1.9
4.1	3.3
3.7	3.1
3.3	2.4
4.3	2.6
3	2.4
2.8	4.5
2.6	4.1
3.2	3.7
	3.1

Note. Ho:: μ ≤ 3 – Teachers face barriers

Note. H1: μ > 3 – Teachers do not face barriers

Appendix G: Hypothesis Test East Charter School Research Question 2

Hypothesis Testing - Population Mean

Evidence

Sample size	18	*n*
Sample Mean	4.07407	*x-bar*
Sample Stdev.	0.34594	*s*

σ Unknown; Population Normal

Test Statistic 13.1725 *t*

Null Hypothesis	*p*-value	At an α of 5%
H₀: $\mu = 3$	0.0000	**Reject**
H₀: $\mu \geq 3$	1.0000	
H₀: $\mu \leq 3$	0.0000	**Reject**

Sample	Data
4.07	3.73
4.13	3.93
3.67	4.67
3.47	3.87
4.73	3.93
4.00	3.80
4.07	4.60
4.27	4.00
4.40	4.00

Note. Ho: $\mu \leq 3$ – Educators not prepared to integrate technology

Note. H1: $\mu > 3$ – Educators prepared to integrate technology

Appendix H: Hypothesis Test Northeast Charter School Research Question 2

Hypothesis Testing - Population Mean

Evidence

Sample size	24	*n*
Sample Mean	3.80375	*x-bar*
Sample Stdev.	0.55898	*s*

σ Unknown; Population Normal

Test Statistic	7.0442	*t*

At an α of

Null Hypothesis	*p*-value	5%
H_0: μ = 3	0.0000	**Reject**
H_0: μ ≥ 3	1.0000	
H_0: μ ≤ 3	0.0000	**Reject**

Sample	Data
2.27	4.73
4.27	4.07
3.07	3.07
3.67	3.47
5.00	3.73
3.87	3.60
3.93	3.93
4.07	3.87
3.53	3.67
3.93	4.60
3.67	3.93
3.47	3.87

Note. Ho:μ ≤ 3 – Educators not prepared to integrate technology

Note. H1: μ > 3 – Educators prepared to integrate technology

Appendix I: Hypothesis Test Southeast Charter School Research Question 2

Hypothesis Testing - Population Mean					
Evidence				**Sample**	**Data**
Sample size	18	n		4.47	3.73
Sample Mean	4.17722	*x-bar*		4.00	4.00
Sample Stdev.	0.42926	s		4.80	4.93
σ Unknown; Population Normal				4.00	3.53
Test Statistic	11.6351	t		4.27	4.07
			At an α of	4.60	4.87
Null Hypothesis		*p*-value	5%		
H₀: μ =	3	0.0000	**Reject**	3.53	4.00
H₀: μ ≥	3	1.0000		4.33	4.33
H₀: μ ≤	3	0.0000	**Reject**	3.93	3.80

Note. Ho: $\mu \leq 3$ – Educators not prepared to integrate technology

Note. H1: $\mu > 3$ – Educators prepared to integrate technology

Appendix J: Hypothesis Test East Charter School Research Question 3

Hypothesis Testing - Population Mean					
Evidence					
Sample size	16	*n*		**Sample**	**Data**
Sample Mean	3.41625	*x-bar*		2.56	1.72
Sample Stdev.	0.76351	*s*		2.83	3.89
σ Unknown; Population Normal				3.83	2.89
Test Statistic	2.1807	*t*		3.28	4.11
			At an α of	3.44	2.67
Null Hypothesis		*p*-value	5%	3.00	4.22
H_0: μ =	3	0.0455	**Reject**	4.22	3.78
H_0: μ ≥	3	0.9772		3.61	4.61
H_0: μ ≤	3	0.0228	**Reject**		

Note. Ho: μ ≤ 3 – Students not technologically prepared

Note. H1: μ > 3 – Students technologically prepared

Appendix K: Hypothesis Test Northeast Charter School Research Question 3

Hypothesis Testing - Population Mean

Evidence

Sample size	23	*n*
Sample Mean	3.60326	*x-bar*
Sample Stdev.	0.53649	*s*

σ Unknown; Population Normal

Test Statistic 5.3927 *t*

At an α of

Null Hypothesis	*p*-value	5%
H_0: μ = 3	0.0000	**Reject**
H_0: μ ≥ 3	1.0000	
H_0: μ ≤ 3	0.0000	**Reject**

Sample	Data
3.28	4.28
4.38	4.11
3.00	3.44
3.39	3.50
4.72	4.00
4.06	2.89
3.00	3.61
4.17	2.61
3.67	3.00
3.94	3.22
3.39	3.56
3.67	

Note. Ho: μ ≤ 3 – Students not technologically prepared

Note. H1: μ > 3 – Students technologically prepared

Appendix L: Hypothesis Test Southeast Charter School Research Question 3

Hypothesis Testing - Population Mean			
Evidence			
Sample size	17	*n*	
Sample Mean	3.42706	*x-bar*	
Sample Stdev.	0.98971	*s*	
σ Unknown; Population Normal			
Test Statistic	1.7791	*t*	
			At an α of
	Null Hypothesis	*p*-value	5%
	H_0: μ = 3	0.0942	
	H_0: μ ≥ 3	0.9529	
	H_0: μ ≤ 3	0.0471	**Reject**

Sample	Data
3.06	3.00
2.89	2.33
5.00	4.94
3.94	3.67
3.39	4.44
3.61	1.00
4.00	3.78
2.94	2.44
3.83	

Note. Ho: μ ≤ 3 – Students not technologically prepared as 21st century professionals

Note. H1: μ > 3 – Students technologically prepared as 21st century professionals