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Kurt Schulze

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Walden University
2014

Abstract

Relationships Between Teacher Characteristics and Educational Technology

by

Kurt Ronald Schulze

MA, Wright State University, 2008

BS, Wright State University, 2007

Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

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Abstract

Too often, teachers are using educational technology resources for administrative purposes instead of using these resources in a constructivist manner to enhance student learning. The study site was well behind the national average in overall educational technology use categories. The purpose of this explanatory correlational research was to examine the relationships between teachers' technology perceptions and integration and the teacher characteristics of gender, age, years of teaching experience, current subject(s) taught, current grade level(s), and highest level of college education. With this information, professional development can be tailored to the specific population. Cognitive flexibility and constructivism provided the theoretical foundations. A convenience sample of 134 pre-K through 12 teachers from 5 school districts completed the Teacher Technology Integration and Perception Survey, which was created from 2 preestablished surveys: Teacher Technology Survey and the Teachers' Use of Educational Technology in U.S. Public Schools. The results indicated that teachers' overall perceptions of educational technology were high; however, their integration was low and did not provide authentic applications for students. Additionally, male teachers and high school teachers had the highest positive perceptions and technology integration as compared to their counterparts. Statistically significant negative rank-order correlations were observed between teacher age and perception, and experience and perception. These findings helped guide the creation of a professional development plan to increase teachers' integration of technology. School leaders and teachers may use this new information to adopt their instructional practices, which provides students with authentic and relevant learning experiences.

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Dedication

Above all, my dissertation is dedicated to God, my Lord and Savior. Without Him none of this would be possible. I know that it is through His grace and mercy that I am provided another day on earth to do His will. He has given me support, guidance, and love. He also provided me the necessary supporting cast of family, friends, and colleagues to help me reach my goal.

I would also like to dedicate my dissertation to my loving, caring, and supportive wife Ali. She has provided me with unconditional love, support, and dedication throughout my entire educational journey. She endured my obsession of coursework, the dissertation, and the goal of perfection by sacrificing quality time with each other and driving places so that I may complete work in the car. She was by my side every step of the way to celebrate, encourage, and pick me up. I knew that if I ever needed anything, her warm touch, a listening ear, or another opinion she was there. I could have not done it without her. She is truly an amazing and special woman. Ali, I love you!

I would also like to dedicate my dissertation to my parents, Ron and Linda. Words cannot describe the love, support, and devotion you have provided me, not just in my education, but also throughout my entire life. You have always believed in me and the goals I set out to accomplish. Whether it was attending a two-year technical school or earning a doctorate degree so that I may teach at a university, you believed and supported me. Early on, you instilled in me the value of education. You always preached to me that education comes first. I have taken this philosophy and applied it to both my personal and professional life. I can honestly and proudly say that I am the person I am today because of your constant love and support. Mom and Dad, I love you!

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Section 1: The Problem

Introduction

The world of education is currently experiencing a second revolution, the digital age (Collins & Halverson, 2010). Many educators are aware that today's students utilize advanced technological innovations. Today's students are Digital Natives or the Net Generation because they have grown up and utilized technology their whole life (An & Reigeluth, 2011). Educational systems did not anticipate technological innovations such as smartphones, tablets, and cloud-based services would influence instructional strategies and methods. Due to the need for teachers to incorporate technology within their classrooms, they have embraced the new forms of technology to enhance the overall learning process (Lee & Spires, 2009). Teachers can use technology to build a flexible and creative learning environment (Vesisenaho et al., 2010) that increase knowledge and skills, which prepares students to be college or career ready (Lowther, Inan, Strahl, & Ross, 2008).

Twenty-first century technologies have changed the way teachers support, deliver, and enhance student learning (Blue & Tirotta, 2011; Manochehri & Sharif, 2010). Utilizing technology inside the classroom is different from utilizing technology outside the classroom (Lee & Spires, 2009). In order for learning to be engaging and relevant, teachers need to blur the line of inside and outside classroom technology (Lee & Spires, 2009). When educational technology resources are thoughtfully integrated, students' views and opinions of teaching and learning where positively affected (Eskil, Ozgan, & Balkar, 2010). Technology designed for student learning will enhance student learning despite various abilities, motivation levels (Halverson & Smith, 2010), language, backgrounds, and exceptionalities (U.S. Department of Education [USDE], 2010).

Despite the benefits educational technology provides for teachers and students, not enough teachers are using technology resources to promote learning. In 2009, Ohio conducted a teacher educational technology survey called the Biennial Educational Technology Assessment (BETA) (eTech Ohio, 2009). For the county research site, 17% had 5 years or less, 31% had 6-12 years, 16% had 13-20 years, and 35% had 21+ years of teaching experience when the survey was completed (eTech Ohio, 2009, Background Information, para 4).

Eight-one percent of the responding educators agreed or strongly agreed that computers are effective tools to help students' master academic content standards. The data showed 29% of the teachers used educational technology at least once a week to support standards-based instruction. Twenty-five percent of the teachers suggested that they never or only once a year used support standards-based technology for instruction (eTech Ohio, 2009).

Using the Internet is such a major component of today's emerging educational technology (Ball & Levy, 2008). The BETA survey also collected information on using the Internet for instructional activities. The survey found that 45% of the educators never or only once a year use the Internet for instructional activities (eTech Ohio, 2009). Thirty-six percent of the participants reported using the Internet to deliverer instructional activities at least once a week (eTech Ohio, 2009). For continuous learning and support of educational technology to occur, technology knowledge-based standards need to be created and enforced (Smeureanu & Isaila, 2012).

Definition of the Problem

The National Education Technology Plan indicated that technology is present in almost every facet of our lives (USDE, 2010). Teachers need to utilize educational technology resources in such a way that engages and provides powerful learning experiences, which will lead to authentic and meaningful student achievement. Today's students have not known life without the Internet or other advanced technologies (An & Reigeluth, 2011). Many current educators have known life without the Internet or other advanced technologies. Researchers found that many educators are using educational technology resources for administrative purposes, not enhancing student achievement (An & Reigeluth, 2011). In the past 10 years, there has been a major push to integrate additional educational technology resources into classrooms. Consequently, researchers need to investigate relationships between teachers' usage and perceptions and teacher characteristics. The research seems to be lacking a strong emphasis on the relationship between successful integration and teacher characteristics (An & Reigeluth, 2011). Researchers must explore teacher technology integration and student success relationships because students are evolving to embrace this digital world.

Schools have invested vast amounts of resources to ensure that teachers are utilizing educational technology for student learning and assessment (Halverson & Smith, 2010). The implemented initiatives have fallen short (Lowther et al., 2008) because not every teacher is embracing educational technologies to meet student needs, even though technology has always had the ability to transform a teachers teaching, learning, and thinking (Halverson & Smith, 2010).

Classrooms at every grade level include students with a wide variety of learning styles (Chu, 2011; Chung & Miller, 2011). Teachers must be prepared to teach students from different social, ethnical, racial, and economic backgrounds (Chung & Miller, 2011). Rahman, Scaife, Yahya, and Ab Jalil (2010) explained that teachers must realize that classrooms are currently, and will always be, filled with diverse learners. Teachers have a responsibility to understand students' abilities, interests, and how they respond to different circumstances (Rahman et al., 2010). Educational technology allows educators to customize instructional materials and lessons to meet the needs of diverse learners (Kuhn, 2008; Manochehri, & Sharif, 2010; Vesisenaho et al., 2010). Customized materials provide capabilities for self-paced instruction while receiving continuous feedback (Manochehri & Sharif, 2010).

Even though access to educational technology has increased for most schools in recent years, concerns still exist for how integrating technology resources promotes student learning (Keengwe, Onchwari, & Wachira, 2008). Researchers have indicated that barriers teachers face include scheduling conflicts, lack of equipment, resources not working properly (An & Reigeluth, 2011; Wright & Wilson, 2011), lack of support, negative perceptions and beliefs, being technology illiterate (Inan & Lowther, 2009; Keengwe et al., 2008; Wachira & Keengwe, 2011), and curriculum (Hsu, 2010; Keengwe et al., 2008). Another barrier standing in the way of technology integration is the lack of time (An & Reigeluth, 2011; Keengwe et al., 2008; Lu & Overbaugh, 2009). Teachers need time to install and learn the hardware and software before developing effective lessons to integrate the new resource for student learning (Keengwe et al., 2008). Teachers willing and capable of utilizing educational technology face devastating barriers that prohibit successful technology integration (Keengwe et al, 2008; Lowther et al., 2008).

Ertmer and Ottenbreit-Leftwich (2010) indicated that knowledge of technology is necessary. Technology will not facilitate student learning if the teacher has low self-efficacy. Self-efficacy may be more important for technology integration than skills and knowledge (Ertmer & Ottenbreit-Leftwich, 2010). Teachers are often learning how to use technology right along with students (Gorder, 2008). The best way to increase self-efficacy is through experience (Ertmer & Ottenbreit-Leftwich, 2010).

Educational technology is not just vital to Ohio and the United States. World government agencies are indicating in order to successful develop and sustain student skills and knowledge in the 21st century students need to utilize educational technology (Selwyn & Husen, 2010). Cutting-edge countries are integrating educational technology practices and policies into their educational systems (Vanderlinde & van Braak, 2011). In 2008, the U.S. government estimated that they allocated about $273 million for technology integration and classroom instruction in secondary schools alone (Manochehri & Sharif, 2010). They have spent more than $18 billion in the last ten years wiring schools for Internet connectivity (Lee & Spires, 2009). Part of the funds have been distributed to teachers who apply for technology grants, which often focus on removing educational technology barriers (Lowther et al., 2008).

Removing educational technology barriers provides educators the ability to meet the needs of diverse learners within the classroom (Manochehri & Sharif, 2010). Evidence suggests that when teachers use current educational technology, student learning is multidimensional and dynamic (Lee & Spires, 2009). Technology is an integral part in teaching students because it improves the overall effectiveness of instruction, increases student motivation (Hsieh, Cho, Liu, & Schallert, 2008; Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer 2010), enhances communication (Manochehri & Sharif, 2010), and allows teachers to challenge students at the highest-level possible (Keengwe et al., 2008). The core value for technology implementation and integration is to benefit students by improving student comprehension of complex topics (Ottenbreit-Leftwich, et al., 2010).

Hsieh et al. (2008) found that students' self-efficacy increased when teachers created a technology-enhanced collaborative learning environment. Students with higher self-efficacy tended to apply additional effort, better handled challenging circumstances, and used a variety of strategies to create relevant learning (Hsieh et al., 2008). Students with low self-efficacy often perform lower than their true ability because they feel as if they cannot succeed (Hsieh et al., 2008; Karaarslan & Sungur, 2011*)*. Teachers are experiencing pressure from administrators to integrate technology into their classroom to increase student engagement and learning (An & Reigeluth, 2011). Low self-efficacy of technological pedagogy content knowledge (TPCK) can causes educators to be reluctant to implement technology (Pierce & Ball, 2009).

Additional research to close the gap between technology and teachers' successful integration is necessary (Ertmer & Ottenbreit-Leftwich, 2010). Teachers often have an understanding of pedagogy and content knowledge, but struggle incorporating technology into classroom effectively (Ertmer & Ottenbreit-Leftwich, 2010). One reason for the gap in technology and successful integration is the lack of teacher education on effective use and proper implementation (Zhou, Smith, Parker, & Griffin-Shirley, 2011). Researchers have not placed an emphasis on determining teachers' characteristics that contribute to educational technology (Holden & Rada, 2011).

Rationale

I explored the relationship between teacher characteristics and teachers' technology integration and perceptions within the classroom. The teacher characteristics are gender, age, years of teaching experience, current subject(s) taught, current grade level(s), and highest level of college education. Because technology has changed the face of education (Halverson & Smith, 2010), the data will help formulate decisions about future technology professional development (PD) sessions by allowing administrators to target specific groups of teachers, based on common characteristics. Technology integration is not likely occurring because teachers are lacking skills needed to utilize resources for effective student learning. When teachers encounter internal or external barriers, the full potential of educational technology cannot be recognized (Handal, Cavanagh, Wood, & Petocz, 2011).

Evidence of the Problem at the Local Level

Ohio's educational leaders recognized that many teachers where using technology as add-ons (ODE, n.d.). Educational leaders created five technology goals for schools and teachers to increase effective technology integration. Ohio districts were to achieve the five goals by 2015. Ohio's educational system must continue to evolve as technology evolves (ODE, n.d.). Ohio teachers are required to have technology training when obtain their initial licensure; however, they are not required to receive any additional training applying for recertification (eTech Ohio, 2009). Ohio administrators are not required to have any technology training for initial licensure or recertification. The lack of technology training for administrators can have devastating effects because administrative knowledge and support is vital for successful teacher technology integration (Lu & Overbaugh, 2009). Providing leaders with training and PD is important because the training will expose leaders to different leadership styles and technology models (Hsu & Sharma, 2008).

Evidence of the Problem from the Professional Literature

Technology is in a constant state of change as innovators try to expand and adapt technologies for the educational learning environment (Lee & Spires, 2009). Researchers are tending to believe that certain resources are better suited for certain pedagogical approaches (Lee & Spires, 2009). The availability of advanced educational technology resources is giving rise to advanced research questions that need to be answered (Parker, Bianchi, & Cheah, 2008). Despite increased access and teacher PD, research efforts to improve technology integration are still low (An & Reigeluth, 2011). Today's student benefits from educational technology because resources have the ability to foster contextual learning (Forthe, 2012). Teachers not using technology need attention (Forthe, 2012). The National Educational Technology Standards helps leaders and teachers focus their efforts to be successful in a digital society (Woolard, 2012).

Definitions

Cloud Computing: "A large-scale distributed computing paradigm that is driven by economies of scale, in which a pool of abstracted, virtualized, dynamically-scalable, managed computing power, storage, platforms, and services are delivered on demand to external customers over the Internet" (Foster, Zhao, Raicu, & Lu, 2009, p. 1). Synonymous with web 2.0.

Educational Technology: “The study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources” (Association for Educational Communications and Technology, 2004, p. 1).

Information and Communication Technology (ICT): “A diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information” (Blurton, 1999, p. 1).

Learner-Centered Instruction: “A teaching methodology that emphasizes the importance of understanding and catering to the students’ needs, interests, and abilities” (Education.com, Inc., 2013, para. 1).

Pedagogy: “The knowledge about the process and practice or methods of teaching and learning” (Lee & Tsai, 2010, p. 4).

Professional Development: “The advancement of skills or expertise to succeed in a particular profession, especially through continued education” (Professional Development, n.d., para. 1).

Technological Pedagogical Content Knowledge (TPCK): Teaching with technology that requires an understanding and representation of concepts using technologies, pedagogical, content, and knowledge (Mishra & Koehler, 2006).

Technology Integration: “Using technology, including computers, digital cameras, compact disks, handheld devices, probes, and related technologies to deliver and enhance the curriculum already in place” (Pitler & Mid-Continent Research for Education and Learning [McREL], 2005, p. 1).

Significance of Research

This research is to be used as a springboard to propel educators into the 21st century of classroom instruction by providing an understanding of K-12 teachers' perceptions and usage of educational technology within one Ohio County. The study helped identify strengths, weaknesses, and patterns to help administrators effectively meet teachers' needs of educational technology PD. The PD sessions are helpful because Ohio students take the Partnership for Assessment of Readiness for College and Careers (PARCC), a computer-based standardization assessment to determine performance and provide accountability (PARCC, 2012). Building, district, and county PD sessions must occur to ensure teachers are comfortable using and implementing technology to increase student learning.

This study is also significant because the research provided an understanding of county educators' perceptions and use of classroom educational technology resources. County leaders can use this acquired knowledge of usage and perceptions to create and implement future PD sessions aligned with educators needs. Researchers revealed specific characteristics that leaders can focus on, such as grade level, content area, years of teaching experience and gender. People learn best when they feel the need for information (Panigrahi, 2011); therefore, county educators are able to use the findings and results from the study to help them improve their teaching. Because teachers received the results of the study, they are able to reflect and formulate a plan for increasing technology integration. Educators can collaborate with colleagues and present a united front to administration with concerns and desires.

In the age of data driven accountability, the advantages listed above may lead to positive social change for the educators because accountability demands schools improve student performance, community outreach, and communication systems (Halverson & Smith, 2010). I plan to share the results and findings of the study with county leaders, which they can used to make informed decisions about how to align PD sessions to maximize results. Teachers may apply the PD information learned to classroom instruction, which can increase and enhance student learning. This study assists educators and leaders in becoming agents of change at multiple levels of the educational system.

Reflectively applying technology to the learning environment and content may enhance pedagogy and learning outcomes (Parker, Bianchi, & Cheah, 2008). Schools and classrooms can become learning communities for students and staff because people and resources continually change and evolve (Levin & Wadmany, 2008). This increased and enhanced learning can create students that are college and career ready when leaving high school. Since students are better prepared, they are likely to succeed in future endeavors, creating positive social change. This study could set into motion not only a county change, but also a regional and state level of social change. The study provides results that school leaders can immediately implement to promote and establish a 21st century learning community.

Research Questions

Educational technology has the ability to increase student achievement by proving teachers with the necessary resources to engage students with rich and authentic learning experiences. Gorder (2008) indicated that many factors contribute to teachers' technology integration. Researchers have indicated that teacher' beliefs, self-efficacy, administrative support, and the barriers teachers encounter affect technology integration (Niederhauser & Perkmen, 2008). Researchers have conducted little research on the affects of teacher characteristics and technology integration (Lu & Overbaugh, 2009). A quantitative correlational research study is an appropriate way to investigate the possible correlation between teacher characteristics and a teacher's perception of educational technology and their current level of technology integration.

For this research, there are two dependent variables teachers' perceptions of educational technology and teachers' integration of educational technology, both of which are ordinal levels of measurement. The independent variables are various teacher characteristics. The teacher characteristics of age and years of teaching experience are ordinal levels of measurement. Four teacher characteristics have nominal levels of measurement: gender, current grade level, highest level of college attainment, and current teaching subject. I investigated the following questions:

1. What are teachers' perceptions about educational technology?
2. What are teachers' current levels of educational technology integration?
3. What is the relationship between a teacher's gender and their perceptions of educational technology?
4. What is the relationship between a teacher's gender and their educational technology integration?
5. What is the relationship between a teacher's age and their perceptions of educational technology?
6. What is the relationship between a teacher's age and their educational technology integration?

7. What is the relationship between years of teaching experience and a teacher's perceptions of educational technology?
8. What is the relationship between years of teaching experience and a teacher's educational technology integration?
9. What is the relationship between a teacher's subject area and their perceptions of educational technology?
10. What is the relationship between a teacher's subject area and their educational technology integration?
11. What is the relationship between a teacher's grade level and their perceptions of educational technology?
12. What is the relationship between a teacher's grade level and their educational technology integration?
13. What is the relationship between a teacher's highest level of college attainment and their perceptions of educational technology?
14. What is the relationship between a teacher's highest level of college attainment and their educational technology integration?

Review of Literature

For this study, both the Cognitive Flexibility Theory and Constructivism are directly related to the used and perceptions of educational technology because both theories require learners to move from the basic to advanced knowledge and move from structured to ill-structured learning domains. This advanced and ill-structured knowledge allows teachers to foster 21st century learning, creating college and career ready students (Strobel, Jonassen, & Ionas, 2008). Teachers changing their role from teacher to facilitator largely accounts for this learning shift. Both theories also indicate that knowledge is gained when content is authentic and learners are able to create their knowledge based on personal experiences (Al-Huneidi & Schreurs, 2012).

The articles for this literature review were found by using the following databases: ERIC, Academic Search Complete, Education Research Complete, Teacher Reference Center. In each of these databases, I conducted keyword and keyword Boolean searches to find relevant articles. The keywords included: *barriers, benefits, cloud computing, cognitive flexibility theory, constructivism, educational technology, factors, perceptions, professional development, resources, self-efficacy, student centered, student achievement, support, technology, technology integration* and *web 2.0*. I also reviewed each articles' reference list to find additional articles that would benefit my research. To ensure the highest quality of research was being used, I only reviewed peer-reviewed journals. The articles also had to be within the last five year, unless it was an original publication about a learning or educational theory. After conducting a search or a Boolean search, I review each articles' abstract. If the abstract seemed to fit my needs, I saved the article for in-depth reading and analysis at a later date.

Conceptual Framework

Two theoretical frameworks that relate to educational technology are Cognitive Flexibility Theory and Constructivism. Each theory relates to educational technology on its own; however, they have overlapping characteristics that allows them to supplement each other. Educational technologies that are generally successful within schools are those technologies that have structured learning goals, guide students, and are able measure student success and achievement (Halverson & Smith, 2010).

Cognitive Flexibility Theory

Advanced knowledge acquisition is important because it causes students to shift their learning from a basic to an advanced learning experience through vast amounts of authentic experience (Spiro, Coulson, Feltovich, & Anderson, 1988). Knowledge needs to be assembled by students, not transmitted by teachers (Hubbard, 2012; Spiro & Jehng, 1990). For students to achieve advanced knowledge acquisition, they must possess a deep understanding of the content, reason with information, and apply the knowledge in different circumstances (Spiro et al., 1988). In other words, students must able apply their knowledge to authentic experiences independently, rather than relying on recalling memorized information (Spiro & Jehng, 1990).

This thought process is the bases for Cognitive Flexibility Theory (Spiro & Jehng, 1990). Spiro and Jehng stated, "By cognitive flexibility, we mean the ability to spontaneously restructure one's knowledge, in many ways, in adaptive response to radically changing situational demands” (p. 165). Cognitive flexibility theory explains that effective learning occurs when students have access to various paths to reach the teacher’s goal or objective (de Brito & Pereira, 2007). One instructional assumptions of the cognitive flexibility theory is that students need to view content material as an interconnected set of themes and perspectives (Godshalk, Harvey, & Moller, 2004). The teacher’s goal for the learner is to have the learner understand the interconnections of the content and to think outside the box (Godshalk et al., 2004).

Cognitive Flexibility Theory involves carefully selecting knowledge that can be adapted to meet the needs of a particular learning experience (Spiro et al., 1988). Spiro et al. explained that three central ideas exist behind Cognitive Flexibility Theory: learning, instruction, and knowledge representation. The three ideas allow for multiple representations, view learning as a multidirectional and multiperspective concept, and allows users to assemble information to fit authentic application problems. Students must be flexible in their understanding; hence, the name Cognitive Flexibility Theory (Godshalk et al., 2004).

Cognitive Flexibility Theory, when used properly, provides educators a different view of instructional approaches and representation of complex information (Boyd & Ikpeze, 2007). Cognitive flexibility theory allows learners to avoid over simplification and generalization of complex information, use multiple representations, apply advanced knowledge or knowledge acquisition skills, understand how concepts can be applied to authentic cases, move from rigid to flexible ideas, explore how cases and concepts are connected, and how to move between the two (Spiro et al., 1988). Allowing educators to push students to reach their full potential (Boyd & Ikpeze, 2007).

Learning that occurs in complex and ill-structured domains need to have multiple perspectives and authentic activities embedded, supported by Cognitive Flexibility Hypertext systems (Strobel et al., 2008). Spiro and Jehng (1990) explained hypertext as “computer-based texts that are read in a nonlinear fashion and that are organized on multiple dimensions” (p. 167). In other words, materials such as text, audio, and video are capable of being explored using different methods and paths for the same topic (Spiro & Jehng, 1990).

Cognitive Flexibility Hypertext focuses on cases, perspectives, and themes connected in a nonlinear fashion, which provides the users the ability to navigate within these contexts (Strobel et al., 2008). An assumption when using Cognitive Flexibility

Hypertext is that multiple perspectives are critical components for learning in ill-structured knowledge domains (Godshalk et al., 2004). When teacher provided multiple perspectives and real-world problems, students are able to link abstract concepts to authentic applications (Strobel et al., 2008).

Constructivism

A complementary theoretical framework to Cognitive Flexibility Theory is Constructivism because Constructivism requires students to build their knowledge internally and construct external artifacts (Clinton & Rieber, 2010; Strobe, Jonassen, & Ionas, 2008). By constructing external artifacts, students often develop new knowledge of the information because they have shared and reflected on the information (Clinton & Rieber, 2010; Fox-Turnbull & Snape, 2011), which utilizes the framework of learning-by-design (Clinton & Rieber, 2010). This allows students to create a deeper understanding of the content (Fox-Turnbull & Snape, 2011).

Constructivism is deeply rooted in Piaget and Vygotsky’s learning theories, especially their concepts of social learning, mediated learning, and the zone of proximal development (Clinton & Rieber, 2010). Effective constructivist learning environments occur when knowledge is not handed over to students, but created by students (Lee & Spires, 2009; Spiro et al., 1988), which improves students’ ability to recall and apply information (Powell & Kalina, 2009). Schools are discussing that constructivism is the best theory of learning and teaching (Overbay, Patterson, Vasu, & Grable, 2010; Powell & Kalina, 2009). Despite the vagueness of the concept, constructivist-teaching methods provide the students with benefits of cognitive and social knowledge within the classroom-learning environment (Powell & Kalina, 2009). Teachers utilizing the constructivist learning approach offer advice, guidance, and inspiration while the students take control of learning (Hubbard, 2012). Hubbard provided the analogy of a person coaching his or her players from the sideline during a game.

Effective constructivist learning strategies utilize common classroom interactions (Powell & Kalina, 2009). Constructive learning occurs when students are challenged, open, comfortable, use their imagination, and are inspired (Powell & Kalina, 2009). Students exposed to constructivist learning gain a rich and relevant understanding of classroom information; providing motivation and practical application (Fox-Turnbull & Snape, 2011). Teachers using Constructivism need to utilize technology to push students to create deeper connections and generate meaning with the information (Overbay et al., 2010).

Computer usage changed education in the early 2000s; however, not in the direction of constructivism because teachers did not use computers to enrich and provide students with authentic learning experiences (Halverson & Smith, 2010). Constructivist learning approaches allows students to create purposeful and meaningful connections to the content (Fox-Turnbull & Snape, 2011). The deep connections and the generation of meaningful information allow students to establish seamless knowledge of information, instead of having isolated pieces of information (Overbay et al., 2010).

Preparing students for learning in the 21st century looks drastically different to past teaching philosophies and strategies (Fox-Turnbull & Snape, 2011). Teachers face the huge task of teaching critical thinking, application, and problem solving skills to ensure effective citizens (Fox-Turnbull & Snape, 2011). Teachers can support these skills through student collaboration (Fox-Turnbull & Snape, 2011). Nontraditional or constructivist based classes can be the academic learning experience students may need to be successful in the 21st century (Hubbard, 2012).

Cognitive Flexibility Theory and Constructivism center on students' ability to construct/assemble the instructional information on their own, which requires teachers to shift from speaker to facilitator. Given the exponential growth of educational technology, researchers have increased their focus on the effects that educational technologies have compared to traditional model classrooms (Ross, Morrison, & Lowther, 2010). Researchers have shown that fully utilized educational technology can be used for more than communication and display; it becomes a resource for extending and maximizing student learning. Computer-intense settings were found to increase student-centered, cooperative, and higher ordering learning along with increased writing, problem solving, and technology skills (Ross et al., 2010).

Spiro and Jehn (1990) indicated that an effective teaching strategy that utilizes assembled knowledge is case-based learning. When case-based learning is applied, students' learning moves from introduction to mastery and memorization to application, both of which provide a deeper learning experience (Spiro & Jehn, 1990). Cognitive Flexibility Theory depends on students to learn information through multiple representations and applications (Spiro et al., 1988). Within the multiple representations, learning approaches are multidirectional and multiperspective (Spiro et al., 1988). Educational technology resources provide teachers with multiple ways to model, share, and provide information and feedback (Solvie & Kloek, 2007).

Educational technology used for the learner shifts the attention from the teacher to the student (Halverson & Smith, 2010). Learner-centered technologies allow students to investigate, retrieve, and actively participate in their learning, which leads to student constructed learning (Halverson & Smith, 2010). Examples of student-centered resources include wikis, blogs, and search engines (Halverson & Smith, 2010). Technology is ideally suited for the constructivist approach to teaching and learning (Halverson & Smith, 2010). Learning in the 21st century needs to look drastically different from previous years in order for students to be successful in the information age (Fox-Turnbull & Snape, 2011). Teachers have the difficult task of developing students' critical thinking and problem solving skills (Fox-Turnbull & Snape, 2011).

The research on Constructivism and Cognitive Flexibility Theory has discovered that the role the teacher and students play under the theories is dramatically different from traditional learning. The teacher takes on the facilitator role and students are responsible for their own learning through exploration, discovery, and construction. Teachers from every grade and subject area need to adopt and develop tools and resources to create a constructivist-learning environment (Powell & Kalina, 2009). Traditional books and lectures are not well suited for teaching and learning in a cognitive flexibility-learning environment (Spiro & Jehng, 1990).

Overbay et al. (2007) conducted a study to investigate the relationship between teachers' constructivist learning approaches and their reported use of educational technologies. The study consisted of 22 schools (12 elementary, six middle, and four high schools) which represented 474 participants from across the state of North Carolina. The researchers found a positive correlation between constructivist approaches and the amount of educational technology that teachers utilized for student-centered learning. They also found that participants with the highest level of constructivist integration were female elementary teachers that taught a core subject. Teaching experience and subject area had no relationship to technology use.

Overbay et al. (2007) contradicted the findings of Inan and Lowther's 2010 study. Inan and Lowther indicated that teachers' beliefs about constructivism and the school's technology budget play an important role in technology integration. Researchers showed that teachers' perceptions of administration, technical support, and the technology infrastructure could not predict technology use, which contradicts findings presented in the literature review. The researchers did not explore causation so they are unable to state that constructivist approaches causes teachers to use technology.

Using the Internet and other advanced technologies allows teachers to crisscross connection of concepts easily (Spiro & Jehng, 1990). Educators' must determine how to link the concepts to enhance student learning (Spiro & Jehng, 1990). Educational technology complements Constructivism and Cognitive Flexibility Theory because educational technology provides teachers the ability to create student-centered learning environments. If teachers utilize Constructivism and Cognitive Flexibility Theory, they would be able to use technology for learners instead of technology for learning (Halverson & Smith, 2010). Technology has always had the ability to change teachers' mindset in terms of teaching, thinking, and learning (Halverson & Smith, 2010). Regardless of a teacher's pedagogical theory, without adequate access and training, educational technology will play a limited role in student learning (Overbay et al., 2010). This research provides administration with the needed data to identify areas of educational technology weaknesses among the staff. Trained teachers shift their mindset from leader to facilitator; improving student learning and better preparing students for the 21st century.

Current Literature

In addition to Cognitive Flexibility Theory and Constructivism, six other topics of literature were researched and discussed to understand educational technology and its role in the educational system and with teachers more effectively. Educational technology is the first topic discussed and how it relates to the classroom and the overall educational environment. The second topic in the literature review focuses on the benefits of educational technology on student learning. The third section reviews teachers' perception and use of educational technology within the classroom. The fourth section discusses the literature found on effectively integrating educational technology resources to enhance student learning. Barriers that teachers face when implementing technology resources such as technical and administrative support, resources, perceptions and beliefs, PD, and school culture/environment is the fifth section. The sixth and final section of the literature review discusses ways to increase technology integration.

Educational Technology

Information technology has changed the way in which people live and technological innovations have forever changed the way information is viewed and displayed (Ohio Department of Education [ODE], n.d.; Panigrahi, 2011). When most of today's educators were in school, educational technologies were not readily available to enhance and supplement student learning or used in everyday life (Loertscher, 2010). Educational technology is so prevalent that young children are able to manipulate resources both in and out of the classroom, which presents challenges for many teachers because of students' technology proficiency level and acceptance (Loertscher, 2010).

Teachers are key players in the ever-changing world of education and teachers have the greatest effect on the quality of technology usage within the school setting (Levin & Wadmany, 2008). Increased technology awareness, expenditures, and advances have increased expectations for teachers (James, 2009). The job description of teachers has changed to include being tech savvy (Loertscher, 2010). This change of job description means that classroom expectations and educational standards have changed to meet the demands of a digital society (Loertscher, 2010).

Technology is everywhere a person turns and is being used in creative and fascinating ways (Ritzenthaler, 2009). Technology has changed over the last several decades, and continues to change, which is why technology is synonymous with change (Ritzenthaler, 2009). Today's classrooms are at the forefront of a major shift in the way teachers teach and the way students learn, with technology playing a major role in this shift (Project Tomorrow, 2012). Digital technologies are reconfiguring the way teachers, students, and administrators view education and learning (Collins & Halverson, 2010) because the resources have the ability to target specific student learning needs (Manochehri & Sharif, 2010). Teachers are required to change their instructional practices when adopting educational technology resources to support and supplement teaching and student learning (Pierce & Ball, 2009).

Since the early 1990s, the federal government and school districts have invested substantial amounts of money on instructional technology, to increase teacher and student access (Miranda & Russell, 2011). Two trends dominated technological change, during this time, massive investments to provide technology access to public schools and research investments to create effective PD sessions for proper integration (Halverson, & Smith, 2010). The massive investments made it seemingly impossible to mandate that educational systems be technology-driven learning environments, which formed a huge revolutionary change to overhaul classroom practices (Halverson, & Smith, 2010).

The revolution resulted in a robust technology infrastructure in the 2000s, which meet the demands of high-stakes testing policies (Halverson, & Smith, 2010). Despite the large investments in resources and providing research-based strategies, classroom practice remained mostly unaffected in the 1990s and early 2000s (Lowther et al., 2008). K-12 technology initiatives have been a topic of researchers' focus for the last 30 years (Lowther, Inan, Daniel Strahl, & Ross, 2008) because technology can change every facet of the educational environment (Parker et al., 2008).

eTech Ohio believed that effective and consistent technology utilization can drive academic achievement at every level of the educational environment (ODE, n.d.). eTech is committed to providing students with educational technology resources, skills, and knowledge for success in the 21st century. eTech Ohio has five strategic goals to accomplish between the years of 2010 and 2015 (p. 5).

- "By 2015, increase daily use of educational technology within K-12 classrooms to 80% to support standards based instruction" (ODE, n.d., p. 5).
- "Provide technological expertise and solutions to create more student-centered and data responsive educational systems by 2015" (ODE, n.d., p. 5).

- "Develop a structured system to evaluate programs and practices during the next two years to ensure effective utilization of resources and to achieve the goals of the Commission" (ODE, n.d., p. 5).
- "Target and utilize Ohio's Public Service Media and Educational Technology affiliates' resources to increase educational technology integration into instruction in coordination with Strategic Goal 1" (ODE, n.d., p. 5).
- "Increase collaborations with regional-level networks by 2012 to better identify and address local districts needs, particularly in underserved regions of Ohio" (ODE, n.d., p. 5).

Three broad categories classify educational technology: preparation, delivery, and as a learning tool (Inan & Lowther, 2010). Hsu and Sharma (2008) described three types of technologies: data collection, simulation and modeling, and online collaborative tools (Hsu & Sharma, 2008). Data collection tools allow students to collect and analyze data easily (Hsu & Sharma, 2008). Simulations and modeling tools allow students to explore and represent processes and concepts in a short amount of time (Hsu & Sharma, 2008). Online collaborative tools allow students to share and explore concepts with communities within and beyond the classroom (Hsu & Sharma, 2008).

Advances in mobile software and WiFi allow persons to have access to almost any information instantly (Panigrahi, 2011). The exponential growth of technology being used in the educational system has dramatically increased the focus of the potential benefits to students, both in the educational and research environments (Ross, Morrison, & Lowther, 2010; Siggins, 2008). Technology has escalated from a resource that a few teachers would occasionally utilize to supplement lessons to an absolute necessity effective lessons (ODE, n.d.; Siggins, 2008). Traditional instruction complements technology and technology compliments traditional instruction; therefore, each can be utilized separately or can be utilized to supplement the other (Walker, 2010).

Lee and Tsai (2010) explained with the number of valuable educational resources available on the Internet, teachers needed to know how to integrate the resources into their teaching. The Internet is an important educational technology resource in today's contemporary educational system (Lee & Tsai, 2010). Simply introducing teachers to the Web for educational purposes is not adequate (Lee & Tsai, 2010). Teachers need continued support and development to integrate this resource effectively (Lee & Tsai, 2010).

Teachers and administrators recognize the advances and the tremendous potential the resources have to transform education (Ball & Levy, 2008; Panigrahi, 2011). Even though this explosion of technology has consumed almost every facet of our lives, technology has not necessarily taken over the education system (Panigrahi, 2011; Project Tomorrow, 2012; Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010). Students and administrators often judge teachers by the quantity and quality of educational technology used within the classroom (Siggins, 2008). Teachers must possess more than just the knowledge of educational technology (Overbaugh & Lu, 2008). Teachers must also believe they are capable of integrating technology into instructional practices because quality is better than quantity (Overbaugh & Lu, 2008).

Researchers have shown that schools serving economically disadvantaged students are more likely to use technology for low-levels of instruction than schools not serving economically disadvantaged students (Ross, et al., 2010). Noneconomically disadvantaged students may receive high-levels of technology instruction because wealthier students generally have home Internet access, making it easier for teachers to assign technology-rich homework assignments (Ross et al., 2010).

For the last several years, educators have been trying to catch up with students on emerging technologies, most recently social media/networking, and mobile technology (Project Tomorrow, 2012). The adoption of classroom technologies by educators largely depends on personal benefits and the ability to extend to other learning environments (Project Tomorrow, 2012). As educators utilize technology, they are developing an appreciation for the value technology can provide within the classroom (Loertscher, 2010; Project Tomorrow, 2012). This new appreciation has caused administrators and educators to reevaluate their stance on the role technology resources have within the classroom (Project Tomorrow, 2012). The reconsideration of technology’s role is largely because of the customized and personal learning students can experience using technology (Project Tomorrow, 2012). Educators cannot truly appreciate the value of new technology innovations until they realize the direct benefits technology has on their personal and professional lives (Project Tomorrow, 2012).

Educational leaders, policymakers, and business and community members envision that educational technology is integrated at every level of the educational environment (Shapley et al., 2010), which suggests that stakeholders play a part in how and why educational technologies are being implemented within the classroom (Hutchison & Reinking, 2011; Parker et al., 2008). To have a positive change on the education environment, stakeholders need to understand the factors driving educational technology (Collins & Halverson, 2010). Educational technology helps teachers, administrators, and other stakeholders collaborate, which increases professional learning and competencies and increases teacher expertise (USDE, 2010). Reforms significantly affect both students and teachers (James, 2009; Polly & Hannafin, 2010). Consequently, schools are requiring comprehensive reforms to integrate technology into classroom settings to enhance student learning (James, 2009).

The national education plan, Transforming American Education: Learning Powered by Technology is a plan for educational systems to integrate advanced technologies used in everyday life to improve student learning, speed-up adopting effective practices, and guide instruction and PD (USDE, 2010). The five essential components to planning are learning, assessing, teaching, infrastructure, and productivity. A gap exists in understanding of how to integrate everyday technologies to enhance student learning, which influences program and curriculum development, funding, and PD (USDE, 2010).

Information technology provides users customization (Collins & Halverson, 2010). Information technology can also present the user with multiple sources of expertise (Collins & Halverson, 2010; Reigeluth, 2010) because educational technology is not a single invention, but a wide variety of modes, tools, and strategies (Ross, et al., 2010). Teachers and administrators use educational technology resources for learning, enriching the classroom environment, and student learning (Ross, et al., 2010). Four roles ensure that a customized learning approach is feasible: Record keeping for students, planning for student learning, instructional practices for student learning, and appropriate assessment of student learning, which provides seamless integration and a cyclical pattern for educators (Reigeluth, 2010). Regardless of the educational technology, each resource potentially can be effective or ineffective based on the manner in which the resource is implemented (Loertscher, 2010; Project Tomorrow, 2012; Ross, et al., 2010).

The usability of educational technology resources is an important factor in the educational environment (Holden & Rada, 2011). Teachers who have positive attitudes and perceptions and have high self-confidence are likely to use technology resources to enhance student learning (Holden & Rada, 2011). High acceptance may eliminate second ordered barriers such as educational technology beliefs and willingness to modify educational practices (Holden & Rada, 2011). Educators' acceptance, satisfaction, and perceived usability play an important role in the use and distribution of educational technology resources. Reduced emphasis is placed on teachers' characteristics that contribute to users' perception of technology integration (Holden & Rada, 2011). Inventors develop technology innovations without adequate understanding of the intended audience's beliefs or characteristics. Generally, teachers accept and utilize educational technology resources as long as they are useable and useful (Holden & Rada, 2011).

Classrooms that use technology are opportunistic and effective in creating an environment that supports and scaffolds learning (Alam, 2011). Information technologies provide new approaches to authentic assessments and standards-based reforms (Collins & Halverson, 2010; Forthe, 2012). Technology-based assessments are significant for improving student learning because they have the ability to provide valuable information that can drive decisions that are the best for every student, improving the entire education system (USDE, 2010). Students' knowledge in an information technology environment requires students to know how and where to find relevant information instead of requiring students to produce information without any assistance (Collins & Halverson, 2010).

Technology is a tool for improving student learning, not a tool for delivering instruction (Keengwe at al., 2008). Educational technology should be used based on how students learn and how educators can best facilitate this learning (Reigeluth, 2010). Purpose and function should determine the resources utilized not the resources determining the purpose and function (Reigeluth, 2010). Teachers and students need to use technology frequently and effectively to see a positive effect in the 21st century learning environment (Berry, 2011; Lowther et al., 2012). Twenty-first century students need be able to think critically, problem solve, communicate, collaborate, and utilize creativity and innovation (Partnership for 21st Century Skills, 2011). A lack of computer proficiency seriously hinders the complexity of technology integration (Latio, 2009).

Educational technology supports the alignment between teachers' instructional practices and strategies and student learning assessments (Polly & Hannafin, 2010). Numerous curriculum and student assessment programs provide digital-based assessments that allow educators to customize the material (Polly & Hannafin, 2010) to meet the individualized needs of diverse students, making the content relevant (Kuhn, 2008; Ottenbreit-Leftwich et al., 2010). Researchers have shown that often times teachers' beliefs and practices are often misaligned (Polly & Hannafin, 2010).

Technology plays a pivotal role not only in the education of the Information-Age success, but also in all facets of life (Reigeluth, 2010). Theory-based practices must drive technology for educators to realize the full potential of educational technology

(Reigeluth, 2010). Three assumptions are present when educational technology is utilized within the classroom: Students want technology that will cause transmission of information easier, educators are initially reluctant for integration, but feel at ease using the resource as part of their pedagogical repertoire, and technology saves students time because they are comfortable using the resources (Siggins, 2008).

Education must adapt itself to the demands and trends of society so that students will become lifelong learners (Smeureanu & Isaila, 2012). The use of educational technology will result in active and responsible attitudes from learners (Smeureanu & Isaila, 2012). Other advantages include reduced training time and easy adoption to meet the needs of learners (Smeureanu & Isaila, 2012). The majority of time, technology is an essential resource in education (Smeureanu & Isaila, 2012). Educational technology requires teachers to have additional knowledge and skills for effective integration (Reel, 2009; Smeureanu & Isaila, 2012). Teachers must be able to identify appropriate pedagogical practices to make the resources effective for students (Smeureanu & Isaila, 2012).

Technology is a primary way for teachers to have students stay in touch and take control of their learning instead of a resource that occasionally influences student learning (Johnson, Levine, Smith, & Haywood, 2010). It also provides the students with the ability to move beyond the classroom through exploration and interaction (Johnson et al., 2010). Educational technology has been widely accepted and incorporated into teaching and learning communities across the world (Marwan & Sweeney, 2010).

Although the use of technology by modern students differs from the learning approaches used by students decades ago, long-term career teachers from this past era of education may still be using the same materials and resources, despite recent technological advances (Johnson et al., 2010). This illustrates that technology integration has been a slow moving process (Johnson et al., 2010). School leaders and educators need to adapt the learning environment to meet the needs of younger tech-savvy students (Johnson et al., 2010). School environments need to embrace and welcome these resources to ensure that students succeed beyond formal education (Johnson et al., 2010). The design and implementation of the resources must reflect the importance of innovation as it relates to professional skills (Johnson et al., 2010). Correctly using educational technologies provides new meaning and utility to widely accepted educational paradigms such as Bloom's Taxonomy and Gardner's Theory of Multiple Intelligence (Kuhn, 2008).

The tremendous growth in educational technology resources has created a vast array of instructional methods for teachers to meet the needs of students and increase learning (Kuhn, 2008), regardless of grade or content (Brown-Joseph, 2010). Learning new technology resource and instructional strategies takes time and may be an inconvenience; however when the technology is mastered, the teachers will save time and money (Loertscher, 2010). Technology will also reduce teachers' workload, and improve efficacy in job performance, having a significant effect on teacher quality and instruction (Loertscher, 2010). Technology integration needs to occur in a meaningful manner with measureable and obtainable goals (Loertscher, 2010). A teachers' sense of ownership and investment can strongly influence the success of technology integration (Marwan & Sweeney, 2010).

A national report by Gray, Thomas, Lewis, and the National Center for Education Statistics (2010) presented quantitative data from public elementary and secondary schools on educational technology availability and use. The participants were public elementary and secondary school teachers. The questionnaire was mailed to 4,133 teachers with a 64% response rate. Researchers found that 97% of teachers had one or more computers located within their classroom every day with 93% connected to the Internet. Fifty-four percent of teachers could bring in computers with 96% connected to the Internet. There was a 5.3 to 1 ratio of students to computers. Forty percent of the time students used computers often during instructional and 29% sometimes. Computers outside the classroom were used during instructional time often (29%) and sometimes (43%). Teachers reported having the following technology resources as needed or in the classroom every day: projectors (36% and 48% respectfully), interactive whiteboards (28% and 23% respectfully), student response systems (22% and 6% respectfully), document camera (22% and 17% respectfully), and digital camera (64% and 14% respectfully). Of the teachers that had access to the resources, projectors (72%), interactive whiteboards (57%), student response systems (35%), document camera (56%), and digital camera (49%) were used sometimes or often for instruction. Teachers sometimes or often used word processing software, such as Word or Pages, (96%), spreadsheets and graphing programs, such as Excel or Numbers, (61%), student record software (80%), presentation software, such as PowerPoint or Presentation, (63%), and Internet (94%) for instructional or administrative purposes. Teachers reported that PD, training provided by staff, and independent learning prepared them to better-integrated educational technology for instructional purposes (61%, 61%, and 78%, respectively).

Only 31% of the schools reported having a fulltime staff member dedicated to technology support and integration. Fulltime technology support was available 45% for secondary schools, 27% for elementary schools, 35% in low poverty concentration areas, and 27% in high poverty concentration areas. When network services crashed, 90% of the schools indicated that it took 1-8 hours for services to be restored (22% < than one hour, 68% 1-8 hours). Fifty-one percent of the schools indicated that it took 1-8 hours for software repairs and 45% reported 2-5 days for computer repairs (Gray et al., 2010).

The goal of Latio's (2009) study was to examine to what extent Ohio teachers used computers for classroom instruction, factors that predict usage, and major barriers teachers face. The study consisted of 256 teachers from 18 schools across Ohio. The survey excluded teachers that were required to use technology for their content area (i.e. computer apps teachers). The data showed about 35% of participants indicated they used computers for classroom instruction and strategies on a regular basis, with about 65% indicating they rarely or never utilize computers for classroom instruction. The data also indicated that only 12% of Ohio public school teachers had five or more computers within their classroom. Computer access within the classroom was a critical factor of technology integration.

Teachers with more computers within their rooms are more likely to integrate technology then teachers with fewer computers (Latio, 2009). Latio showed that the computer ratio, level of technology proficiency, teacher perceived computer value, and teacher attitudes are significant factors of computer usage. Resistance to change and location of computers were not significant predictors. Teachers seemed to underutilize computer labs for instruction because of tight lab schedules. Centralized computer locations were not beneficial for increasing student learning. Using computers for management, communication, and lesson planning was not a significant predictor of computer usage for classroom instruction.

Certain technologies seem to thrive inside the educational environment and others seem to thrive outside the educational environment (Halverson & Smith, 2010). Leaders find it difficult to predict which technologies will have a lasting impression on the educational environment and student learners (Halverson & Smith, 2010). Pairing technology with accountability and mandated polices reshapes the traditional learning environment (Halverson & Smith, 2010). Instead of having definitive lines between in-school and out-of-school technology, educators need to embrace technology to blur this line to enhance student education (Halverson & Smith, 2010). Educators are not in favor of increasing technology integration accountability; however, researchers believe a direct positive correlation exists between accountability and practice if accountability was enforced (Woolard, 2012)

The world is embracing technology with open arms (Loertscher, 2010). Educators must prepare students to be successful adults in this ever-changing world (Loertscher, 2010). Possessing technology skills is important because persons with more technology knowledge will advance in society (Johnson et al., 2010). The technology education students receive today will assist them as adults, regardless of the career path chosen (Pac. 2008). Nearly every job in today’s market requires the use of technology (Johnson et al., 2010; Loertscher, 2010). Educators need to embrace and utilize technology within the classroom to meet the demands of today’s society (Loertscher, 2010). Technology education will not move forward without leaders guiding new and innovative technology integration practices (Pac, 2008).

Several factors affect teachers' use of educational technology (Miranda & Russell, 2011). District-level barriers that are important for successful integration include resources, proper funding, time, leadership, shared vision and goals, and technology planning. Examples of internal factors that influence technology integration are the educators' philosophy and beliefs about education (Miranda & Russell, 2011; Niederhauser & Perkmen, 2008). Evidence also suggests a relationship between teachers' characteristics (years of teaching experience and educational background) and frequency of technology usage (Miranda & Russell, 2011). To maximize the benefits of educational technology for enhancing student learning, leaders must understand and supplement factors that increase technology usage and integration (Miranda & Russell, 2011). School leaders need to understand and embrace that teachers' perceptions of educational technology are just as important as the resources themselves (Berry, 2011). Education systems need to consider both internal and external factors when considering technology integration to enhance student learning (Miranda & Russell, 2011) because the factors can have negative effects on technology integration (Niederhauser & Perkmen, 2008; Pierce & Ball, 2009).

The U.S. Department of Education started a program called *Enhancing Education Through Technology* (EETT) to support student achievement in elementary and secondary schools using technology (Bakia, Means, Gallagher, Chen, & Jones, 2009). The program has three primary goals: (a) improve student academic achievement using educational technology, (b) have every student technology literate by 8th grade, and (c) encourage effective teacher training and integration is training and PD sessions to establish research-based instructional methods to improve student learning. From 2002 to 2008 there have been about $3.4 billion allocated to the EETT program with the program receiving about $267 million in 2008. The program's researchers found that only 27 states had defined technology standards to measure teachers' competency and skills. Of the districts with teacher technology standards, 69% of the districts reported assessing or planning on assessing teachers' performance. Only six states conduct statewide assessments to measure student technology proficiency. Twenty-five states reported that they relied on districts to assess technology proficiency.

Miranda and Russell (2011) conducted a qualitative study to examine the effects of internal and external factors on technology integration with administrators, principals, and teachers within 21 Massachusetts school districts, which encompassed three urban, five rural, and 13 suburban. The sample included 104 district level personnel, 81 principals, and 1,040 teachers. The two district level themes that emerged were awareness and accountability of technology standards and principals' judgment on technology spending. At the school level, the biggest effect on teachers' reported use of educational technology was associated with principals' reported use. The biggest predictors at the classroom level were teachers' beliefs about instructional benefits and technology experience. Principals' reported use of educational technology, teachers' view about benefits of technology, and perceived pressures to use technology by teachers were associated with district, school, and classroom level factors. The factors listed may have minimal effects on individual classrooms; however, they may have huge effects at the district level. If each classroom is affected, then when added together the district has a large problem. Resolving small problems can prevent large problems.

Enhancing Student Achievement

Using technology allows teachers to create student-centered learning environments, which fosters an effective learning/educational system (Alam, 2011). Educational technology resources have the ability to transform students from consumers to producers (Grunwald Associates LLC., 2009). Two types of technologies exist, technologies for learners and technologies for learning. Technology for learning is often student-centered and users are guided towards the goals, providing valid and reliable learning (Halverson & Smith, 2010), which provides for a richer learning experience (Parker et al., 2008). Inventors design educational technologies to maximize student participation and motivation so that any user can interact and learn with the content and peers (Halverson & Smith, 2010; Parker et al., 2008), which aligns with the constructivist learning approach (Parker et al., 2008).

Technology for learners is technology used by learners, not usually intended for educational purposes (Halverson & Smith, 2010) because the resources dictate the content teachers share with students (Parker et al., 2008). Technologies for learners usually do not provide reliable or predictable learning results (Halverson & Smith, 2010). Teachers must utilize educational technology resources that align with the learning objectives of the lesson (Parker et al., 2008). Content needs to control the technology, not the technology controlling the content.

Lowther et al. (2008) conducted a study to see how technology influences student learning. The overall goal of the Tennessee EdTech Launch was to use technology as a teaching tool to align curriculum and instruction to better prepare students for the state's academic content standards. The program addressed technology integration barriers identified through research. The overall goal of the researchers study was to reveal the degree in which the program reached the goal of removing barriers of technology integration. The quasi-experimental study consisted of 26 schools (13 control & 13 experimental) containing 12,420 students and 927 teachers.

The researchers showed that the program students did as well or better than the control students did in every instance. The program students were significantly engaged in hands-on, inquiry/research, and cooperative learning, which positively influenced student learning. The data also indicated that participant teachers had a positive attitude and self-efficacy towards technology usage and integration, which permitted a student-centered learning environment. Program schools were reflective and used student-center learning approaches more frequently than control schools, allowing for increased and higher-quality use of technology resources for learning. The researchers significantly revealed that only after three years of technology integration, great strides were made towards creating a positive social change on the school's culture and learning environment.

Lowther, Inan, Ross, and Strahl (2012) conducted a study that focused on student achievement with overall effectiveness of the Michigan Freedom to Learn (FTL) One-to-One laptop program on teaching practices and student learning. A combination of 90 public and private schools received the FTL grant funding. The schools were located in both rural and urban elementary, middle, and high schools. The study contained 380 teachers and 5,770 students. The researchers showed promising results in the areas of student-centered teaching strategies, laptop use by students, student attitudes, and motivation towards learning with laptops. Teachers implemented student-centered strategies that directly supported development of 21st century learning knowledge and skills. The program significantly increased teachers' confidence in laptop integration of state curriculum aligned lessons. Students reported that they liked using the laptops and wanted to use them again the next year because they improved their learning and study skills and made learning interesting. The researchers indicated that the FTL program served as a catalyst for innovative technology, which produced improved educational opportunities for Michigan students.

Palak & Walls (2009) conducted a mixed-methods study to investigate if teachers who frequently used technology and taught in a technology-rich environment shifted their beliefs towards student-centered instructional practices. The participants were teachers who used technology and taught in a technology-rich school. The researchers used probability sampling to select 113 participants from 28 collaborative PD schools in northern West Virginia. The researchers showed that if technology integration does not explicitly focus on student-centered pedagogy, technology integration could slip into low levels of technology usage. The data showed that using student-centered or teacher-centered approaches were not predictors of teachers' technology practices. Researchers indicated that teachers' did not use of student-centered instruction even though the teachers had technology available, had positive attitudes, had adequate support, and were comfortable using technology. The researchers concluded that teachers' attitudes were the most significant predictor of students and teachers' technology use.

Shapley et al. (2010) conducted a study that examined the relationship between Technology Immersion components, at both the students and teacher level, and student achievement. The study included 42 middle schools (Grades 6 - 8), representing 21 control groups, and 21 experimental groups from Technology Immersion schools. The schools were from rural, suburban, and urban Texas. The researchers indicated that immersed teachers grew in technology proficiency, integration, and beliefs about the value of technology for increasing student learning. When teachers worked with colleagues who embraced technology, collaborated, received instructional support, and if they believed parents and community members were supportive higher technology immersion occurs.

The purpose of the study conducted by Downes and Bishop (2012) was to investigate middle grades students' engagement in a student-centered and technology rich learning environment. The study focused on three middle grades schools in Vermont. Three main strategies promoted a student-centered technology rich environment: (a) increased student access to technology through one-to-one computer laptops, (b) provided PD, and (c) partner with students to understand student needs and interests by using Google forms and interviews.

The researchers found that adolescent learners valued a learning environment that encouraged collaboration because the students appreciated and enjoyed sharing assignments with their classmates (Downes & Bishop, 2012). The teachers also valued this instructional strategy because of the high level of student engagement. The students indicated that they enjoyed using technology because it made tasks more efficient, made multitasking easier, and increased organization. Teachers found that students were less likely to lose/misplace assignments and the turn-in rate increased when assignments were computer generated. The students indicated that they were the most engaged when technology resources were being used for construction and expression.

Technology will not single handily improve student achievement, regardless of the technology resource (Brunk, 2008). Improperly implementing technology usually causes failures to improve student learning, not the technology itself (Brunk, 2008). Many educators believe that a shift towards a learner-centered model would allow for deeper and longer lasting learning across disciplines because students encounter real life learning experiences (Johnson et al., 2010).

Teachers who have learner-center classrooms pay special attention to students' skills, knowledge, and attitudes while holding students to high expectations. Teachers also account for student uniqueness by making instruction and support personalized and relevant (An & Reigeluth, 2011). Student-centered teachers assume that every student wants to learn; therefore, teachers cultivate social, emotional, and intellectual growth (An & Reigeluth, 2011). Teachers also use self-reflection as a way to promote student growth (An & Reigeluth, 2011).

Teachers serve as facilitators and transmitters of knowledge by increasing responsibility, participation, and peer collaboration when utilizing student-centered instruction (An & Reigeluth, 2011; James, 2009). Providing students with authentic experiences can help develop communication, collaboration, critical thinking, and decision-making skills by having students apply knowledge rather than just recall information (An & Reigeluth, 2011). Assessing learner-centered students individually provides genuine feedback on growth and progress (An & Reigeluth, 2011). In order for learner-centered learning to occur teachers, administrators, parents, community members and students must support each other (An & Reigeluth, 2011).

New technologies create new learning opportunities, which allow individuals to pursue learning on their own (Collins & Halverson, 2010). Using technology in a transformative way allows students to solve complex problems not possible with traditional resources (Parker et al., 2008). This style of learning will help students' master relevant skills that will be useful throughout life (Ottenbreit-Leftwich et al., 2010).

The American society needs people capable to solve ever-increasing complex problems and construct decisions in the wake of uncertain and troubling times (An & Reigeluth, 2011). The factory model of the past is not an efficient or effective way to produce problem-solvers because it does not take into account the various needs to individual students (An & Reigeluth, 2011). The learner-centered model is an effective learning model because it allows students to develop skills and knowledge of collaboration, higher-order thinking, application, and problem solving (An & Reigeluth, 2011). Problem-based instruction, project-based learning, and constructivist learning models are similar instructional methods to student-centered learning (Wang, Myers, & Yanes, 2010), with technology playing a crucial role, but not a require component (Park & Ertmer, 2008). Adding components of authenticity, application, and relevance to students' work enhances the learning experience (Park & Ertmer, 2008).

Researchers continue to investigate the effectiveness of problem-based instruction, project-based learning, and constructivist models (An & Reigeluth, 2011). Learner-center models revolve around the principles of meta-cognition, affective, personal and social development, and individual differences while focusing on learning and the learner (An & Reigeluth, 2011). The two most important pieces in creating a student-centered technology rich learning environment are willing and enthusiastic teachers and school leaders completely committed to finding funds, allocating time, and providing PD (Downes & Bishop, 2012).

Many teachers are still not comfortable with student-centered teaching strategies that utilize technology; despite the benefits research has presented (Brunk, 2008; Groff & Mouza, 2008) and the push by schools and government agencies (Groff & Mouza, 2008). Most teachers realize that implementing a student-centered technology-rich learning environment requires them to take risks (Downes & Bishop, 2012). Teachers were willing to take risks when the school culture was built on trust and collaboration (Downes & Bishop, 2012).

Information and communications technology (ICT) have transformed and will continue to transform the learning environment because ICT is universal, adaptive, creates new possibilities and directions, and provides teachers with the ability to make teaching meaningful and rewarding (Hutchison & Reinking, 2011; Levin, & Wadmany, 2008). Students must be able to use ICT resources effectively because students are growing up in a digital age (Selwyn & Husen, 2010). Although students have knowledge of ICT resources, they have minimal knowledge on how to utilize the resources for learning (Ertmer & Ottenbreit-Leftwich, 2010). As computer technology and support becomes increasingly stable, administrators need to focus on increasing ICT opportunities to enhance the learning environment (Kirkscey, 2012). It has been found that students who have acquired ICT skills are better at utilizing higher-ordered thinking skills, improving academic performance (Levin, & Wadmany, 2008; Panigrahi, 2011).

Often times ICT is used only with traditional practices, which focus on computer skills, management, and organization rather than integrating learning through inquiry and collaboration and assessments (Levin, & Wadmany, 2008) because integration of ICT resources is not a straightforward matter and requires the organization to have a solid conceptualized and defined framework established (Alam, 2011). To learn how to use ICT effectively in classrooms, attention must be given to teachers and their perceptions of the culture and the profession (Levin, & Wadmany, 2008). Teachers are obligated to understand how ICT resources will translate into innovative classroom practices before adopting resources (Ertmer & Ottenbreit-Leftwich, 2010). The teachers must utilize technology in such a way that facilitates student-centered instruction (Ertmer & Ottenbreit-Leftwich, 2010). Schools need to support, teach, and assess educators on ICT (Panigrahi, 2011).

Wang et al. (2010) indicated that student-centered learning methods are better than traditional learning methods because traditional methods are limited in their ability to provide students with instant visual feedback. Instant visual feedback can increase student performance and students' sense of responsibility to learn the content (Wang et al., 2010). Students and teachers need training on how ICT tools and resources can foster learning (Alam, 2011). When teachers are trying to implement a technology-based project, they encounter barriers such as lack of resources, pressure, insufficient support, poor teacher and student beliefs/attitudes, and problems with the resources (Groff & Mouza, 2008). Educators reported that traditional learning methods have a place in a 21st century learning environment, especially when technology was not present or not functioning properly (Walker, 2010).

Teachers' Perceptions and Use of Technology

Educators of the 21st century act and think differently from previous century educators because of the radically different tools available (Ertmer & Ottenbreit-Leftwich, 2010; James, 2009). Many educators believe that students need to develop critical thinking, application, and problem solving skills to be effective 21st century students and that technology integration has the potential to change the learning environment to enhance teaching and learning to promote these skills (James, 2009; Shapley et al., 2010). Teachers play a crucial role in implementing educational technology innovations that link curriculum and assessments, hence the importance of gaining teachers' perceptions (Reigeluth, 2010; Vanderlinde & van Braak, 2011). Prior researchers indicated that teachers often use technology for preparation, administration, and management purposes even when teachers are comfortable using technology for teaching in a technology-rich environment (Palak & Walls, 2009).

A study conducted by Gorder (2008) of 174 K-12 teachers from South Dakota who attended the Advanced Technology for Teaching and Learning Academy found that teachers were effective at using technology for delivering instruction and professional productivity, but struggled utilizing technology for students. Teachers may be using web resources only to gain students' attention simply because teachers do not understand how to implement technology to facilitate student development (Lee & Tsai, 2010). This indicates that teachers lack an understanding of Technological Pedagogical Content Knowledge -Web (TPCK-W), an extension of Pedagogical Content Knowledge (PCK) (Lee & Tsai, 2010). The TPCK learning framework shows that integrating educational technology resources requires more than just technical skills because an important link exists between technology, pedagogy, and content (An, & Reigeluth, 2011; Pierce & Ball, 2009). When teachers apply TPCK to teaching and learning environments, teachers are attempting to find a perfect balance between technology, content, and pedagogy (Lee & Spires, 2009).

A 2009 online survey was conducted by an independent research and consulting firm, Grunwald Associates LLC, of 1,418 fulltime classroom teachers from around the country. The participants represented urban, suburban, and rural districts. Seventy-six percent of the K-12 teachers indicated using digital media in their classrooms, which was up seven percent from the previous year. Of this 76%, 44% indicated using digital media in the classroom twice or more a week and 20% used digital media once a month or less. Only 33% of pre-K teachers indicated using digital media and 42% of the teachers used digital media twice or more a week and 22% used digital media once a month or less. Ninety-three percent of K-12 teachers reported having computers with Internet access within their school and 81% reported having computer and Internet access within their classroom, a sharp contrast to pre-K teachers at 36%. Twenty-nine percent of K-12 teachers reported using social networking/media sites for classroom instruction. The students indicated they preferred to learn utilizing digital media to other types of instructional methods.

Researchers also suggested that K-12 teachers displayed positive attitudes towards technology use in teaching and learning because technology helped students learn and enabled students to complete complex tasks effectively (An & Reigeluth, 2011). Teachers believed that their attitudes were not barriers for creating a learner-centered learning environment (An & Reigeluth, 2011). A study conducted by Lee and

Tsai (2010) revealed that teachers with varying years of teaching experience embraced web-based instructions; but older teachers tended to have lower self-efficacy about implementation. A teachers' level of anxiety can also determine the success of technology and pedagogical innovations (Lee & Tsai, 2010). The evidence suggested a positive correlation between self-efficacy and positive attitudes towards web-based learning (Lee & Tsai, 2010). Teachers who utilized educational technology believed that it not only benefited them, but technology also benefited students, causing teachers to use resources in a thoughtful and intentional manner for instructional strategies (Grunwald Associates LLC., 2009).

Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer (2010) conducted research on eight award-winning teachers from Michigan. The researchers showed that teachers used technology to facilitate a variety of classroom operations and that technology was an effective method to communicate with parents. Teachers felt that technology was a valuable resource for improved communication, regardless of the method teachers used the resources as communication tools. Teachers indicated that technology increased and enhanced parental communication. The eight teachers believed that technology could support and address PD needs by providing learning opportunities and collaboration.

The teachers of the study were motivated to integrate technology because of their strong belief that technology resources help students learn and better prepare them for future application endeavors (Ottenbreit-Leftwich et al., 2010). In addition to helping students learn, teachers reported that using technology resources increased student motivation and engagement of the learning process, making it easier for teachers to engage students in complex problem solving activities. Teachers' beliefs to integrate educational technology primarily stemmed from the teachers wanting to become better professionals, which ultimately influences student learning.

Despite the numerous advantages of educational technology, teachers who are not proficient or unfamiliar with the uses of modern educational technology are still resistant to change because technology creates a sense of inadequacy and intimidation (Loertscher, 2010). Educational technology can provide students with learning experiences that are robust and relevant (Loertscher, 2010). Even if teachers have an abundant amount of technology resources available, if they are not effectively integrated, student achievement will be negligible (Shapley et al., 2010).

Researchers have indicated that when teachers believe technology resources are valuable, teachers are likely to integrate technology into instructional practices (Hutchison & Reinking, 2011; Ottenbreit-Leftwich et al, 2010) and work relentlessly to resolve integration conflicts or barriers because they believe they are capable of using technology (Hutchison & Reinking, 2011). In general, teachers with high-levels of technology implementation, apply student-centered or constructivist learning philosophies (An & Reigeluth, 2011). Teachers may choose to use educational technology because they believe that using educational technology is the norm (Parker et al., 2008). Teachers can have a student-centered philosophy and actually practice a teacher-centered philosophy (An & Reigeluth, 2011).

Wright and Wilson (2011) conducted a study with 10 teachers following the teachers' certification and the completion of teacher education programs. The participants were from a southern United States middle and high school. The researchers indicated that participants continued to be familiar with current educational technology resources and basic ways to implement the resource even after completing education programs and PD. Three themes emerged when teachers moved beyond the basic level and used resources for student-center learning. The three themes that emerged were (a) participants continued to seek PD, (b) teachers felt compelled to use technology for the students, and (c) teachers felt supported by school and community members. Teachers who experimented with new technologies did so because they knew the new technologies had the potential to deepen student learning, provide support, and increase motivation.

Four major factors have a direct and significant influence on teachers' using technology for teaching and learning are beliefs towards technology and pedagogy, attitudes, knowledge and skills, and time and workload (Marwan, & Sweeney, 2010). A Michigan study with a one-to-one laptop initiative found that teachers' beliefs and attitudes significantly increased, from this initiative, in regards to the effect of computers on instruction and learning, perceived readiness for integration, and perception of available technical support (Lowther et al., 2012).

Often times teachers use technology aligned with their own beliefs; however, technology integration is not always considered best practices (Ottenbreit-Leftwich et al., 2010) because teachers might not have a clear understanding of the significance of TPCK (Lee & Tsai, 2010). Teachers are having a positive outlook on usage, acceptance, and attitudes towards educational technologies such as digital media and social networking (Grunwald Associates LLC., 2009). Teachers also use technology to motivate, engage, increase comprehension and high-order thinking, and to increase technology skills for future applications (Ottenbreit-Leftwich et al., 2010).

Technology Integration

Teacher characteristics, access, and support are critical factors in effective integration (Inan, & Lowther, 2010). Inan and Lowther explained that there were insufficient data supporting that access to technology increases student performance or quality of instruction. Teachers not receiving proper training is one explanation why technology is not increasing performance or quality of instruction (Inan & Lowther, 2010). Simply using technology does not ensure effective integration; teachers still need to make reflexive and informed decisions when implementing educational technology (Parker et al., 2008).

A long-standing notion in education is that implementing a new educational technology will transform the classroom and student learning (Groff & Mouza, 2008). Even though students have access and readily use 21st century technologies outside school, educators and schools have been slow to embrace technology for instructional purposes to enhance student learning (Downes & Bishop, 2012). The complex and challenging task of effectively integrating classroom technology may be evident by the slow integration process in K-12 schools (Forthe, 2012; Groff & Mouza, 2008).

Technology integration researchers have focused on knowledge, self-efficacy, pedagogical beliefs and culture, which needs to be considered for successfully influencing teachers to make a long-term change (Ertmer & Ottenbreit-Leftwich, 2010). Effective technology integration has many factors; however, the most important factor is teachers' competency and ability to meet student needs (Gorder, 2008). Teachers need to understand how and why using educational technology achieves meaningful learning (Gorder, 2008). Two themes that serve as the driving force behind technology integration within K-12 schools: preparing students for the 21st century and increasing student knowledge and ability (Lowther et al., 2008). A teacher's primary goal is to ensure that students are college and career ready. Researchers should focus on how to use technology scientifically and reflectively to produce teachers that are effective at making students college and career ready (Ross et al., 2010).

Society expects that professionals, in their given field, use the latest and most advanced technology resources available when providing services (Ertmer & Ottenbreit-Leftwich, 2010). Rarely are teachers held to this same standard when teaching students (Ertmer & Ottenbreit-Leftwich, 2010). The most common classroom uses of educational technology are low-level tasks and direct instruction, instead of student-centered learning experiences such as problem-based learning and independent inquiry (Berry, 2011; Lowther et al., 2012). Often, educators use technology for low-level learning experiences because they were either not comfortable or had no experience using resources to engage students in higher levels of learning (Berry, 2011). Administrators need to push and encourage staff members to utilize technology or teachers will continue to neglect educational technology and utilize current instructional practices (Pac, 2008). Technology cannot transform the learning environment if resources are unavailable, limited, or unreliable (Wachira & Keengwe, 2011).

Teachers can no longer believe they are doing an effective job if they do not use technology resources, as teachers 20 years ago could do (Ertmer & Ottenbreit-Leftwich, 2010). Educators reach a major milestone when their mindsets have changed to include the idea that effective teaching does not occur without technology integration (Ertmer & Ottenbreit-Leftwich, 2010). The definition of a high-quality teacher needs to be redefined and expanded to include ICT tools and usage and a change in beliefs, knowledge, and culture as part of the new standard (Ertmer & Ottenbreit-Leftwich, 2010).

Just because teachers know how to use technology's software and hardware, one cannot assume they know how to integrate the resources for student learning (Ertmer & Ottenbreit-Leftwich, 2010). If teachers are to integrate technology with confidence, appropriate training and support needs to occur (Polly & Hannafin, 2010; Wachira & Keengwe, 2011). The principal is a key figure in determining successful and effective technology integration (Shapley et al., 2010). Parents and community members can play an important role in helping teachers integrate technology as long as open lines of communication are established (Shapley et al., 2010). Teachers' beliefs about computer technology affects teachers' integration practices (James, 2009).

Teachers generally teach the same way they were taught (Wachira & Keengwe, 2011). Implementing technology into everyday practices poses unique challenges for certain educators; hence PD needs to be content and grade specific (Wachira & Keengwe, 2011). Central to any discussion of technology integration is teacher change. Asking teachers to learn and implement technology is like asking teachers to hit a high-speed moving target because technology is in a constant state of transformation (Ertmer & Ottenbreit-Leftwich, 2010). When technology resources are just starting to be understood, another innovative tool finds its way into the classroom (Kuhn, 2008). The complexity of technology integration makes it difficult for educators to stay current and continue the change process (Hsu & Sharma, 2008). If teachers do not anticipate technology change, they will not be able to achieve the desired outcomes because of internal or external barriers, which will likely cause them to stop or never start implementing educational technology resources (Ertmer & Ottenbreit-Leftwich, 2010).

Traditionally, technology innovations have been add-ons to traditional instruction (James, 2009; ODE, n.d.). Teaching with educational technology is not simply just adding technology resources to currently existing practices and expecting to see a change (Wachira & Keengwe, 2011). Full integration involves development and understanding (Wachira & Keengwe, 2011). Teachers need be included in the conversations and decision-making processes of technology integration because they are at the forefront of educational reform (Wachira & Keengwe, 2011). Because of budget cuts and a weak economy, districts are often turning to large-scale one-size-fits-all teacher PD, which resolves larger issues effectively (Woolard, 2012). This concept of one-size-fits-all is inappropriate with educational technology integration because teachers use and implement technology in a variety of ways (Forthe, 2012; Levin & Wadmany, 2008) and this approach leaves personalized issues unattended (Woolard, 2012). There needs to be a balance between technology and school reforms to maximize results.

Teacher education agencies, national professional organizations, and federal agencies have expressed the need for teacher training in technology integration (Wachira & Keengwe, 2011). “Technology integration means incorporating technology and technology-based practices into all aspects of teaching and learning specifically, incorporating appropriate technology in objectives, lessons, and assessment of learning outcomes” (Wachira & Keengwe, 2011, p. 17). Technology resources allow students to perform powerful capabilities such as computation, construction, and visual representations, which provides the ability to extend student thinking (Wachira & Keengwe, 2011).

Beliefs, context, subject, and school culture directly influenced teachers' technology integration. Possessing relevant information, confidence, and beliefs is sufficient for full classroom technology integration (Ertmer & Ottenbreit-Leftwich, 2010). Culture and peer pressure can have a positive effect on teachers' technology integration (Ertmer & Ottenbreit-Leftwich, 2010). Another factor that influences classroom technology integration is school size (Wu, Hsu, & Hwang, 2008). Researchers indicated that teachers' beliefs of classroom technology integration has become an integral aspect of effective teaching and learning because students are able to learn more and school learning can be expanded to the global environment (Almekhlafi & Almeqdadi, 2010).

State departments of education have established standards for teachers to follow when using educational technology (Wright & Wilson, 2011), which focuses on relevant and meaningful tasks, higher-ordered thinking, and technology integration (Polly & Hannafin, 2010). The departments promote that technology integration is a method used to enhance teaching and learning within the school environment (Wright & Wilson, 2011). Most school districts do not have technology standards, and if standards are present, measuring teachers' proficiency is not systematic against the standards (Hannafin, 2008).

Teachers need to possess specific knowledge and skills to utilize technology within the classroom (Hsu, 2010). Technology integration is more than just using computer and resources; teachers must know how to understand and use technology within their content area (Hsu, 2010). When teachers have a better understanding and higher competence of technology, the chances of effective and frequent integration dramatically increases (Hsu, 2010). Teachers who have the ability to integrate technology may not be able to integrate technology resources because of uncontrollable barriers such as nonfunctioning equipment, lack of appropriate software, student abilities, and curriculum (Hsu, 2010). Schools and educators need to be making an increased effort to integration technology into the curriculum (Reel, 2009). The challenge for classroom technology integration lies in behavior, investments, and commitment by individual teachers (Keengwe et al., 2008).

Hsu (2010) explained that ability and usage are two different entities; therefore, researchers must study them separately when examining teachers' technology integration proficiency (Hsu, 2010). Ability refers to how capable, knowledgeable, or skilled a person is at doing specific tasks. Usage refers to how much or how frequently one is performing specific tasks (Hsu, 2010).

Gorder (2008) conducted a study of 174 K-12 teachers from South Dakota to investigate the association between teachers' who were trained to use and integrate technology and the perceived learning that was created within the classroom. The researcher also showed a difference in integration perceptions based on characteristics, except for grade level because 9-12 teachers tend to integrate and use more technology. Teachers across different grade levels tended to integrate resources differently. Regardless of the resources used, technology integration needed to occur within the context of the classroom through practice, reflection, and collaboration (Gorder, 2008).

Factors relating to the implementation process, that are considered significant to technology integration, are strategic planning, creating a sense of ownership, available and working resources, and PD (Marwan & Sweeney, 2010). Organizational factors that influence integration are leadership, culture, and external influences (Marwan & Sweeney, 2010). Of those three factors, leadership is the major component for effective technology integration (Marwan & Sweeney, 2010). The level of persistence in technology integration is dependent on the amount and quality of support received. The more quality support received, the more persistent teachers will be in technology integration (Marwan & Sweeney, 2010). Teachers may resist technology integration because technology integration takes time away from other duties or activities that they perceive to be more important (Keengwe et al., 2008).

Many schools primarily focus is on technology acquisition instead of a creating a shared vision, providing feedback and expectations, and performance when implementing technology-enhanced programs (Park & Ertmer, 2008). Technology implementation is more effective if stakeholders create shared vision through communication and collaboration, which details teacher expectations (Forthe, 2012; Glazer & Hannafin, 2008; Park & Ertmer, 2008; Project Tomorrow, 2012). Teachers should and need to understand the purpose of an innovation or program before administrators ask teachers to embrace significant changes to their educational practices (Park & Ertmer, 2008). If the new technology does not fit teachers' current educational practices, they need to revamp instructional practices to accommodate the technology (Wu et al., 2008).

One way to help develop, implement, and carryout a shared vision is by utilizing a leadership team. When developing a leadership team, it is important to seek a leader who has a vision, is committed to technology integration, and is willing to collaborate with others about ideas and beliefs (Hsu & Sharma, 2008). A leadership team should consist of key personnel such as department chairs, teachers, faculty, and administrators (Hsu & Sharma, 2008). Leaders should have a strong knowledge and expertise in technology integration and identify and establish relationships with human and financial resources in order for change to occur (Hsu & Sharma, 2008). The leadership team will become a powerful force for technology integration when the team works collaboratively with the members' expertise (Hsu & Sharma, 2008). Teacher collaboration, inquiry, self-reflection, reflective dialogue, and shared vision and goals should shape the progression of the group (Hsu & Sharma, 2008).

A national survey collected data from over 940 science and mathematics teachers from 82 junior high schools in Taiwan (Wu et al., 2008). Researchers indicate that smaller schools provided a better environment for supporting teachers with technology integration. School size did not affect teachers' perceptions of school resources, but did affect attitudes towards technology integration. Teachers in high academic schools might be discouraged from technology integration because teachers felt pressured to cover the material found on high-stakes tests. High academic schools generally are larger schools that attracted students because of the reputation to produce high scores on entrance exams. The researchers also found that technology integration positively correlated with teachers' attitudes and beliefs. The researchers also indicated that teachers needed proper and adequate resources and support for effective technology integration to occur within the classroom.

Lu and Overbaugh (2009) found conflicting results when research was conducted with 177 K-12 in-service teachers from mid- and southeastern Virginia. The teachers took at least one educational technology integration PD courses funded and supported by the NCLB-EETT grant. When looking at school location, the data showed that suburban schools were the best at technology integration (Lu & Overbaugh, 2009). Urban schools struggled with the amount of time required to resolve technical issues and the lack of PD (Lu & Overbaugh, 2009). Rural schools struggled with the amount of time required to resolve technical issues and resource access (Lu & Overbaugh, 2009). The data showed that middle school and high school classrooms contained slightly higher technology integration; however, the difference was not statistically significant (Lu & Overbaugh, 2009). Administrative support and increased time to learn the resources for implementation were the same across all three settings.

Hsu (2010) conducted a study to determine the relationship between teachers' technology integration ability and usage. The study included 3,729 Taiwanese teachers ranging from Grades 1-9 from 334 schools and from all 23 cities and counties in Taiwan. There was a moderate positive correlation between ability and usage (Hsu, 2010). Hsu indicated that generally teachers who used more technology were better at technology integration and therefore, had higher technology usage (Hsu, 2010). Hsu (2010) noted that this correlation could be applied to multiple grade levels and subject areas.

Inan and Lowther (2010) conducted a study on 1,382 Tennessee teachers from 54 public schools using the *Teacher Technology Questionnaire* instrument to see what effects teacher and environmental characteristics play in technology integration. The researchers found teachers' characteristics and perceptions influenced technology integration; however, readiness had the largest affect (Inan & Lowther, 2010). Researchers indicated that age did not directly influence technology. Age made a difference when paired with competence, readiness, and beliefs (Inan & Lowther, 2010). Older teachers were not as likely to integrate technology resources. The researchers indicated that the school environment played a crucial role in technology integration, specifically in support (Inan & Lowther, 2010). Computer proficiency indirectly effects technology integration and directly effects readiness and belief, which in return effects integration (Inan & Lowther, 2010).

Inan and Lowther (2010) found that teacher readiness strongly influenced technology integration because teachers who were willing, ready, and confident to integrate a new resource would do so and would see an improvement in student achievement and learning. The researchers found that effectively integrating technology was a complex task influenced by teacher characteristics, self-efficacy, and beliefs about the school environment (Inan & Lowther, 2010). Overall teacher support played the biggest role in teachers' belief.

A comprehensive technology audit was conducted with a middle class school in a mid-Atlantic state with the goal of evaluating technology usage and integration, identify strengths and weaknesses, and provide future recommendations (Hannafin, 2008). Data were collected using focus groups from seven groups of elementary teachers, 10 groups of middle school teachers, 12 groups of high school teachers, six groups of elementary principals, five groups of middle and high school assistant principals, 10 groups of information technology staff members, and five groups of Academic Services staff members.

The traditional thinking for stakeholders was if teachers have technology, then integration would follow (Hannafin, 2008). This philosophy is partially true because if teachers do not have technology, integration cannot occur (Hannafin, 2008). Just because teachers have technology does not necessarily ensure integration (Hannafin, 2008). Each administrator seemed to have developed their own definition and vision of technology integration, which was poorly communicated to the staff members (Hannafin, 2008).

Over half of the teachers were unaware there was a district technology vision and plan (Hannafin, 2008). Ninety-five percent of teachers and administrations believed that effective technology integration was capable of improving student performance. Sixty percent of the teachers indicated that high-stakes testing discouraged creative teaching with technology because teachers felt as if they could not try new teaching strategies. Even though an overwhelming numbers of teachers had positive beliefs and feelings about the benefits of educational technology, only 56% utilized technology.

The teachers were enthusiastic about how technologies had the ability to increase motivation, improve instructional opportunities (Hannafin, 2008), and increase discussions and creativity (Grunwald Associates LLC., 2009). The interviews discovered friction between the information technology (IT) department and the educators. The educators felt that the IT department was too direct, often felt intimidated, and did not have permission to complete certain technology tasks, which caused educators to stop asking questions (Hannafin, 2008).

Access to computers was a major obstacle for teachers because sometimes there was only one per classroom and it may be too slow for effective instruction (Hannafin, 2008). The audit indicated barriers such as access and availability to hardware and software, lack of time and support, and a lack of collective vision prevented teachers from effective technology integration, which were similar barriers that past researchers discovered. The greatest barrier discovered by the audit was the district's lack of vision to for growth, innovation, and risk tasking among educators. The researchers believed that the root of the problems were because of the lack of vision and leadership, which could be contributed to a lack of understanding and low priority. The lack of vision and the strained relationship between IT members and staff are not easily detectable and not problems administrators are likely to proclaim publicly as a reason for the lack of technology integration.

The lack of vision or leadership is not the only problem teachers face when integrating technology. In 2008, Pac conducted a phenomenological study to investigate factors that influence technology during instructional time. There were 1,049 participants from two Hartford County, Connecticut school districts, ranging from pre-K-12 educators and administrators. Pac found that 90% of high school teachers felt strongly about technology integration and that technologies had a place within the classroom. Availability and access seemed to be more of an issue with upper grade level teachers than lower grade level teachers. Pac also found that elementary teachers were comfortable with their own technology skills, but were reluctant because of time or lack of background knowledge on the integration process. Eighty percent of the educators indicated they had little to no experience using technology to enhance student learning. Of those 80%, 91% felt that using technology would be beneficial, but a lack of confidence prevented integration.

Another predictor of technology integration is how a teacher defines educational technology integration. James (2009) conducted research with 37 teachers from three schools districts to investigate middle school teachers' understanding and knowledge of educational technology integration. The data showed that teachers' level of technology integration influences their definition of technology. Teachers who integrated technology defined technology integration in terms of constructivist instructional practices and establishing relationships that would offer them to access and use technology, which was another way they overcame technology barriers. James showed that approaches by teachers who integrated the use of advanced technology comprised negotiated computer time, shared personal technology and resources, self-education about how to repair nonfunctional technological systems, attendance of workshops and conferences, and shared information with administrators and colleagues.

Teachers who integrated technology indicated that students benefited from technology. Technology integration benefited students with constructivist opportunities, which encouraged higher-ordered thinking. The teachers also thought that technology would fit the methods of teaching the curriculum. Teachers who did and did not integrate technology indicated environmental barriers of lack of computer access, training, support, and time.

Nontechnology using teachers felt that student learning did not benefit from using technology; rather they used technology resources because the resources were required or because they provided entertainment (James, 2009). Teachers were uncertain on how to integrate technology into the curriculum. Teachers' not integrating technology had traditional learning style approaches or if they were utilizing technology, it was for low-level practices. Teaching style beliefs played a role in integrating and nonintegrating teachers. Non-technology integration teachers did not complete classes beyond those required, did not explore with colleagues, did not seek support from nonpedagogic staff, did not ask for additional technology-related resources, and were primarily interested in their curriculum goal and classroom management.

Even if teachers are integrating technology, integration can occur in an ineffective manner or for only administrative purposes. Hutchinson conducted a study with 1,442 literacy teachers from across the nation to investigate the role ICTs play in literacy instruction and to determine beliefs that impede successful technology integration (2009). Members of the International Reading Association received the survey. Hutchinson showed that participants used ICT for planning and delivering instruction (71%) more than students were assigned (55%) to use ICTs. Both percentages were based on once or more a week. Students' most common application of ICTs was information location, reference sites, and playing games. Ninety-three percent of teachers reported they were somewhat to moderately skilled using ICTs. Teachers did not integrate ICTs into instruction effectively, which may indicate that teachers had incomplete definitions of ICTs because teachers were not using ICTs in a meaningful way. Teachers may also have a shallow view of what 21st century learning entails with skills, strategies, and dispositions.

Hutchinson (2009) also showed that replacing existing print-based activities instead of transforming student learning for higher learning was the common use for ICTs (Hutchison, 2009). Teachers need to create room in their educational practices not only for new educational technology resources, but also for new instructional ways of learning and teaching. The researcher indicated that teachers' willingness and desire to learn and seek assistance might be more important than a teachers' background.

ICT integration increases with perceived skills, perceived benefits to students, and a teacher's stance towards technology (Hutchison, 2009). Teachers with one to five years of teaching experience reported using less ICT integration then teachers with more years of experience. This may be because new teachers were overwhelmed learning new curriculums and settling into the teaching profession. The percentage of teachers reporting the importance of ICTs was always higher than the real percentage of ICT integration. The smallest gap of this percentage was in playing games, gathering information, and using reference cites. The largest gap existed in higher-level ICT applications such as student collaboration and publishing information.

Teachers from different generations can naturally have different abilities, knowledge, and skills of educational technologies. Martin's (2011) qualitative study indicated differences and similarities between Digital Natives and Digital Immigrants. Martin's study examined educational technology practices of Digital Natives and Digital Immigrants and technology integration within Situated Learning. The participants, six from each group, were full time K-12 teachers in core areas with five or less years of teaching experience. Three key themes emerged (a) Digital Natives and Digital Immigrants had more technology integration similarities than differences, (b) access and times were factors that influenced technology integration, and (c) Situated Learning was a significant part of technology integration.

Digital Immigrants were more familiar with technology resources than the Digital Natives were and had similar years of technology experience before entering the classroom (Martin, 2011). Prior work experience is important when discussing a possible divide between Digital Natives and Digital Immigrants. Martin's study confirmed other researchers' findings that there was no significant ICT difference between the two groups. Both groups indicated they learned through experimentation, situated experiences, and collaboration with peers and mentors. Both groups also had limited access and exposure to everyday classrooms technologies and did not receive instruction on integrating educational technology effectively. The amount and types of technology used was similar between the two groups. The responses ranged from never to once per week.

Family and friends are likely to influence teachers to integrate technology (Martin 2011). Digital Immigrants rated the two groups higher than the Digital Natives did because certain Digital Immigrants expressed reliance on their children to assist and support with new technologies. Conversely, in-district PD and colleagues had the most influence on teacher integration. Teachers mentioned that they were more comfortable with colleagues as facilitators and mentors than outside personnel. In-district PD was more effective for teachers when teachers were able to select activities directly related to their needs because learning became relevant. Perhaps most importantly, Digital Immigrants were able to become technology experts, in the eyes of their peers and colleagues, and were able to share their knowledge and skills with others (Martin, 2011).

Perceptions of what effective technology integration looks like were similar in both groups (Martin, 2011). The data indicated there was minimal evidence that supports the theory that there was a divide between Digital Natives and Digital Immigrants when it comes to background exposure to technology. Both groups of teachers were looking for access to technology that was located within their classroom, not another location, which can affect their sense of being an effective integrator. Researchers felt that if the teachers went out of their way to obtain technology resources, then the resources were not accessible. Both groups thought they would be able to teach with technology and expressed interest in having access to additional technology resources especially if additional time was available to explore and learn the resources. Most teachers indicated that they needed additional time to learn, practice, experiment, integrate, and self-teach with the resources.

Technology proficiency among staff increased significantly slower in schools with higher concentrations of student poverty (Gray et al., 2010; Shapley et al., 2010). Schools with high demographics of poverty are the schools that desperately need educational technology resources; however, high poverty schools are often provided the least amount of resources (Brunk, 2008). The use of educational technology is different in poverty concentration areas. Researchers found that schools with low poverty concentration versus high poverty concentration areas agreed that teachers are adequately trained in use (74% vs. 62%), adequately trained in classroom integration (67% vs. 56%), adequate technical support (74% vs. 60%), and educational technology funding is spent appropriately (79% vs. 69%) (Gray, Thomas, & Lewis, 2010). Nonpoor students attending schools with high concentrations of poverty tend to fail behind more than poor students who attend schools with low-levels of poverty concentrations (Brunk, 2008).

Most states and higher institutions do not require any formal training of understanding or implementation of educational technology for teachers (Schrum, Galizio, & Ledesma, 2011). Teachers are not likely to be prepared to implement educational technology within the school environment (Schrum et al., 2011). Technology training usually comes when preparing for licensure or through PD (Schrum et al., 2011). The federal program, Preparing Tomorrow's Teachers to Use Technology has provided vast amounts of funding to ensure that teacher candidates are prepared to use classroom technology (Schrum et al., 2011).

Since computers started showing up in the educational setting more than 30 years ago, technology integration has been a slow and rocky process (Lu & Overbaugh, 2009). Concerns exist about the quality of research conducted on educational technology (Ross et al., 2010). When requiring teachers to integrate new resources, they will need additional time and/or PD training, and support to ensure effective integration within the learning environment (Hutchison, 2009).

Establishing and maintaining a comprehensive infrastructure, after technology integration, is crucial to ensure a rich and continued integration process (Forthe, 2012; USDE, 2010). The infrastructure needs to contain people, learning and technical resources, processes and polices, sustainable models, and management systems and tools that advocate for educational technology (USDE, 2010). Regardless, when teachers are implementing educational technology, teachers expect to receive a positive return for their investments of time, effort, and resources (Parker et al., 2008; Wachira & Keengwe, 2011). Successful technology integration takes leadership collaboration, and investments at all levels of the educational system (USDE, 2010). If done correctly, technology will become "invisible" to the classroom setting because it will be a natural part of the classroom, just like desks, pencil sharpeners and whiteboards (Schrum et al., 2011).

Technology Integration Barriers

There is a large amount of information written about educational technology integration in K-12 schools over the past several decades (Hannafin, 2008). Proper and effective technology integration into K-12 curriculum has been one of biggest problems for educators (Hannafin, 2008). Schools in the United States invest heavily in technology, often without a clear understanding of what changes need to occur, what changes will occur, or how the changes will be detected and measured (Hannafin, 2008). When it comes to integrating technology in classrooms, teachers must overcome barriers for the resources to be effective (An & Reigeluth, 2011). A positive correlation exists between the complexity of technology integration and barriers teachers face (Hsu & Sharma, 2008). Simply put, districts are unaware of the technology barriers, much less how to address the barriers when they arise (Hannafin, 2008).

NCLB has hindered technology integration because teachers tend to focus on high-stakes testing and other accountability measures rather than technology integration because technology is not part of high-stakes testing (Forthe, 2012). Teachers are not likely to invest vast amounts of time, energy, and resources into aspects of teaching they do not perceive as important aspects of their job (Forthe, 2012).

Teachers may be fully committed to technology integration; however, existing barriers present challenges (Keengwe et al., 2008; Wachira & Keengwe, 2011). The extent on which K-12 teachers integrate technology depends on external and internal factors (Niederhauser & Perkmen, 2008) and users' beliefs and perceptions (Holden & Rada, 2011). First order barriers (external) include lack of and unreliable equipment, lack of technical support, and other issues dealing with resources (Wachira & Keengwe, 2011). Second ordered barriers (internal) include classroom, school, and district factors and teacher factors of beliefs, attitude, openness to change (Niederhauser & Perkmen, 2008; Wachira & Keengwe, 2011), expected outcomes, and interests (Niederhauser & Perkmen, 2008).

Understanding why teachers are not using educational technology is just as important as why teachers are implementing educational technology resources (Parker et al., 2008). Teachers and administrators are often unaware what effective educational technology integration looks like and what role each plays in the process (Hannafin, 2008).

Technical and administrative support. Effective technology integration cannot occur without administration supporting teachers with leadership or in-depth PD (Keengwe et al., 2008; Lu & Overbaugh, 2009; Pierce & Ball, 2009; Schrum et al., 2011). Researchers believed that technology integration is only as strong as the support and leadership provided by building administrators (Brown-Joseph, 2010; Schaffhauser, 2009). Inadequate, unreliable, and poor support only discourages and prevents technology integration (Glazer & Hannafin, 2008; Hutchison & Reinking, 2011; Keengwe et al., 2008; Lu & Overbaugh, 2009; Wachira & Keengwe, 2011). When Ohio teachers need technology assistance, 26% of the time another fulltime teacher provides assistance, which was the highest percentage (Education Resource Center, 2008). Teachers consulted with district level coordinators with problems 21% of the time and the principal or another administrator six percent of the time (Education Resource Center, 2008). Ohio received a grade in the “C” range for its technology leadership (Education

Resource Center, 2008). Even if teachers and students have adequate resources, usage and integration may not occur if they do not feel supported (Miranda & Russell, 2011).

Current research is lacking on how states and institutions require future school leaders to lead technology within the school environment (Schrum et al., 2011). In the digital age of the 21st century, administrations must know how technology can promote learning, support curriculum, and support school improvement (Schrum et al., 2011) because today's learners are expected to be able to enter the workforce technologically literate (ODE, n.d.). Teachers and administrators need to accept and embraced educational technologies and associated benefits to meet the demands of today's' digital natives (Loertscher, 2010). Administrators must have a current technology vision, training in educational technology, and communicate effectively with the technology leaders and educators within the building (Schrum et al., 2011).

Researchers investigated administrators' preparation to provide leadership to teachers for technology integration that increased student engagement and achievement (Schrum et al., 2011). This information was collected through web searches from the department of education from all 50 states looking for current requirements to serve as a building level administrator. The researchers also collected data from 137 educational leadership programs for evaluation of course materials and program requirements. Researcher found that only two states (Michigan and New Mexico) required administrators to demonstrate knowledge of technology use, integration, and promotion. Researchers indicated that 92% of the higher education institutions did not require any form of technology preparation, only a small portion offered technology integration as elective courses. The data indicated that states were not requiring current or future administrators to be experts in any aspects of educational technology.

The researchers also found that administrators learned about technology through PD, on their own, during teacher preparation courses, as classroom teachers, or through clerical tasks (Schrum et al., 2011). Administrators also learned that technology played an important role in their ability to lead teachers and the school environment successfully. The data indicated that administrators required new teachers to complete a technology-training course within the first three years and veteran teachers were required to complete six hours of educational technology PD each year. Administrators tried to have teachers understand that technology was not always relevant and that teachers should not use technology for technology’s sake because it does a disservice to the students. Technology training sessions are important because administrators believed that technology would continue to expand in the next five years, will become prevalent in school operations, and will increase learning opportunities for both teachers and students. Administrators stated that technology would continue to facilitate assessments, which allowed teachers to make data driven decisions, allowing for personalized instruction and differentiation. The administrators stressed that it was their role as school leaders to help teachers establish a culture of risk taking, exploration, and collaboration. Teachers can find effective support when technology coordinators and administrators work closely with each other. However, the administrators noted support barriers of funding, ability to work with the technology department, and student safety.

School leadership is a central factor for assisting teacher change by supporting teachers and creating and sharing a technology vision that includes technology as part of superior teaching practices (Ertmer & Ottenbreit-Leftwich, 2010). There needs to be a shared vision that both teachers and administrators have created (Ertmer & Ottenbreit-Leftwich, 2010). A shared vision is a significant factor in technology integration (Hsu & Sharma, 2008). The lack of a shared technology vision creates a barrier when integrating technology (Keengwe et al., 2008).

Resources. Schools must provide adequate resources for integration to be successful (Ertmer & Ottenbreit-Leftwich, 2010; Keengwe et al., 2008; Wachira & Keengwe, 2011). Because schools are not able to replace computers every couple of years, students and teachers are utilizing resources that are out-of-date and sometimes obsolete (Latio, 2009). When teachers do not have adequate access to hardware and software, teachers become reluctant and classroom integration is difficult (Hutchison & Reinking, 2011; Keengwe et al., 2008; Lu & Overbaugh, 2009; Martin, 2011; Pac, 2008; Wachira & Keengwe, 2011). When technology is available, teachers need time to plan, learn, and collaborate before effective integration can occur (Wachira & Keengwe, 2011). Educational technologies always needs to be available in order for teachers to experiment, learn, and use the resources to enhance student learning (Wachira & Keengwe, 2011). Leaders need to ensure that resources are effectively working and replace missing or broken equipment (Wachira & Keengwe, 2011).

Teachers felt that there was not adequate time (Hutchison & Reinking, 2011; Keengwe et al., 2008; Lu & Overbaugh, 2009) to teach both course content and computer technology (Kirkscey, 2012). Inadequate time, scheduling conflicts, and lack of resources (Wright & Wilson, 2011), prevented teachers from implementing new educational technologies, even though they felt they had adequate training and support (Kirkscey, 2012; Wright & Wilson, 2011). Teachers also face barriers of lack of feedback and expectations from school leaders (Park & Ertmer, 2008). Clear expectations, from administrators, must be set to improve teacher performance. Without expectations, teachers are unaware if their performance is up to expectations (Park & Ertmer, 2008).

Forthe's (2012) study selected three case study districts and two outside organizations within the district to identify strategies and functions outside organizations can provide K-12 districts and identify collaboration implementation efforts of technology integration and reform (Forthe, 2012). Forthe used the criterion-based sampling method to select participants. School leaders began to realize that outside organizations can provide support and services beyond what schools can provide. The data showed a disconnect between schools and outside organizations. Relationships need to be established and built to increase collaboration because relationships that focus on collaboration and joint responsibility are the most effective. The data indicated that outside organizations were beneficial because they served as negotiators and communicators between administrators and educators because of the hierarchical disconnect between outside organizations and schools.

Internal factors can prevent successful integration even after removing external barriers. Woolard (2012) verified this information about barriers when he conducted a case study with 10 elementary teachers and 2 elementary principals to gain their perspectives why teachers were still reluctant to integrate technology even after removing common barriers. The participants indicated time as the leading barrier to technology integration. The participants wanted time to learn, collaborate, plan, and interact with colleagues and the technology resources. Time may have been a barrier because teachers had no chance for situated learning and reflection. Time was not as much as a factor for ICT integration as the participants believed; most barriers were with perception and beliefs. Woolard was able to draw this conclusion from the information that teachers seamlessly utilized ICT resources in their personal lives; therefore, time is not the issue. The issue was about teachers' beliefs about teaching and learning with technological innovations.

Perceptions and beliefs. Perceived obstacles may deter teachers from using technology resources (Miranda & Russell, 2011; Wachira & Keengwe, 2011). Providing teachers with authentic learning experiences using educational technology resources will help diminish fears, misunderstandings, and negative attitudes (Walker, 2010). Negative attitudes by veteran teachers towards technology integration could discourage novice teachers from integrating technology (Ertmer & Ottenbreit-Leftwich, 2010). Low-levels of confidence (Keengwe et al., 2008) and attitudes (Glazer & Hannafin, 2008; Wachira & Keengwe, 2011) will negatively affect teachers' technology integration. Teachers' attitude towards utilizing educational technology depends on how the teachers feel the technology will influence student learning and school culture (Pierce & Ball, 2009).

Researchers have verified that teachers' beliefs and perceptions influence technology integration. Ball and Levy (2008) conducted a study to investigate instructors' intentions of utilizing educational technology resources. The researchers compared instructors' intentions to factors of instructors' computer self-efficacy, computer anxiety, and experience using educational technology resources. The researchers gathered responses from 58 instructors from a small southeastern private university. The data showed that a significant predictor of intended usage was an instructor's computer self-efficacy (Ball & Levy, 2008). However, an instructors' experience using computers was not a predictor of their intended integration (Ball & Levy, 2008). Ball and Levy (2008) explained that even though computer anxiety did not directly affect intended usage, the data indicated that computer anxiety plays a secondary role. Researchers indicated that a teachers' experience using technology was not a significant predictor of teachers' intended usage (Ball & Levy, 2008). Institutions must provide instructors with training on how to implement technology effectively and the training should increase computer self-efficacy (Ball & Levy, 2008). Instructors must know the pedagogical benefits of using educational technology and how technology can support learning objectives (Ball & Levy, 2008).

Researchers also investigated teachers' beliefs and perceptions through a longitudinal study (Levin & Wadmany, 2008). The longitudinal study lasted three years within one school building with six teachers from each Grades four to six. The researchers showed that ICT had the potential to change the way teachers function, think, and feel about classroom educational technologies (Levin & Wadmany, 2008). When teachers changed their perceptions about beliefs, practices, and conditions there was a noticeable change in patterns of teaching (Levin & Wadmany, 2008). Teachers' views of factors that hindered or promoted teaching and learning in a technology-integrated environment indicated that activities involving other people and circumstances influenced perceptions (Levin & Wadmany, 2008).

One explanation for the gap between technology and teacher integration relates to teachers' self-efficacy about successfully being able to complete tasks (Ertmer & Ottenbreit-Leftwich, 2010). Integrating technology into teaching practice and strategies requires teachers to expand their knowledge of content and pedagogical practices and theories of planning, implementation, and evaluation to support student learning (Ertmer & Ottenbreit-Leftwich, 2010). Based on their knowledge of the students and content, teachers need to select appropriate ICT resources that allow students to master the learning goal (Ertmer & Ottenbreit-Leftwich, 2010).

One way to have students meet their learning goals is through a variety of technology modes and models (Ertmer & Ottenbreit-Leftwich, 2010). Another beneficial way for teachers to develop confidence is by hearing and observing other teachers' success stories with educational technology (Ertmer & Ottenbreit-Leftwich, 2010). Teachers often have an understanding of pedagogical content knowledge (PCK) but lack knowledge of technology and how it can be integrated into their current PCK to enhance student learning (Ertmer & Ottenbreit-Leftwich, 2010). The process of learning how to connect PCK and technology is a difficult process for educators (Ertmer & Ottenbreit-Leftwich, 2010).

The Teacher Acceptance Model (TAM) predicts, through causal relationships, how persons come to accept and use new or existing educational technology resources (Holden & Rada, 2011). The model investigates individuals' cognitive, affective, and behavioral feedback towards technology questions. The model suggests that when teachers receive a particular set of technology resources, perceived usefulness and ease of use will determine technology integration. The researchers indicated that perceived usability and technology self-efficacy positively affected acceptance and usage behaviors (Holden & Rada, 2011). The researchers indicated that perceived ease of use significantly influenced perceived usefulness. The researchers also indicated that perceived usefulness and ease of use significantly influenced attitudes and intentions towards usage and integration. Holden and Rada (2011) noted that their results were different from other research, which may produce limited generalizations.

Professional development. Teachers need proper technology training, both during and after formal education, to meet students' educational technology needs (Pac, 2008). However, researchers have found the insufficient technology training creates a barrier for teachers when implementing technology resources (Glazer & Hannafin, 2008; Hutchison & Reinking, 2011; Keengwe et al., 2008). Technology training usually focuses on knowledge and skills, but lacks connecting technology, content, and pedagogy (An & Reigeluth, 2011). Teacher training needs to occur in content specific learning environments where teachers engage in authentic applications (An & Reigeluth, 2011).

Too often educators are required to integrate technology into classroom learning without the proper training (Downes & Bishop, 2012). Evidence suggests that teachers are capable and willing to integrate technology, but they need proper training to make the experience truly effective (Reel, 2009). If teachers have incomplete or weak ideas or definitions of ICT, teachers are not likely to have authentic integration (Hutchison & Reinking, 2011). PD sessions should increases teachers' knowledge and understanding (Hutchison & Reinking, 2011).

Not just any PD will increase teachers' knowledge and understanding. Presenting PD information, to teachers, in a manner not conducive to learning, results in ineffective PD. An and Reigeluth (2011) illustrated the importance of PD in a mixed-methods study of 126 Texas and Arkansas K-12 teachers. Their study explored teachers' perceptions, beliefs, and support needs to produce a learner-centered technology classroom. The teachers were from 27 different rural schools (14 elementary, four middle, and nine high schools) with the 126 participants representing a 32% response rate.

The researchers indicated that PD sessions needed to be hands-on where individualized support. The biggest perceived barriers for teachers establishing a student-centered learning environment was time, lack of technology, assessments, and technical support. Other identified barriers were the lack of funding for technology, limited resources available, student classroom behavior, class size, and parents who complained about complex activities. The researchers indicated that teachers seemed to face more external barriers (1st order) than internal barriers (2nd order) when creating technology enhanced students-centered classrooms. Teachers will not be able to implement student-centered learning if the teachers are require to cover vast amounts of material in preparation for high-stakes testing, even if the teachers possesses the knowledge, skills, and attitude (An & Reigeluth, 2011).

School culture/environment. Some factors that influence technology integration performance include “knowledge and skills, performance capacity, motivation and self-concept, tools and environment, expectations and feedback, rewards, recognition” (Park & Ertmer, 2008, p. 633), and incentives (Hutchison & Reinking, 2011; Park & Ertmer, 2008). The overall culture of the organization influenced the six factors (Park & Ertmer, 2008).

A barrier often ignored is aspects of change (Brunk, 2008). When teachers are asked to implement technology, they often have to change instructional practices (Brunk, 2008), which is problematic for teachers because instructional practices are at the heart of teachers’ purposes (Brunk, 2008; Glazer & Hannafin, 2008). Because digital technologies are here to stay is apparently not adequate motivation for teachers to change their practices (Hutchison, 2009).

Multiple barriers. Up to this point, the technology integration barriers have focused on information from single barriers teachers encounter. However, teachers often encounter more than one barrier when integrating technology. The following information focuses on multiple barriers to technology integration.

Wachira and Keengwe (2011) focused on barriers that influenced technology integration with urban teachers in mathematics classrooms. The study utilized the mixed-methods approach on 20 teachers enrolled in the Teaching Mathematics with Technology program at a large Midwestern university. The major barriers that teachers faced were unavailable and unreliable technology, lack of support and leadership, lack of confidence and anxiety, and the lack of technology knowledge (Wachira & Keengwe, 2011). Teachers were frustrated with the lack of leadership and support from administration to ensure that the resources were working and available and that support was available when needed (Wachira & Keengwe, 2011). The data showed that even though teachers were convinced that technology provides cognitive and affective advantages, teachers were unaware of how to integrate technology for content specific integration and enhancement (Wachira & Keengwe, 2011).

Researchers indicated that teachers are not convinced that removing technology barriers will increase student achievement. Reel (2009) conducted an action research study, with 80 participants, to investigate how an understanding of the current state of technology integration into middle schools enhanced technology integration. Reel indicated that many middle school teachers did not possess high levels of technology pedagogical competency, causing a lack of confidence to integrate technology into the curriculum. Teachers' perceived barriers were inadequate technology-based PD and limited time to learn and practice new technological resources before implementation. Participants indicated they were not convinced that removing technology integration barriers would positively influenced student learning.

A case study experiment conducted by Berry (2011) investigated teachers' computer-based technology perceptions and the support received. The perceptions focused on computer skills, comfort, obstacles, support, time, and available training. The 30 participants were from three rural K-12 school districts in southern Virginia. The two most frequently mentioned obstacles for integration, for participants, were limited access and limited time to plan (80%). Lack of staff development training was third. The data indicated that school districts could increase technology integration by providing teachers with collaboration time for learning and exploration. It became apparent to the researchers that limited time, access, and training directly related to the district's funds. Teachers noted that when school leaders expected them to learn new technology resources outside the normal school day, they wanted compensated. If this was not a possibility, teachers indicated they wanted time during the day to explore and learn.

Berry's study is not the only study to discover restricted access causing barriers for technology integration. Hutchinson (2009) investigated the role ICTs have in literacy instruction and to determine beliefs that impede successful technology integration. The participants were 1,442 literacy teachers from across the nation. Members of the International Reading Association received the survey. Ninety-two percent of the participants indicated they had computer access, with Internet, in their classroom or other locations within the school. However, 83% reported lack of access was a barrier to ICT integration. This access was inadequate because 83% indicated that an increase in technology resources would increase technology integration. The data indicated that teachers' perceived time was a significant obstacle for technology integration. There were many aspects of time that teachers reported as being obstacles, such as lack of time during a class period (87%), lack of time to prepare students for high-stakes testing (68%), and lack of time to teach basic computer skills (73%). Teachers wanting extra time for planning and longer class periods to integrate technology may present a dilemma for administrators. There were multiple areas of support that teachers indicated as being PD barriers: technology integration (82%), technical support (80%), lack of incentives (60%), and administrative support (52%).

Even if teachers have the needed support, they often face other barriers. Walker (2010) conducted a qualitative phenomenenological study to gain a better understanding how successful teachers overcame barriers of technology integration. The study used purposeful sampling to select 10 K-5 teachers who were currently integrating technology successfully. A significant barrier teachers faced was the lack of time. Teachers often lack time when exploring technology and related materials and conduct PD. Another time barrier teachers faced was the time it took to resolve technical issues. Other factors relating to lack of training in Walker's (2010) study included materials not being relevant or lacking to teachers' curriculum, poor training practices, and lack of mentoring (Walker, 2010). Other barriers that Walker's (2010) participants encountered were technical support and equipment issues. Participants faced barriers of nonworking computers because of viruses, broken equipment, outdated equipment, security breaches, long waits on repairs, lack of funding for repairs and personal assistance, and the lack of on-site support. The barriers challenged teachers to integrate technology within the normal school day.

Lu and Overbaugh (2009) found similar results when research was conducted with 177 K-12 in-service teachers from mid- and southeastern Virginia. Participating teachers took at least one technology integration PD course financed by the NCLB-EETT grant. The researchers looked to examine teachers' perceptions of factors that encourage, discourage, or hinder technology integration. Researchers indicated that administration support was important for technology integration because support was a gateway for other factors, especially technology PD (Lu & Overbaugh, 2009). Factors of concern were available time and access (Lu & Overbaugh, 2009). Half of the teachers indicated that lack of time was the reason technology integration was not occurring. However, the other half indicted that time was not a factor because time was already spent learning the resource through PD. Resolving technical issues remained to be a central concern for teachers. Technology integration barriers are an on-going problem; however, local, state, and federal efforts are ongoing to reduce barriers for teachers.

Removing technology integration barriers does not always reduce teachers' fears. This is evident from Brown-Joseph's 2010 qualitative exploratory case study. Brown-Joseph wanted to gain an understanding of teachers' perceived barriers that hindered technology integration. The case study consisted of two primary schools and two high schools in Midwestern United States. The data showed that teachers were fearful to inform school leaders of needs pertaining to technology for the fear of rejection or being ignore. Additional collaboration needed to occur between teachers and administrators in the planning of technology integration. Participants faced training/demonstration barriers because it was unknown what needs teachers required to move forward with integration and how to provide continued and relevant PD.

Reducing learning environment barriers provides teachers more opportunities to incorporate educational technology resources within the learning environment to support student learning (Lu & Overbaugh, 2009). The factors can be addressed in teacher education programs, during PD programs (Ertmer & Ottenbreit-Leftwich, 2010), through the infrastructure, PD, time, and technical and pedagogical support (Niederhauser & Perkmen, 2008).

Predictors

Studnicki (2012) investigated if teachers' self-efficacy and/or collective efficacy played a significant role of technology integration and barriers faced by New Jersey teachers. The mixed-methods data showed that participants influenced technology integration the most, more so than colleagues, administrators, technology personnel, and school board members. Participants indicated that students were the second most influential group to determine technology integration, followed by colleagues third, and administrators last.

Brunk (2008) also conducted a study investigating predictors of technology. Brunk sought to determine technology implementation levels related to teachers current instructional practices, level of computer usage, poverty concentration levels within a school, teacher efficacy, school culture, administrative support, and teacher demographics (Brunk, 2008). The 146 participants were teachers from the same southwestern school district. Fifteen elementary school building participated in the survey. The data showed that there was a relationship between teachers' instructional practices and technology integration. The teachers' instructional practice score was the strongest predictor of implementation. Teachers with a constructivist approach were likely to have higher levels of technology implementation. The researcher also showed a positive correlation between personal computer use and levels of technology implementation. Brunk showed no relationship between concentration of poverty and technology implementation. Brunk also showed no conclusive evidence between teacher efficacy and implementation. This may have contributed to the fact that teachers were confident in their ability to teach students under the current environment (low technology). In this case, a positive correlation between teacher efficacy and the desire to improve technology integration. However, teachers' gender, teachers' age, receiving an advanced degree, years of experience, and principal seemed to have no significant relationship in classroom integration.

Increasing Technology Integration

Ottenbreit-Leftwich et al. (2010) indicated that aligning PD with teachers' curriculum and beliefs would increase their educational technology usage. Effective integration requires stakeholders to have long-term planning and budgeting aligned with state curriculum and standards, which requires a shift in the institutional culture that starts at the top and works its way down (Hannafin, 2008). Teachers need support and guidance when using technology to enhance the curriculum the way they see fit (Ottenbreit-Leftwich et al., 2010). Rarely, are teachers' values and beliefs taken into account when best educational technology practices are discussed (Ottenbreit-Leftwich et al., 2010).

Delivering technology training and integration in small and continuous increments ensures continuity and success (Smeureanu & Isaila, 2012). The training should not focus just on the technology itself, but also technology integration into curriculum and pedagogy (Palak & Walls, 2009). Educators properly trained and provided with adequate support are likely to integrated technology resources into everyday lessons than teachers are not trained and lack support (Loertscher, 2010).

Administrative support is a critical component for effective integration because administrators can provide policies, incentives, and resources (Alam, 2012; Wachira & Keengwe, 2011). One way to increase success is by equipping teachers and leaders with an understanding of emerging themes that hinders teachers' technology integration (Brown-Joseph, 2010). Administration needs to make a valiant effort to support teachers currently implementing technology and encourage integration among other teachers (Wachira & Keengwe, 2011). Other important components for effective ICT integration are colleagues, administrators, and financial support; without resources, integration is difficult (Alam, 2012). Lack of administration support implies that teachers may oppose technology integration because integration will take away from instruction and other responsibilities (Wachira & Keengwe, 2011).

Increasing self-efficacy can directly increase acceptance and indirectly influence usage behavior of classroom technologies (Holden & Rada, 2011). When the teacher's primary goal to improve students' learning or when teachers possess high-levels of self-efficacy, teachers are willing to confront and overcome technology barriers (Glazer & Hannafin, 2008; Studnicki, 2012). Teachers with higher self-efficacy show increased effort and determination (Studnicki, 2012).

Reel (2009) provided the following recommendations to improve integration: (a) increase awareness of integration, (b) increase recognition and needs of teachers, and (c) increase effectiveness. Teachers can use failed experiences, flexibility, collaboration, and motivation to lead to successful technology integration (Walker, 2010). Learning communities can also be another effective way for teachers to overcome fears, anxieties and help build confidence towards effective technology integration (Wachira & Keengwe, 2011).

Teachers, who indicated they received adequate PD on ICT within the last year, integrated technology at higher rates. Quality PD is a significant part of effective technology integration (Hutchison, 2009). Continued PD for teachers is necessary to increase frequency and intensity of implementation in this ever-changing field (Lowther et al., 2008).

Finding funds to purchase and update technology resources remains a problem for school leaders (Downes & Bishop, 2012). Another innovative and effective tool schools are starting to implement to help increase technology integration and reduce costs are Web 2.0 resources (Downes & Bishop, 2012). “Cloud computing is a computing technology that uses the Internet and central remote servers to maintain data and applications” (Siegle, 2010, p. 41). Google Docs is a well-known productivity cloud-computing tool that allows users to collaborate simultaneously with other users across the room, the country, or the world on documents (Siegle, 2010). Other examples include blogs, social networking, and wikis (Blue & Tirotta, 2011; Diaz, 2011; Pang, 2011). In general, there are five classifications for Web 2.0 tools: communicative, collaborative, documentative, generative, and interactive (Diaz, 2011). The five categories have drastically changed technology access and use for the educational learning environment (Blue & Tirotta, 2011).

Cloud computing is inexpensive for districts because the only requirement is the Internet (Siegle, 2010). Few changes are required to users' hardware systems to operate cloud-computing services (Pang, 2009; Thomas & Qing, 2008). Because resources are stored on a remote sever, districts do not have to purchase expensive licensed software and continuous upgrades (Nevin, 2009). When Web 2.0 applications updates become available, users instantly have access to the upgrades (Thomas & Qing, 2008).

Another benefit of Web 2.0 resources is that students currently use and are familiar with numerous Web 2.0 resources (Pang, 2009). Most young people use Web 2.0 applications every day, mostly for socializing and entertainment (Asselin & Moayeri, 2011) and do not understand how Web 2.0 can supplement learning (Diaz, 2011). Teachers must understand that students are going to embrace and utilize Web 2.0 resources whether teachers incorporate them into the classroom setting (Asselin & Moayeri, 2011).

Pang (2009) explained that cloud computing is a subset of Web 2.0. Cloud computing uses remote servers and storage space to bring information to users in a local setting. Users do not own the servers or storage space (Pang, 2009). Cloud computer is a new way of thinking. Cloud computing removes most of the hands on resources because resources are being fully provided online (Pang, 2009). The data gathered or generated by users are stored online and the users are the only persons with access, unless they decide to share the data (Pang, 2009). Online data storage is a popular feature of Web 2.0 applications because users do not need to worry about hard drive crashes or lost storage drives (Thomas & Qing, 2008). Users can access the data using any Internet connection because information is stored on a remote server (Siegle, 2010; Thomas & Qing, 2008).

Researchers argue that Web 2.0 resources engage and support students in higher order thinking and synthesizing (Hedberg & Brudvik, 2008). Web 2.0 resources can change consumers into producers by promoting and facilitating participation and collaboration (Hedberg & Brudvik, 2008; Thomas & Qing, 2008). Web-based resources allow teachers to shift the focus from the masses to the individuals (Diaz, 2011), making curriculum and instruction personalized (Hedberg & Brudvik, 2008). To take education to the next level, the education system needs to parallel Web 2.0 resources in structure and function to effective prepare students for 21st century life (Thomas, 2009).

Web 2.0 resources can prepare students for 21st century life by "transforming existing visual, auditory, and textual content into new multimodal context" (p. 2), making resources engaging, interactive, supportive, and collaborative (Asselin & Moayeri, 2011). Web 2.0 resources foster student skills in engagement, knowledge, creativity, independent learning, reflection, and innovation (Diaz, 2011). Students' skills are enhanced largely because of the flexible nature Web 2.0 tools provide users. Many tools allow users to choose, create, collaborate, and share as they see fit (Asselin and Moayeri, 2011; Blue & Tirotta, 2011; Diaz, 2011). Multiple users can simultaneously interact with same document, removing the necessity for multiple document versions (Siegle, 2010).

Like any technology, barriers or limitations are associated with Web 2.0 resources (Diaz, 2011). A substantial barrier with Web 2.0 applications is the vast array of possibilities available to teachers, making it difficult for teachers to select and implement resources (Diaz, 2011). Before teachers select a Web 2.0 tool to use with students, teachers need to gather student data to determine if the tool will benefit the learner (Diaz, 2011). Servers block effective resources to protect students from harmful resources and content (Blue & Tirotta, 2011).

Researchers must investigate how teachers meet and overcome technology integration barriers. Walker (2010) conducted a qualitative phenomenenological study to gain a better understanding how successful teachers overcame barriers of technology integration. Walker used purposeful sampling to select 10 K-5 teachers who were currently integrating technology successfully.

Walker's participants felt that successful integration sustained attentiveness, saved time, and provided different modes of presentations and learning. The data also indicated that when participants had positive self-efficacy, their technology confidence increased and their confidence to promote technology integration among colleagues increased. Walker indicated that intrinsic motivation affected technology integration for enhancing instructional practices the most. The major intrinsic motivation factors that influenced technology integration were student success, student motivation, and collaboration. Surprisingly, technology integration did not increase because of extrinsic motivation. Successful integration requires commitment and collaboration from stakeholders. When teacher support is increased, the likelihood that teachers will successfully integration technology also increases (Walker, 2010).

Implications

The quantitative technology research presents several possible implications. Regardless of the outcome, the research has a positive influence on educational technology and the educational learning environment. I investigated the following null hypotheses.

1. There is no relationship between a teacher’s age and their perceptions of educational technology.
2. There is no relationship between a teacher’s age and their educational technology integration.
3. There is no relationship between years of teaching experience and a teacher’s perceptions of educational technology.
4. There is no relationship between years of teaching experience and a teacher’s educational technology integration.

Based on the findings from my research, I created a PD project to further influence positive social change. I created two PD sessions to address the issues found in the study. The data allowed for PD sessions to be relevant and authentic experiences for teachers, which increases session and teacher effectiveness.

Summary

Today’s students are comfortable using technology in their everyday lives. However, teachers often do not use educational technology resources to enhance student learning because teachers are using technology for low-level uses such as administrative tasks. In recent years, there has been a push to change how teachers teach and the way students learn. National and local government agencies are supporting the educational technology revolution by providing vast amounts of money on resources, development, and teacher training and support. Stakeholders are creating policies and reforms for using educational technology within the learning environment. The policies and reforms are creating a shared vision for administrator and teachers to follow. Researchers have found that educational technology is effective when a professional learning community has and operates using a shared vision. Researchers also indicated leaders cannot create a vision and force the vision on teacher. All stakeholders need to be involved in the creation of a shared vision.

When using educational technology properly, teachers create a student-centered learning environment. This environment transforms students from consumers to producers. Technology resources maximize participation, provide motivation, create higher-ordered thinking and problem solving, and establish collaboration among peers. Research on students' perceptions of student-centered classrooms indicated that students welcomed, preferred, and succeeded in a student-centered learning environment. Student-centered learning environments create 21st century learners because students encounter authentic learning experiences in which they apply knowledge not just recall knowledge. If teachers are not willing and enthusiastic, as well as provided with resources and support, student-centered learning environments cannot occur.

Educational technology is currently changing the face of education by transforming the learning environment. The literature also indicated teachers cannot passively or occasionally use technology resources to enhance student learning. Many researchers have indicated that teachers must use educational technology to provide students with the best possible learning experience. However, teachers often face barriers that prevent or hinder successful technology integration.

Teachers face first order barriers (external) including lack of and unreliable equipment and lack of technical and administrative support. Teachers also face second ordered barriers (internal) of classroom, school, and district factors and teacher factors of beliefs, attitude, openness to change, expected outcomes, and interests, which illustrates that teachers are willing and enthusiastic to implement technology. However, teachers do not integrate technology because they face barriers. Stakeholders need to work collaboratively to identify and reduce barriers teachers encounter.

Section 2 of this doctoral study contains the methodology information that guided the study's research. The methodology section contains the information on the research design and approach, the setting and sample population, and a description of the research survey. The data collection and analysis procedures are described. After collecting data, Section 2 contains the presentation, interpretation, and explanation of data collection. Tables and figures are located within this section.

Section 3 contains the project study information, which is a PD program on technology integration. Section 3 contains a discussion of the project, literature review supporting the project, goals and rationale for the project, and project evaluation. The doctoral study concludes with Section 4: reflections and conclusions of the project study. I reflected on the project study and discussed the strengths and limitations in addressing the problem discovered in Section 2. I also discussed what I learned about scholarship, developing and evaluating projects, leadership, and various aspects of change. This section also includes an overall personal reflection and discussion of the doctoral study. There is also a discussion of the doctoral study's implications and applications to the teaching profession and the direction for future research.

Section 2: The Methodology

This study's design is a combination of two valid, reliable, and preestablished surveys, Teacher Technology Survey and Teacher use of Educational Technology in U.S. Public Schools, to collect educators' perceptions and integration of educational technology. I analyzed the survey data utilizing quantitative statistical measures in order to draw conclusions and/or determine the relationships between teacher characteristics (independent variables) of gender, age, years of teaching experience, current subject(s) taught, current grade level(s), level of college education, and the study's two dependent variables: teachers' perceptions of educational technology and teachers' integration of educational technology. I analyzed the quantitative data using descriptive statistics and explanatory Spearman rank-order correlation research methods to investigate relationships. I looked to answer the following questions.

1. What are teachers' perceptions about educational technology?
2. What are teachers' current levels of educational technology integration?
3. What is the relationship between a teacher's gender and their perceptions of educational technology?
4. What is the relationship between a teacher's gender and their educational technology integration?
5. What is the relationship between a teacher's age and their perceptions of educational technology?
6. What is the relationship between a teacher's age and their educational technology integration?

7. What is the relationship between years of teaching experience and a teacher’s perceptions of educational technology?
8. What is the relationship between years of teaching experience and a teacher’s educational technology integration?
9. What is the relationship between a teacher’s subject area and their perceptions of educational technology?
10. What is the relationship between a teacher’s subject area and their educational technology integration?
11. What is the relationship between a teacher’s grade level and their perceptions of educational technology?
12. What is the relationship between a teacher’s grade level and their educational technology integration?
13. What is the relationship between a teacher’s highest level of college attainment and their perceptions of educational technology?
14. What is the relationship between a teacher’s highest level of college attainment and their educational technology integration?

After the survey design and research procedures received approval from the IRB, I collected the participants’ data using an online survey that was created from components of two preestablished surveys. After data collection, I imported the data into SPSS statistical software to calculate the descriptive statistics and the Spearman rank-order correlation coefficients. This information provided the necessary evidence to draw conclusions and determine if a relationship existed between the study’s variables. I used the data to create a PD project study to influence positive social change within the educational learning environment.

Research Design and Approach

Researchers can use multiple research designs when conducting research. For many of the questions, simple descriptive statistics such as means, percentages, and standard deviations were researched. I used a Spearman rank-order correlation research design for questions 5-8 in the study. A correlation is a statistical test that determines the relationship of two sets of data (Creswell, 2012; Lodico, Spaulding, & Voegtle, 2010; Patten, 2009). Correlational designs are used when researchers investigate the relationship between two or more variables to see if they directly influence each other (Creswell, 2012; Lodico et al., 2010), and to generalize the results to a larger population (Lodico et al., 2010). The variables' influence on each other will permit a researcher to predict scores and explain the relationship between study variables (Creswell, 2012). Not only does the design allow researchers to make potential predictions and provide some likely explanations, researchers will also be able to test the degree of association, determining a strong or weak association between the variables statistically (Creswell, 2012). Correlational research designs cannot predict causation between two variables (Lodico et al., 2010). A breach of ethics occurs if researchers attempt to state causation of two variables using correlational research (Creswell, 2012).

I used an explanatory correlation research approach to examine the relationships between teacher characteristics and teachers' technology integration and teachers' perceptions. Explanatory correlational research designs utilize six characteristics (Creswell, 2012). The first characteristic is that researchers correlate two or more variables. For this study, I investigated correlations between the independent variables of teachers' gender, age, years of teaching experience, current subject(s) taught, current grade level(s), and level of college education with the dependent variables of technology integration as well as teachers' perceptions of technology.

Collecting data at one time is the second characteristic of explanatory research design (Creswell, 2012). Electronic distribution of the preestablished survey to the participants occurred at the same time. Data analysis of a single group of participants is the third characteristics (Creswell, 2012). There was one group of participants for data analysis, even though the participants are from five different districts. The fourth characteristic is that researchers obtain at least two scores for each participant. Data collection was on five independent variables and two dependent variables. Using a correlational statistical test is the fifth characteristic. Applying statistical tests determined the correlation coefficient, revealing the level of association between variables. The last characteristic is to draw conclusions based on the data (Creswell, 2012). Reviewing the data revealed conclusions and relationships between the level of technology integration and teachers' perceptions and teachers' personal characteristics of age, gender, years of teaching experience, content area, and grade level.

The statistical procedure that I used to calculate the correlation coefficients was the Spearman rank-order. Spearman rank-order was chosen because the data (age and years of teaching experience) were reported as ranks instead of the data being continuous. If the data were continuous, then Pearson product moment correlations would have been acceptable. Furthermore, Spearman rank-order was also used because there was no guarantee that the data would have a normal distribution.

Setting and Sample

The target population for this study was K-12 educators from one west central Ohio County. Eligible participants were any K-12 educators teaching within any of the five Ohio county school districts. Eligible participants were determined by accessing each district's staff directory from the district's website. The staff directory was reviewed and eligible staff members' name and e-mail addresses were added to my Google E-mail account**.** Because the target population was relatively small, the sample population was all K-12 educators from the county (*N* = 387), which contains five school districts. Of the total potential participants, 272 (70%) were females and 115 (30%) were males.

The sample population was representative of the county since every educator was included. The districts enrollments rates were between 900 and 2,200 students (ODE, 2011). I choose Ohio teachers because local government agencies have invested large amounts of resources in technology integration in recent years, which shows that Ohio is fully committed to embracing the technology revolution and using technology to enhance the learning environment (Latio, 2009). However, Ohio's state report card revealed that Ohio received a "D+" on the use of technology compared to the national average grade of a "B-" (Education Resource Center, 2008). Ohio's overall technology grade of a "C" was also behind the national average grade of a "C+" (Education Resource Center, 2008). Ohio has room to make improvements. One way to improve Ohio's educational system is by investigating correlations between teacher characteristics and teachers' technology integration and perceptions of educational technology.

Creswell (2012) indicated when conducting correlational research, the sample size must be at least 30; however, the larger the sample the less error for variance and the better representation of the population. The study included educators from the sample population and did not use a simple random sample selection method to select participants. Census sampling is a nonrandom sampling method that uses the entire population (Lodico et al., 2010). Lodico et al. indicated that researchers use census sampling when the population is not too large. The sample size exceeded the 30-participant size suggested by Creswell because the sample population is K-12 teachers from five school districts with each district containing at least 75 educators. Creswell's sample size criterion is satisfied if eight percent or more of the sample population participates in the survey. Walden University required a one-third survey response rate. Therefore, 132/387 surveys were needed to be completed to meet this requirement. This was achieved and the total numbers of surveys was 134.

Table 1 displays several county demographics for the five districts that were part of the study. Ohio's averages are also displayed for comparison purposes. Every teacher had a bachelor's degree or higher per the requirement from the Ohio Department of Education. This wide range of teaching expertise provided diversity to the study. The study not only provided data from diverse subjects and grade levels, but the data included teaching experience from novice to veteran teachers and everything between. The participants also increased the diversity of the study by their formal education and previous PD experiences.

Table 1

District Demographics

District	Regular Education Teachers*	Years of Teaching Experience 0-4	5-10	11+	Student / Teacher Ratio (Est)*
1	58	22.22%	20.20%	57.58%	20:1
2	87	14.39%	16.55%	69.06%	21:1
3	62	20.24%	19.05%	60.71%	14:1
4	53	19.78%	16.48%	63.74%	17:1
5	45	20.48%	25.30%	54.22%	18:1
6**	123	22.62%	18.82%	58.56%	18:1

Note. *FY08. **State averages Adapted from Ohio Department of Education [ODE], Center for School Finance – Simulation, Foundation, and Analysis Unit. (2012). FY2011 District Profile Report (also known as the Cupp Report). Retrieved from http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEDetail.aspx?page=3&TopicRelationID=1441&ContentID=122224&Content=132699

After sending out the initial e-mail and three reminder e-mails, 134 participants completed and submitted the survey, which created a response rate of about 35%. The percentage of females and males who completed the survey was an identical percentage to the actual percentage of females and males teacher within the county, 70% and 30% respectively. The majority of participants (86) reported having a master’s degree, 44 reported having a bachelor’s degree, and four reported having professional degrees (see Table 2 and Figure 1). The level of education rankings of masters, bachelors, & professional, respectively, still holds true even if classified according to gender. Participants had a mean age of 39.4 (see Tables 2 and 3) and an average of nearly 14 years of teaching experience (see Table 3). See Figures 2 and 3 for a histogram portrait for age and experience.

Table 2

Gender by Education Cross Tabulation

Gender	Bachelors		Masters		Professional		Total	
	n	%	*n*	%	*n*	%	*n*	%
Male	18	13%	19	14%	3	2%	40	30%
Female	26	19%	67	50%	1	1%	94	70%
Total	44	33%	86	64%	4	3%	134	100%

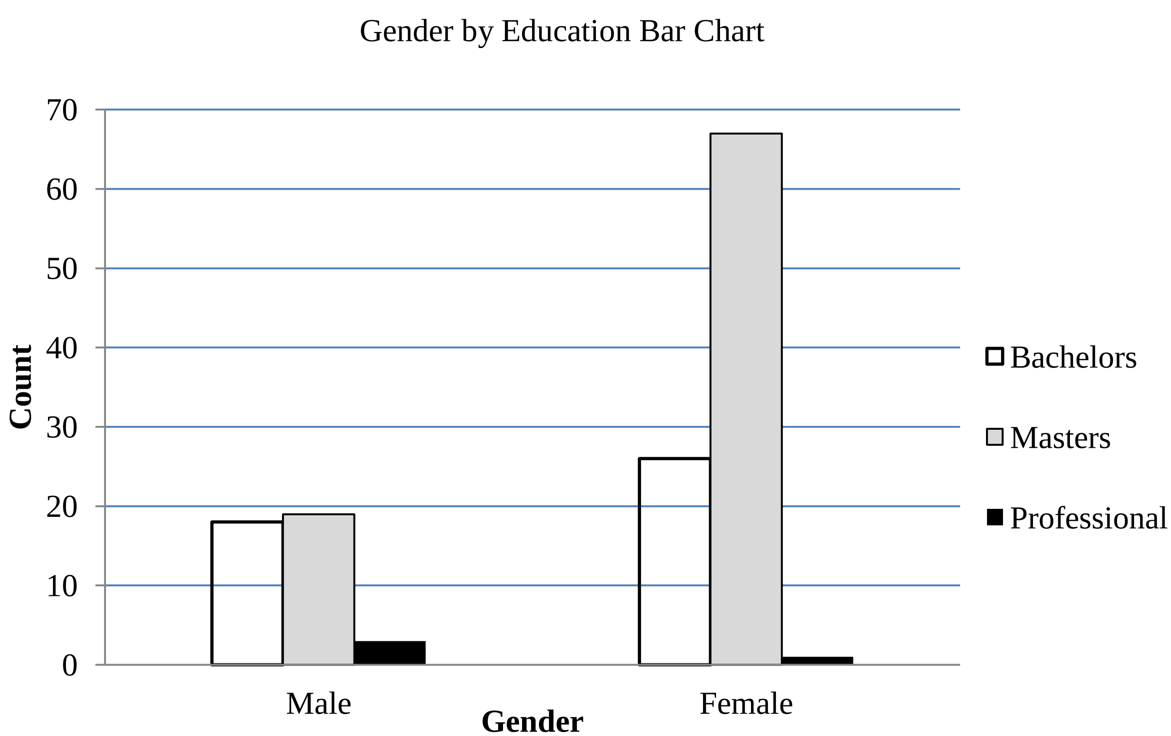

Figure 1. Bar chart of gender

Table 3

Descriptive Statistics: Age and Experience

Type	Age	Experience
Mean	39.39	13.75
Median	37.00	12.00
Mode	34.00	1.00, 8.00
Std. Deviation	10.88	9.88
Variance	118.38	97.57
Minimum	22.00	1.00
Maximum	67.00	45.00

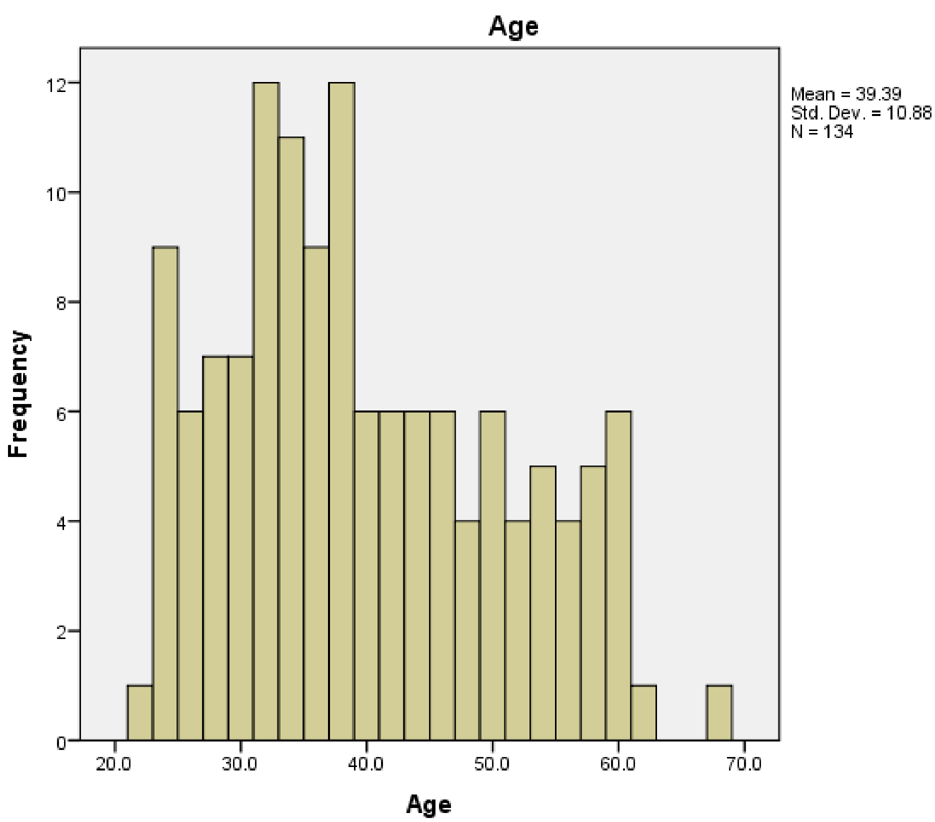

Figure 2. Histogram of participants' age

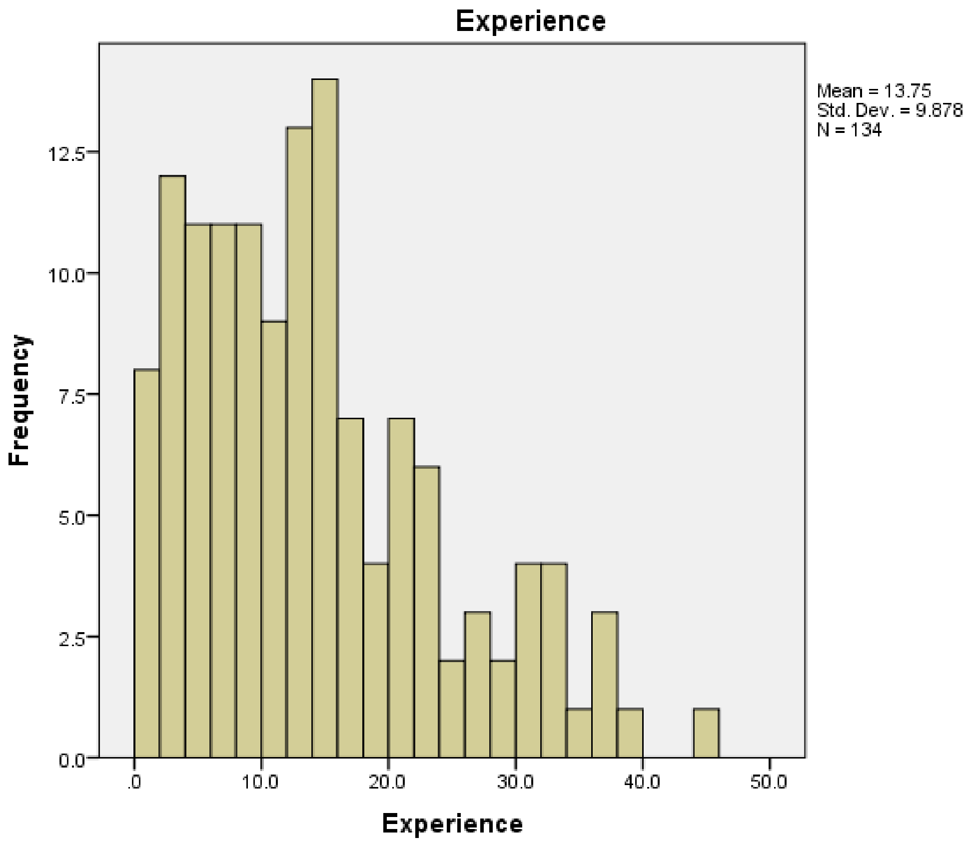

Figure 3. Histogram of participants' experience

Table 4 displays the breakdown of participants according to their district. It is obvious that the majority of participants were from District 1. The most taught subject was mathematics, followed by elementary, which consisted of all subjects, followed by science, and then language arts (see Figure 4). All of the other subjects were less than 10%. The majority of the participants taught classes in Grades 9-12, followed by classes in Grades 4-8, followed by classes in Grades pre-K-3 (see Figure 5). It should be noted that these totals are higher than the total number of participants because teachers could and did teach classes in more than one grade level.

Table 4

Participants by District

District	*n*	Response Rate (%)	Participating Teachers (%)*
1	58	43%	71
2	28	21%	24
3	15	11%	21
4	16	12%	27
5	17	13%	29

Note. Percentage of all teachers who completed the survey

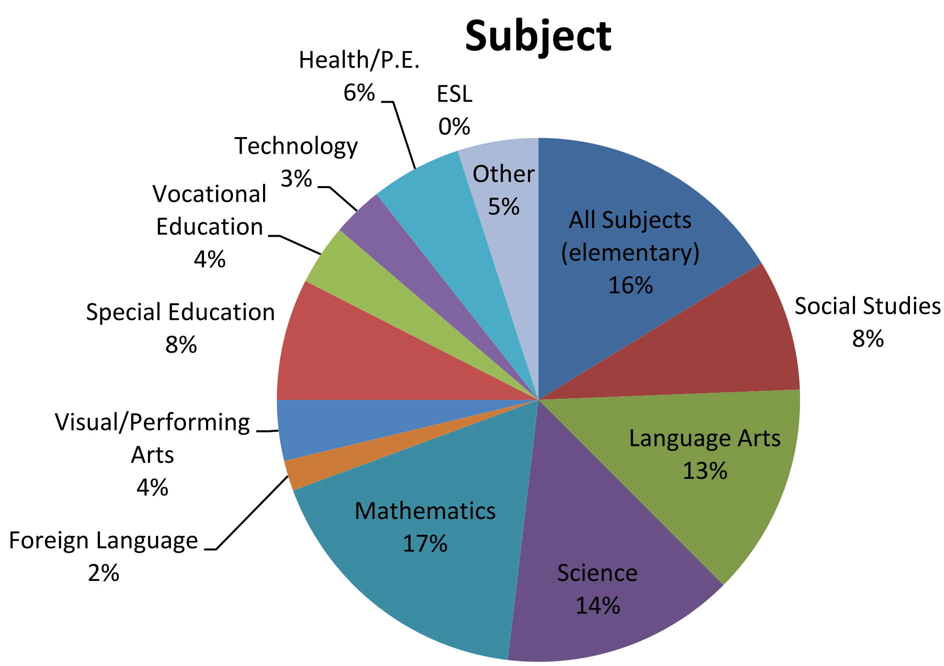

Figure 4. Pie chart by subject

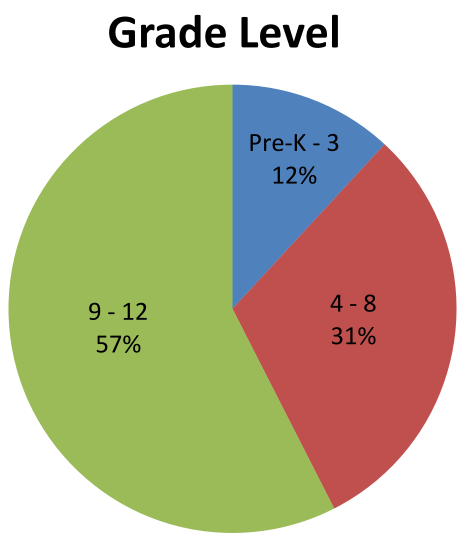

Figure 5. Pie chart by grade level

The participants were asked how many hours they typically used a computer, personally and professionally, during a one-week period (see Table 5). The data indicated that participants average more hours of professional computer use than personal use. However, the standard deviation and variance values are larger for professional use; indicating that the data is more spread out.

Table 5

Descriptive Statistics: Computer Usage

Type	Personal	Professional
Mean	7.90	11.92
Median	7.00	10.00
Mode	10.00	10.00
Std. Deviation	6.17	8.63
Variance	38.03	74.47
Minimum	0.00	1.00
Maximum	30.00	32.00

Table 5. Descriptive Statistics: Computer Usage

Instrumentation and Materials

The instrument used for data collection was a combination of two preestablished surveys. The first preestablished survey Teachers' Use of Educational Technology in U.S. Public Schools (Gray, Thomas, Lewis, & National Center for Education Statistics [NCES], 2010). Bahr from NCES was contacted and indicated that the survey was public domain and parts can be reused and modified for additional surveys as long as I removed the NCES references and cited NCES as the source of the survey (See Appendix B). A wide variety of weighted respondent characteristics were researched to identify the standard error for each. The overall standard error from this in depth analysis was with a 95% confidence interval overall. These numbers were established in a study that was conducted in 2008-2009 school year measure for a nonrandom sample of over 1,949 elementary schools (NCES, 2009). Validity estimates were not published but the face validity of the questions are clear, they ask teachers how much technology do they have and use.

The second survey utilized is titled Teacher Technology Survey (Pitler & Mid-Continent Research for Education and Learning [McREL], 2005). I contacted the Customer Care Team to gain permission to use part of their survey and make slight modifications. The e-mail was forwarded to Kuhn, Curriculum and Instruction Technologist, for approval. Kuhn provided permission to use and modify their survey (See Appendix B).

The merging and modifying of the two preestablished surveys created a single survey, Teacher Technology Integration and Perception Survey (See Appendix D). As previously stated, parts of each survey were modified to meet my needs. I added a pre-K category to the Teacher Technology Survey because some districts within the county employ pre-K teachers. The second question I modified asked participants to describe the learning environment when using technology in their classroom. The response “I don’t use technology in the classroom” I relocated to earlier in the survey because participants who do not use technology are able to skip questions relating to technology integration.

I modified one question from the Teachers' Use of Educational Technology in U.S. Public Schools to meet my research needs. The survey asked participants’ about the availability of various educational technologies and how often they utilized these technologies. I used the same stem, but modified the answer section by adding additional types of technology including tablets, scanners, DVD/VCR, airliners, and gaming devices.

The new survey was electronically distributed, even though the original surveys were distributed in paper form. The survey was created and distributed using Google Drive. Google Drive was chosen because of the quantitative design of the survey, which let me enter each survey question with preselected answers. This ensured that I did not receive erroneous answers, which helps quantify the questions. Participants were only able to choose from defined answers.

The Teacher Technology Integration and Perception Survey gathered information on teachers’ perceptions of educational technology and teachers’ educational technology integration. For the full survey, please see Appendix D. Below are the general topics that were collected from the participants.

- The survey collected information on a variety of teacher characteristics reported in the last section on sample demographics: gender, age, years of teaching experience, current subject(s) taught, current grade level(s), and highest level of college education.

- To investigate participants' perception of educational technology, the survey collected information on the extent to which participants agree or disagree with various educational technology statements.
- To investigate participants' integration of technology participants reported information on the educational technology resources availability and frequency of classroom use by teachers (projectors, videoconference, classroom response systems, digital camera, video recorder, MP3 player/iPod, document camera, gaming devices, DVD/VCR, and handheld devices [palm pilots, blackberry, iPad]).
- Participants reported the degree to which educational technology has changed the learning environment.
- Participants classified themselves as one of five technology type users. The participants were provided with a definition of each type of technology user.
- Participants described how frequently various classroom and professional activities are performed and the extent to which technology helps support this activity.
- The survey collected data on participants' information on how often their students perform various activities using educational technology.

Survey Background, Reliability, and Validity

I used pieces from the two preestablished surveys, Teachers' Use of Educational Technology in U.S. Public Schools and Teacher Technology Survey, to create one survey on teachers’ perceptions of educational technology and teachers’ educational technology integration. The Teachers' Use of Educational Technology in U.S. Public Schools survey is a national teacher-level survey developed by the NCES (Gray et al., 2010). In 2008, NCES redesigned the survey to reflect topics and information on educational technology within the public education-learning environment (Gray et al., 2010). The survey covers topics such as teacher demographics, the number of computers located within the classroom or that can be brought in, computer Internet access, availability and frequency of use of technology devices during instructional time, remote access to district information, types of software and Internet resources, student use of technology, modes of technology used for communication, teacher training of educational technologies (Gray et al., 2010).

Instead of simply cataloging equipment and use, The Teacher Technology Survey was designed to capture teachers' perceptions of technology as they matriculated through a PD program. McREL developed a technology initiative to help teachers feel comfortable integrating technology within their classroom through PD (Pitler & McREL, 2005). A comprehensive literature review on educational technology, PD, and how technology supports learning was conducted to support and guide the PD intervention. The Teacher Technology Survey was one instrument used to determine the effectiveness of the PD interventions (Pitler & McREL, 2005).

Pitler and McREL (2005) reported that two pieces of literature were especially influential in the survey design, Lemke and Coughlin's (1998) Technology in American Schools: Seven Dimensions for Gauging Progress and the Apple Classroom of Tomorrow Project. After creating the Teacher Technology Survey, the survey was pilot tested to confirm validity and reliability. Pilot testing lasted for 3 years in 10 different schools, which were from six different districts across five states. The survey allowed researchers to determine teachers' comfort levels using technology, the extent that technology supports classroom practices, how technology has changed the learning environment, teachers' attitudes, teachers' comfort level of students using technology, and the extent students can perform various technology-related tasks (Pitler & McREL, 2005).

Data Collection and Analysis

District and county superintendents were contacted to obtain permission to conduct research within the county and each district (See Appendix C). Each superintendent provided permission to conduct research within their district and collect data from teachers who voluntarily agreed to complete the electronic survey. After superintendent and IRB approval, I sent an e-mail to county educators informing them of their selection to participate in an educational technology survey. The e-mail also contained information such as the reason for selection, the purpose and reason for the research, and the participants' requirements as possible participants of this educational technology study. The IRB consent form contained this information (See Appendix E). The consent form also reassured potential participants their participation is voluntary. However, once a survey was submitted, participants could not withdraw their data. The consent form also informed the participants there was no penalty for not participating or for withdrawing their responses. Participants received no compensation for completing the survey. When teachers clicked on the survey link and completed the survey, they implied agreement to the terms and conditions of the study.

The e-mail also contained the link to the survey, which I sent from my Gmail account to county educators’ school e-mail addresses. Once clicked on, the link took participants directly to the survey for completion. Even though I created and distribute the survey using Google Drive, the participants did not need a Google account to complete the survey. From the time the potential participants received the e-mail, they had one week to complete the online survey. After the one-week deadline, I sent a reminder e-mail to the participants. The e-mail served as a friendly reminder for those teachers who had not completed the survey, with a five-day extension, and thanked the teachers who had completed the survey. After the initial e-mail and one reminder e-mail, I received more than eight percent needed for my correlation coefficient. However, Walden University required the survey response rate be at least one-third, which was not met after the first e-mail reminder. It took two additional reminder e-mails to surpass the required one-third response rate.

Google Drive was not only able to create and distribute the survey, but this cloud-based computer network could also collect and store participants’ responses. The raw data are stored on the secured and password protected network of Google Drive. I am the only person that has access to this information. The information is available upon request. To ensure the data was not lost in cyberspace, I imported the data into a Microsoft Excel file. This file is stored on a private password protected computer.

Participants who voluntarily agreed to participate in the study completed the online educational technology survey. Participants responded to a variety of questions about personal characteristics and their use, integration, and perceptions of various educational technologies. Participants also responded to questions about how student utilize technology for learning. Participants were required to complete the entire survey, unless the participant did not use technology. Participants who did not use technology were able to skip several questions because the questions were irrelevant to nontechnology users. The survey completed by the participants is found in Appendix D of the study.

Table 6 displays the research questions, data analysis procedures, and the corresponding survey questions for each research question. Research Questions 5-8 use two-tailed Spearman rank-order correlation coefficients to determine the relationship between the variables. The dependent variables for these four research questions are teachers' perceptions of technology integration and teachers' integration of educational technology. Two of the research questions have an independent variable of teachers' age and the other two research questions have an independent variable of years of teaching experience. The independent and dependent variables found in Research Questions 5-8 have the same level of measurement: ordinal. For this reason, utilizing Spearman rank-order statistical tests is appropriate. The independent variables are various teacher characteristics. The teacher characteristics of age and years of teaching experience are ordinal levels of measurement. Four teacher characteristics have nominal levels of measurement: gender, current grade level, highest level of college attainment, and current teaching subject. These are described in detail throughout this section. Table 6 on the following page lists all research questions, questions used on the survey (Q), and the type of data analysis completed. Note that the *Teacher Technology Integration and Perception Survey* is the data collection tool for all the research questions. Participants are the data sources for all research questions.

Table 6

Analysis of Research Questions

Research Question	Datapoints Yielded	Data Analysis
1. What are teachers' perceptions about educational technology?	Q: 13	Descriptive
2. What are teachers' current levels of educational technology integration?	Q: 10-12, 14	Descriptive
3. What is the relationship between a teacher's gender and their perceptions of educational technology?	Q: 1, 13	Descriptive
4. What is the relationship between a teacher's gender and their educational technology integration?	Q: 1, 12, 18	Descriptive
5. What is the relationship between a teacher's age and their perceptions of educational technology?	Q: 2, 13	Spearman rank-order
6. What is the relationship between a teacher's age and their educational technology integration?	Q: 2, 12, 18	Spearman rank-order
7. What is the relationship between years of teaching experience and a teacher's perceptions of educational technology?	Q: 7, 13	Spearman rank-order
8. What is the relationship between years of teaching experience and a teacher's educational technology integration?	Q: 7 , 12 , 18	Spearman rank-order
9. What is the relationship between a teacher's subject area and their perceptions of educational technology?	Q: 5, 13	Descriptive
10. What is the relationship between a teacher's subject area and their educational technology integration?	Q: 5, 12, 18	Descriptive
11. What is the relationship between a teacher's grade level and their perceptions of educational technology?	Q: 6, 13	Descriptive
12. What is the relationship between a teacher's grade level and their educational technology integration?	Q: 6, 12, 18	Descriptive
13. What is the relationship between a teacher's highest level of college attainment and their perceptions of educational technology?	Q: 3, 13	Descriptive
14. What is the relationship between a teacher's highest level of college attainment and their educational technology integration?	Q: 3, 12, 18	Descriptive

Note. The *Teacher Technology Integration and Perception Survey* is the data collection tool for all the research questions. Participants are the data sources for all research questions.

I investigated factors that are hypothesized to affect teachers' perceptions and integration of educational technology resources. The factors were teachers' characteristics of age, gender, years of teaching experience, subject taught, grade level, and level of college education.

Google Drive provided the descriptive statistical analysis of the data and I conducted the advanced correlational statistical analyses in SPSS. Almost every quantitative study uses descriptive statistics to help reveal patterns in the data (Lodico et al., 2010). However, advanced statistical analysis is not appropriate for all research questions. I cannot apply Spearman rank-order correlation coefficients tests to Research Questions 1 and 2 because these questions do not contain two variables. Correlation coefficients are not appropriate for Research Questions 3, 4, and 9-14 because the independent variables of gender, teaching subject, grade level, and highest level of college attainment are not easily quantifiable. The level of measurement for these variables is nominal. Each of the individual items was analyzed descriptively using frequency distribution and central tendency to the data to show patterns and trends.

As previously mentioned, I transferred the data into SPSS software for in-depth correlation analysis. The statistical procedure that I used to calculate the correlation coefficients was the Spearman rank-order. Spearman rank-order was chosen because the data (age and years of teaching experience) was reported as ranks instead of the data being continuous, which would be acceptable for Pearson product moment correlations. Spearman rank-order was also used because there was no guarantee that the data would have a normal distribution. The SPSS software allows users to conduct parametric test.

Parametric tests provide researchers with the necessary tools to accept or reject the null hypothesis (Lodico et al., 2010). The calculation of correlation coefficients provides the variables strength and direction relationship (Lodico et al., 2010).

I conducted Spearman rank-order correlation analyses for four questions. The null hypotheses for these questions were:

1. There is no relationship between a teacher's age and their perceptions of educational technology.
2. There is no relationship between a teacher's age and their educational technology integration.
3. There is no relationship between years of teaching experience and a teacher's perceptions of educational technology.
4. There is no relationship between years of teaching experience and a teacher's educational technology integration.

I calculated the Spearman rank-order correlation coefficients for teachers' years of teaching experience and teachers' age and teachers' technology integration and perceptions of educational technology. However, the questions involving teacher perception and integration are nonnumerical Likert scale questions. Quantifying these questions allowed the Spearman rank-order correlation coefficients to be determined. I assigned high or positive responses for technology perceptions and integrations a score of 5. Conversely, I assigned low or negative responses for technology perceptions and integration a score of 1. Three technology perception questions were stated in a negative manner. I reverse coded the data for these questions so all of the data is going the same direction. For example, if a participant indicated he or she "strongly disagreed" with the statement, then it was reverse coded to a response of “strongly agreed.” However, the data displayed in the tables, for these three questions, were not reverse coded because the statements were listed as negative statements. In other words, the data would be inaccurately reported if the negative statement was listed and the data was reverse coded.

To determine the Spearman rank-order correlation coefficients, a perception score was created for each individual. For each participant, the responses for each perception question was added together to generate a technology perception score. There were 134 separate scores for technology perception. Participants’ technology score and their age were inputted into SPSS where a two-tailed Spearman rank order correlation coefficient was run. This same process was carried out for perception and years of teacher, technology integration and age, and technology integration and years of teaching experience.

The relationship between the variables (correlation coefficients) can range from a negative 1.00 to a positive 1.00 (Lodico et al., 2010). Lodico et al. (2010) explained that the negative and positive sign has nothing to do with the results being good or bad, but the sign indicates direction. For example, a negative relationship reveals that one variable increases while the other variable decreases. However, a positive correlation reveals that one variable increases while the other variable also increases.

Once the Spearman rank-order correlation coefficients were determined for teachers’ age and years of teaching experience, I created a correlation matrix to display the correlation coefficients of each variable. SPSS automatically indicated if the variables were statistically significant. I determined a correlation was significant if the *p*-value is less than .05. This means that I can be 95% confident that a correlation exists between the variables (Lodico et al., 2010). If a correlation is determined not to be significant, their relationship exits by chance (Lodico et al., 2010).

It is worth noting that questions 8, 9, 15, 16, and 17 from the survey were not utilized in the data analysis because the questions did not directly align in answering the research questions. The questions were kept in the survey because of potentially providing interesting data. However, they did not reveal stunning results so they were not included in the data analysis.

Results

Research Question 1, regarding teacher perception of technology, and Research Question 2, regarding teacher's integration of technology, were answered in the first section of the survey. In the first section of the survey, participants were provided with various statements about educational technology and participants indicated the degree to which they agreed or disagreed with the statement. Numerical values were assigned to the level of agreement choices so that mathematical operations could be performed (*Strongly agree* = 5, *Agree* = 4, *Neither Agree or Disagree* = 3, *Disagree* = 2, and *Strongly Disagree* = 1). The average score, for each question, was calculated to determine the sample's general feelings. Noteworthy measures of centrality and distribution were documented.

Each Research Question is addressed, in order, in two subsequent sections. First, I provide the readers an overall view of the data including the technology statements most highly and least highly rated. Any trends or relationships that existed are presented. The survey findings are related and connected to current literature, whenever appropriate. Then, the information was compiled in order to answer the research questions in order.

Overview of Primary Results

The first major finding that the data analysis showed was that 126 out of 134 (94%) participants utilize educational technology in some capacity. The eight participants who indicated that they did not utilize technology were four males and four females. Only two of these eight were core subject teachers, they were over 40 with an average of 20 years of experience. The majority of the participants who completed the survey use some type of educational technology.

The participants were asked to classify themselves as a technology user. The participants were provided five different classifications, ranging from *entry* (level 1) to *transformation* (level 5). The data indicated that only 11% of the participants indicated being level 1 users. However, 77% of the participants indicated that they were level 2 or level 3 technology users. Only 11% of the participants indicated that they were level 4 or level 5 users, with the average age of these participants being about 40. Half of these level 4 and 5 users were core teachers and the other half were noncore teachers. To summarize, the majority of the participants felt they were level 2 or level 3 technology users, which indicted participants are not consistently using technology to engage students in authentic learning experiences.

Participants were asked about their computer usage. Participants indicated that the average number of years in which they had actively utilized educational technology within their classroom was about eight years. Participants' average number of hours in which computers were used for professional purposes was about 12 hours per week. The participants also averaged about an additional eight hours a week using computers for personal use. Participants averaged about 20 hours a week using computers.

Teachers' Perceptions of Educational Technology

To answer Research Question 1, "What are teachers' perception of educational technology?," question 13 from the survey was used (see Appendix D). The data indicated an overall mean score for all of the technology statements was 3.80. This score indicates that teachers have a slightly positive perception of educational technology because the score is closer to agreement (4.0) than neutral (3.0). This middle of the road average perception score also reveals that participants believe there is room for improvement in schools' use of educational technology.

I found that participants agreed with six of the statements below (see Table 7). The highest average participant score (4.40) was on the statement regarding teachers willingness to learn or continue to learn about ways to integrate educational technology. The data indicated that these teachers are in an ideal situation to proceed with technology reform because they are willing to receive more technology training and they felt as if their administration encourages technology integration (4.19).

Table 7

Educational Technology Statements

Technology Statement	Average Score
The school administration encourages the use of technology	4.19
My students have adequate access to computers	3.54
My school administrator(s) understands how technology can be integrated into the classroom to improve student learning	3.94
I am provided with adequate access to computers for myself.	3.99
I know how other teachers in my school use technology in their classrooms	3.54
I have sufficient time to integrate technology into my classroom instruction	3.28
Teachers in my school meet and share ideas about how to use technology in their classrooms	2.87
I understand how I can use technology to help me attain school and district standards	3.72
I believe that the use of computers in education almost always reduces the personal treatment of students	2.54
Working with computers means working on your own, without contact with others	2.10
Sometimes I wish that technology would go away	1.90
Integration of technology into classrooms is a high priority for my school administrator(s)	3.51
Integration of technology into classrooms is a high priority for me	3.90
I have sufficient training in how to integrate technology into my classroom instruction	3.24
Technology has been helpful in meeting district and state standards	3.69
Technology makes my teaching more effective	3.93
I feel that computers are important for student use	4.31
I use technology in my classroom to enhance student understanding	4.25
I use technology in my classroom to improve student skills	4.04
Technology helps me to accommodate different learning styles	4.11
Computers can be useful instructional aids in almost all subject areas	4.31
Computers can stimulate creativity in students	4.07
Available technology resources are sufficient to support student learning	3.28
I am willing to learn or continue to learn about integrating technology into my classroom	4.40
Teachers in my school are involved in decision making related to implementation of technology	3.21
I would like more training in integrating technology	4.01

Participants felt that computers can be useful instructional aides for any subject and that computers are important for students to use (4.31). From the response, it appears that most teachers are already integrating educational technology because the average score for "I use technology in my classroom to enhance student understanding" was 4.25. The percentage of participants who agree or strongly agree with the previous statement was calculated. These results align with the results of a 2009 study by Grunwald Associates LLC. They also found that participants felt that utilizing educational technology can enhance student learning, which in returned caused teachers to use technology resources in meaningful ways.

The calculation on using technology to enhance student understanding indicated that about 62% of the participants felt they used technology to enhance student understanding, which is slightly higher than a previous study. A 2008 study by Hannafin found that only 58% of the participants utilized educational technology, despite the positive feelings and beliefs about educational technology. In another study, Pac (2008) found that 80% of the participants in the study did not utilize educational technology to enhance student learning or understanding. However, of the 80%, 91% stated that they felt that educational technology is beneficial at improving student learning and understanding, but their lack of confidence prevented integration. Loertscher (2010) indicated some teachers do not utilize educational technology because they are unfamiliar with the resources. This unfamiliarity creates a sense of inadequacy and intimidation with the teacher.

Participants also indicated they received encouragement from school administrators to use educational technology (4.19). Participants indicated that administration understand how to integration educational technology (3.94). However, participants indicated they felt slightly above neutral about technology being a high priority for administration (3.51). Participants' average score about their priority to integrate technology was almost 0.5 higher, 3.90. Participants also felt slightly above neutral (3.24) about having sufficient training in how to integrate educational technology within the classroom. To summarize, everyone wants technology reform, there is a positive attitude, and participants want more training. They already have many resources they are not using. The county is well suited to provide and implement technology reform.

One statement that participants disagreed with was the statement "Sometimes I wish technology would go away" with an average response score of 1.90. In other words, participants like technology and for the most part do not want it to go away. Conversely, four participants strongly agreed that technology should go away. These teachers were males, two taught core subject areas, and the average age was 47. There were also 13 participants agreed that technology should go away. Of the 13 participants, five were core teachers, six were males, and the average age was 43. These 13 people are about 10% of the population, indicating an overall positive perception towards technology.

Two other statements that participants disagreed with was computers reduce the personal treatment of students and that working with computers means working without contact (2.54 and 2.10, respectively). This reflects a positive perception of technology. Participants indicated that they felt they did not collaborate with other teachers about ideas or strategies when integrating educational technology (2.87). While it is unclear if they felt that wanted to collaborate more, this could be inferred and reflects a positive perception of technology.

These three items are those that were intended to be disagreed with and thus it is positive in terms of their perceptions of technology. In the data tables, the numbers are consistent with participants' responses, but for data analysis they were reverse coded so a 1.9 became a 4.1 marking the data point be consistent with the other statements with high numbers indicating a positive perception. In summary, almost all participants indicated they utilized educational technology and they have a favorable perception of educational technology.

Teachers' Educational Technology Integration

In order to answer Research Question 2, "What are teachers' current level of educational technology integration?", teachers responded to various statements regarding educational technology availability and usage (see Table 8 and Table 9). To answer Research Question 2, Questions 10, 11, 12, and 14 from the survey were used (see Appendix D). These availability and use statements were asked, in combination, to determine participants' technology integration.

One of the first questions teachers answered about technology integration was the number of hours they used a computer for personal and professional use. Using Spearman rank-order the correlation coefficient was calculated to determine the relationship between personal and professional use of computers (see Table 11). The Spearman rank-order correlation between personal and professional use of computers was significant, $r(134) = .359$, $p < .01$. These data indicate a significant moderately strong positive correlation between the number of hours participants' use computers personally and professionally. In other words, as participants increase their personal computer usage, their professional computer usage also increases. This means that when teachers use computers for personal use, they are more likely to use computers for professional activities. The moderately strong positive relationship can be useful in making group predictions about personal and professional computer use.

Table 8

Correlation Among Type of Computer Use

	Computer Use	
Measure	Personal	Professional
Personal	__	.359*
Professional	.359*	__

Note. *N* = 134. $*p < .01$

Participants were provided a Likert scale to indicate their level of integration for a series of different technologies: 4 = *often*, 3 = *sometimes*, 2 = *rarely* and 1 = *never*. To create a composite score for each resource availability, numerical scores were assigned to the Likert scale. For example, 3 = *In Classroom Every Day*, 2 = A*vailable When Needed*, and 1 = *Not Available*. Theses scales were used in all tables involving availability and use.

Results are shared in terms of each type of technology included in the survey that was used most often including, projectors, interactive whiteboards, and DVD/VCR. When one looks at the distribution of data points as percentages, Table 9 below, it shows that 75% of participants indicated a projector was located within their room every day. Ninety percent of teachers indicated that a projector was in their room every day or available when needed. Sixty-two percent of participants indicated that a projector was utilized often. However, 19% of participants rarely or never used the resource.

The second most available technology resource found in participants' classrooms was DVD/VCR players (51%) with only one percent indicating that the resource is not available for use. Sixty percent of the participants indicated that DVD/VCR players are used often or sometimes. Only 10% of the participants indicated that they never utilize DVD/VCR players.

Table 9

Technology Availability and Usage by Percent

Technology Resource	Availability (%)			Used (%)			
	In classroom Daily	When Needed	Not Available	Often	Sometimes	Rarely	Never
Projector	74	16	10	62	19	6	13
Videoconference	0	19	81	0	1	4	95
Interactive Whiteboard	47	16	37	34	13	5	47
Clickers	6	45	49	1	11	13	74
Digital Cameras	14	62	24	6	26	30	38
iPod/MP3 Player	4	20	75	3	9	7	81
Document Camera	24	27	49	13	12	11	63
Scanner	10	74	16	9	31	28	33
Tablets	15	19	66	15	7	11	66
DVD/VCR	51	49	1	6	54	30	10
Airliner	7	18	75	5	1	4	89
Gaming Device	2	13	85	1	1	7	91

The third most available resource found in participants' room every day was interactive whiteboard (47%) with 37% indicating that this resource is not available for them to utilize. Even though 47% had access every day, only 34% of the participants indicated that they utilized interactive whiteboard often with 52% never or rarely utilizing interactive whiteboards. Another interesting finding is that over half of the teachers indicated that student response systems were available to utilize with students. However, 74% indicated they never utilized this technology despite being available.

Two educational technologies that are effective and simple to integrate are document cameras and student response systems. The data indicated that about half of the participants did not have access to either resource. For the 50% of the participants who had access to each resource, 88% indicated never or rarely using clickers and 74% indicated never or rarely utilizing document cameras. In other words, about half of the participants had access to each resource, but rarely ever utilized them.

When one looks at the measure of central tendency averages in Table 10 below, it appears to show similar findings as the percentage distribution. The top three resources are projectors, DVD/VCR players, and interactive whiteboards. The average score (2.63) for projectors indicates that availability is close to *In the classroom Every Day* then it is to *Available as Needed*. In other words, the majority of the participants have projectors within their classroom every day.

Table 10 indicates similar results for DVD/VCR players because the average score was 2.50. While they were both available the use of the projectors (3.31) was definitely higher than the DVD/VCR players (2.57). Even though these projectors and DVD/VCR players have similar availability, their usage is different (3.31 and 2.57, respectfully). These data show that participants utilize their projectors much more frequently than they utilize DVD/VCR players. However, the same cannot be said for interactive whiteboards availability. The average score of 2.10/3.00 indicates that the majority of these resources are available as needed. The interactive whiteboard average score indicates that participants use this resource between rarely and sometimes. When viewing Table 10 it is important to understand that availability and use are displayed using two different scales. Availability is on a scale of 1-3 and use is on a scale of 1-4.

Table 10

Technology Availability and Usage by Average

Technology Resource	Average Score	
	Availability*	Used**
Projector	2.63	3.31
Videoconference	1.19	1.06
Interactive Whiteboard	2.10	2.35
Student Response Systems (Clickers)	1.57	1.40
Digital Cameras	1.90	2.00
iPod/MP3 Player	1.29	1.34
Document Camera	1.75	1.75
Scanner	1.93	2.16
Tablets	1.49	1.71
DVD/VCR	2.50	2.57
Airliner	1.31	1.23
Gaming Device	1.17	1.11

*Scale 1-3. **Scale 1-4

The overall data about availability and use is helpful, but perhaps even more helpful in determining how much participants actually use technology is to look at the data based on resources teachers have access to and how often these resources are utilized. Table 11 below displays the technology resources and usage of only the participants who have access to the various resources. In other words, if a participant did not have access to the resource, his or her data was not included in the chart. The *n*-value fluctuates between each resource.

Table 11

Usage When Available in Classroom Every Day or As Needed

n	Technology Resource	Percent			
		Often	Sometimes	Rarely	Never
120	Projector	68	22	6	4
26	Videoconference	0	4	19	77
85	Interactive Whiteboard	54	21	7	18
68	Student Response Systems (Clickers)	3	21	26	50
102	Digital Cameras	7	31	39	23
33	iPod/MP3 Player	12	21	21	45
68	Document Camera	26	22	22	29
112	Scanner	11	37	33	20
46	Tablets	41	15	20	24
133	DVD/VCR	6	55	30	9
33	Airliner	21	6	15	58
20	Gaming Device	5	5	35	55

The data indicated some very promising results for technology resource integration. Ninety percent of the participants who had access to projectors used them often or sometimes. Seventy-five percent of participants who had access used interactive whiteboards often or sometimes. These data also show that tablets are starting to be used more frequently within the classroom because about 60% of the participants indicated that they used this resource often or sometimes.

The data also indicated two alarming findings regarding use. The first piece of information is that less than 50% of participants indicated that they used documents camera sometimes or often. The second alarming result is that less than 25% of the participants utilized clickers sometimes or often. Both of these resources are rather simple to implement and when used properly can provide students with authentic learning experiences.

To this point, none of the data that has been displayed has taken into account participants responses according to the different districts. Table 12 displays technology use according to the different districts. The data displayed is from participants who indicated they had the different technology resources available to use. The data in the table represent the percent of teachers who indicated “Sometime” or “Often” as the frequency in which they utilize the technology.

Table 12

Frequency of Technology Use According to District

Technology Resource	District				
	1*	2*	3*	4*	5*
Projector	96	96	62	62	88
Videoconference	14	0	0	0	0
Interactive Whiteboard	50	90	79	88	89
Clickers	11	41	25	25	13
Digital Cameras	46	38	36	47	8
iPod/MP3 Player	45	40	13	33	0
Document Camera	55	36	25	60	67
Scanner	26	67	47	36	82
Tablets	45	36	79	50	67
DVD/VCR	64	59	47	56	71
Airliner	38	29	13	0	38
Gaming Device	0	25	0	33	38

*Percent of participants indicating “*Sometimes*” or “*Often*”.

Table 12 shows some interesting information about technology use in the different districts. The majority of the use is similar between the different districts. Some districts lack in technology use when compared to the other districts. Not a single technology resource was used sometime or often by 75% of the district participants.

Districts 3 and 4 only used their projectors about 60% of the time, compared to the other districts, which was about 90% and above. One of the most staggering differences occurred in interactive whiteboards. District 1 teachers indicated that only 50% of teachers used interactive whiteboards sometime or often. District 3 was the next lowest district with 79%. For student response systems, every district had less than 50% and all but one district was below 25% of teachers using them sometimes or often.

Table 13 displays parts of data from participants from my study and parts from the National Center for Education Statistics [NCES] 2010 study. The results from my study are bolded. The data indicated that participants from my study indicated that they had technology resources more readily available. If the “In Classroom” category is reviewed, one can see that my participants either were tied or had the higher percentage. If the percentages were tied, my participants had a higher percentage in “As Needed”. In other words, participants indicated they had more resources available to integrate than the NCES participants. However, if one would to compare usage of those resources, one would clearly see that NCES participants utilize their available resources much more than my participants.

Table 13

Study Comparison of Technology Resources Availability and Usage

Technology Resource	Availability (%)				Use (%)	
	As Needed		In Classroom		Often	
Projector	36	**16**	48	**74**	72	**62**
Interactive Whiteboard	28	**16**	23	**47**	57	**34**
Clickers	22	**45**	6	**6**	35	**1**
Document Camera	22	**27**	17	**24**	56	**13**
Digital Camera	64	**62**	14	**14**	49	**6**

Note. Nonbolded percents from Gray, L., Thomas, N., Lewis, L., & National Center for Education Statistics [NCES], (2010). Teachers' use of educational technology in U.S. public schools: 2009. First Look. NCES 2010-040. National Center for Education Statistics. Bolded percents from this study.

Participants' responses indicated that teachers used educational technology to help students learn or practice basic skills often or sometimes 64% of the time, which is the most performed task using educational technology (see Table 14). The second most occurring task performed by students utilizing educational technology was conducting research, which occurred often or sometime 54% of the time. Slightly lower was word processing with 52% of teachers indicating students use educational technology for word processing often or sometimes. After learn and drill, conducting research, and word processing, the frequency in which teachers utilize educational technology to perform various tasks greatly declines.

Conversely, students did not perform several activities frequently with the assistance of educational technology. Sixty-eight percent of the teachers reported that they never or rarely had students creating art, music, movies, or webcasts. Another low performed activity was designing or producing product. Fifty-seven percent of teachers reported they never or rarely had students perform these tasks. About 50% of the teachers reported that they never or rarely had students conduct experiments or calculations or solve problem with the assistance of educational technology. All of the previous activities, when implemented properly, would be considered high-level and authentic learning experiences for students. Table 15 displays the average score or rating for the different student activities.

These data indicate that the activities teachers are having students complete using educational technology are only low-level assignments. In other words, teachers are not using technology to its full potential. This information confirms teachers’ responses about their level of technology integration. The majority of the teachers reported a technology level of 2 or 3, which excludes frequently using technology in authentic applications.

Table 14

Student Technology Use by Percent

Student Activity	Used (%)				
	Often	Sometimes	Rarely	Never	NA
Prepare written text	15	37	25	10	13
Create or use graphics or visual displays	9	40	24	15	12
Learn or practice basic skills	28	36	19	7	10
Conduct research	17	37	28	7	11
Correspond with others	7	16	20	39	18
Contribute to blogs or wikis	1	4	11	58	26
Use social networking websites	4	2	11	56	27
Solve problems, analyze data, or perform calculations	11	25	25	23	16
Conduct experiments or perform measurements	2	22	19	30	27
Develop and present multimedia presentations	7	32	19	26	16
Create art, music, movies, or webcasts	1	10	25	43	21
Develop or run demonstrations, models, or simulations	2	12	18	43	25
Design and produce a product	1	10	14	43	32
Other	2	10	15	19	54

Table 15

Student Technology Use by Average

Student Activity	Average Score Used
Prepare written text	2.66
Create or use graphics or visual displays	2.49
Learn or practice basic skills	2.93
Conduct research	2.72
Correspond with others	1.90
Contribute to blogs or wikis	1.33
Use social networking websites	1.39
Solve problems, analyze data, or perform calculations	2.28
Conduct experiments or perform measurements	1.95
Develop and present multimedia presentations	2.23
Create art, music, movies, or webcasts	1.63
Develop or run demonstrations, models, or simulations	1.64
Design and produce a product	1.57
Other	1.90

The data just discussed has shown that the participants have various technology resources available to use, with the most available and most used resources being projectors. Note, this does not include associated resources such as interactive whiteboards or document cameras. The majority of the participants had projectors in their rooms' every day and they were used often. The study's availability and usage was compared to NCES's national study and it was found that this study's percents were higher than the national survey regarding availability. However, the national study indicated that their participants utilized the resources much more often than this study's participants did. Participants from the study need to understand that implementing technology takes time and is inconvenient at first. It is well worth the time and inconvenience after being mastered because student learning is increased and increased teachers' efficiency reduces time teachers spend completing various tasks, and ultimately saves money (Loertscher, 2010).

The use of the different technology resources was further broken down. The use of the different resources was analyzed according to participants who had the different resources available to them to integrate. These data indicate that teachers who had access used projectors and interactive whiteboards frequently. However, documents cameras and student response systems were not utilized frequently. The aforementioned data was similar when broken down according to districts. Some districts were well behind the others when utilizing the different resources.

The data also revealed that students use technology to perform various instructional activities. However, the data showed that these activities were low-level activities such as drill and practice and preparing written text. High-level activities such as collecting measurement data for science experiments or designing or creating products were almost never used. These participants were using technology, but not to its full potential. Not utilizing technology's full potential is a shame because technology provides a customizable learning approach (Manochehri & Sharif, 2010; Project Tomorrow, 2012). Inventors have designed many learning technologies to maximize student participation and motivation, through customization, which aligns with constructivist learning approaches (Parker et al., 2008). Teachers must transition their technology usage from low level to authentic applications so that students are prepared for the 21st century workforce.

Gender Comparison: Technology Perception and Integration

Research Questions 3 and 4 regarding each gender's perception and integration of technology used items from the perception educational technology statements and teacher and students integrational use of educational technology. Because of the overlapping nature of perception and integration, this analysis looks at the technology statements individually from Table 10, which has participants' perceptions of educational technology broken down according to gender. The analysis is concluded by separating out perception and integration to answer Research Question 3 and Research Question 4 directly.

To answer Research Question 3, questions 1 and 13 from the survey were used (see Appendix D). While many of the averages were somewhat close, there were several major differences between the average scores of males and females (see Table 16). The biggest discrepancy between average responses was participants having adequate training integrating educational technology into classroom instructions. Female respondents' average score was 3.01 and the males' average score was 3.78. While female averages showed they are neutral about adequate training, males mostly agreed that they had adequate training. Not only did males feel they had adequate training, they also felt their students had better access to available technology resources than female (3.70 and 3.11, respectively).

Table 16

Educational Technology Statements by Gender

Technology Statement	Gender	
	Male	Female
The school administration encourages the use of technology	4.28	4.16
My students have adequate access to computers	4.08	3.32
My school administrator(s) understands how technology can be integrated into the classroom to improve student learning	3.95	3.94
I am provided with adequate access to computers for myself.	4.05	3.97
I know how other teachers in my school use technology in their classrooms	3.85	3.40
I have sufficient time to integrate technology into my classroom instruction	3.63	3.13
Teachers in my school meet and share ideas about how to use technology in their classrooms	3.18	2.74
I understand how I can use technology to help me attain school and district standards	4.00	3.60
I believe that the use of computers in education almost always reduces the personal treatment of students	2.83	2.41
Working with computers means working on your own, without contact with others	2.25	2.03
Sometimes I wish that technology would go away	2.35	1.71
Integration of technology into classrooms is a high priority for my school administrator(s)	3.68	3.45
Integration of technology into classrooms is a high priority for me	3.93	3.88
I have sufficient training in how to integrate technology into my classroom instruction	3.78	3.01
Technology has been helpful in meeting district and state standards	3.80	3.65
Technology makes my teaching more effective	3.90	3.95
I feel that computers are important for student use	4.18	4.37
I use technology in my classroom to enhance student understanding	4.05	4.18
I use technology in my classroom to improve student skills	3.88	4.11
Technology helps me to accommodate different learning styles	4.00	4.16
Computers can be useful instructional aids in almost all subject areas	4.20	4.35
Computers can stimulate creativity in students	4.00	4.11
Available technology resources are sufficient to support student learning	3.70	3.11
I am willing to learn or continue to learn about integrating technology into my classroom	4.30	4.45
Teachers in my school are involved in decision making related to implementation of technology	3.33	3.16
I would like more training in integrating technology	3.78	4.12

The next biggest difference was regarding students having adequate computer access. Females' average was 3.32 where the males' average was 4.08. Another noticeable difference was regarding wishing technology would disappear. Both genders disagreed with the statement, but females were in more disagreement than males (1.71 and 2.35, respectively).

There were several categories that the males and females had close average scores. Two of these areas were "I feel that computers are important for student use" and "I am willing to learn or continue to learn about integrating technology into my classroom." No participant responded that that he or she disagreed or strongly disagreed with either statement.

If all of the educational technology statements were compared, male perceptions were more in agreement or higher on about 54% of the statements. However, female perceptions of technology were higher than males regarding technology being used to enhance student learning and skills, allowing for creativity, and accommodating different learning styles. Female participants also wanted more training on integration and had a lower score on sometimes wanting technology to go away.

Table 17 emphasizes, using percentages, some of the most significant differences described above about the difference between male and female perceptions of educational technology. These data confirm that male participants had a higher average positive perception of technology, especially with access, availability, and training. In terms of Research Question 3, the data indicates the overall male participants' perception of educational technology is somewhat higher than female perception of educational technology (3.73 and 3.56, respectfully).

Table 17

Significant Educational Technology Statements by Gender

Technology Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
My students have adequate access to computers	35%	50%	3%	13%	0%
	16%	**32%**	**22%**	**28%**	**2%**
I have sufficient time to integrate technology into my classroom instruction	18%	48%	20%	10%	5%
	14%	**31%**	**19%**	**27%**	**10%**
I have sufficient training in how to integrate technology into my classroom instruction	38%	20%	25%	18%	0%
	3%	**39%**	**20%**	**30%**	**7%**
I use technology in my classroom to improve student skills	10%	15%	15%	20%	40%
	0%	**7%**	**10%**	**30%**	**53%**
Available technology resources are sufficient to support student learning	23%	40%	23%	15%	0%
	9%	**39%**	**15%**	**29%**	**9%**

Note. Female percentages are bolded

To answer Research Question 4, the technology integration data was categorized according to gender (see Table 18) using questions 1, 12, and 18 from the survey (see Appendix D). Table 18 displays participants' average score on availability and use. Regardless of gender, projectors are the most readily available and most widely used by participants. Females actually score the highest in both categories. The next highest available and used resource was interactive whiteboard, where male participants scored higher. If all the resources were compared to gender, the data indicated that the male participants had the higher average availability score on 8/12 (about 67%) of the resources and the higher average use score on 7/12 (about 58%) of the resources.

Table 18

Technology Availability and Use by Gender

Technology Resource	Availability Male	Availability Female	Use Male	Use Female
Projector	2.63	2.64	3.28	3.32
Videoconference	1.35	1.13	1.15	1.02
Interactive Whiteboard	2.13	2.07	2.7	2.38
Clickers	1.63	1.54	1.35	1.43
Digital Cameras	1.95	1.88	2.05	1.94
iPod/MP3 Player	1.4	1.24	1.53	1.26
Document Camera	1.73	1.76	1.58	1.83
Scanner	1.88	1.96	1.98	2.23
Tablets	1.58	1.46	1.95	1.61
DVD/VCR	2.5	2.5	2.53	2.59
Airliner	1.43	1.27	1.35	1.18
Gaming Device	1.28	1.13	1.15	1.1

Students performing a variety of activities utilizing educational technology was also broken down by gender (see Table 19). The highest student activity score for males and females were different. Male participants indicated that students utilized educational technology resources the most while conducting research whereas female participants indicated students used technology resources the most for learning or practicing basic skills. The second highest activity for males was preparing written text and for females was conducting research. Neither gender designed, created or produced products, or developed demonstrations, models, or simulations significantly with students. However, male participants scored higher on about 71% of the student activities.

Table 19

Student Technology Use by Gender

Student Activity	Gender	
	Male	Female
Prepare written text	2.80	2.60
Create or use graphics or visual displays	2.51	2.48
Learn or practice basic skills	2.65	3.05
Conduct research	2.81	2.67
Correspond with others	2.19	1.76
Contribute to blogs or wikis	1.42	1.28
Use social networking websites	1.40	1.41
Solve problems, analyze data, or perform calculations	2.42	2.23
Conduct experiments or perform measurements	2.04	1.92
Develop and present multimedia presentations	2.17	2.26
Create art, music, movies, or webcasts	1.75	1.58
Develop or run demonstrations, models, or simulations	1.81	1.57
Design and produce a product	1.80	1.46
Other	1.89	1.91

The previous tables regarding gender allows Research Question 3, “What is the relationship between a teacher’s gender and their perceptions of educational technology?”, and Research Question 4, “What is the relationship between a teacher’s gender and their educational technology integration?”, to be answered. Male participants scored higher in perceptions, availability, use, and student use (3.73, 1.79, 1.88, and 2.12, respectively) than female participants (3.56, 1.71, 1.82, and 2.01, respectively) (see Table 20). The data indicated that male participants had higher overall scores on all of the technology components. Answering the research questions, male participant perceive technology better than female and male participants integrate more educational technology resources. In other words, while the differences follow similar trends and are marginal; overall, male participants had a more positive perception of educational technology, perceived more resources available to them, and believed they integrate technology more frequently than female participants.

Table 20

Overall Technology Scores by Gender

Technology Component	Gender	
	Male	Female
Technology Perception	3.85	3.77
Resource Availability	1.79	1.71
Teacher Integration	1.88	1.82
Student Use	2.12	2.01

Age Comparison: Technology Perception and Integration

Research Questions 5 and 6, regarding participants' age perception and integration of technology, used items from the educational technology statements and teacher and students use of educational technology. To answer Research Question 5, questions 2 and 13 from the survey were used (see Appendix D). The participants' responses to the various educational technology statements were categorized according to age in order to answer Research Questions 5 and 6. The age brackets were broken down into ten-year increments starting at the age of 20 and going up to the age of 69 (see Table 21). The data indicated several interesting trends.

One of the most interesting trends is that the average scores for the age group of 60-69 was often the highest, meaning these participants most often agreed with the positive educational technology statements. Some may speculate that these five participants would be considered outliers or they provide interesting cases, or our preconceived notation about this age group is inaccurate for this particular county.

Table 21

Educational Technology Statements by Age

Technology Statement	Age				
	20-29	30-39	40-49	50-59	60-69
The school administration encourages the use of technology	4.15	4.12	4.29	4.16	4.80
My students have adequate access to computers	3.63	3.59	3.46	3.40	3.80
My school administrator(s) understands how technology can be integrated into the classroom to improve student learning	3.96	3.84	4.07	3.80	4.80
I am provided with adequate access to computers for myself.	4.04	4.06	4.07	3.72	4.00
I know how other teachers in my school use technology in their classrooms	3.48	3.57	3.68	3.36	3.60
I have sufficient time to integrate technology into my classroom instruction	3.74	3.35	3.00	2.80	4.00
Teachers in my school meet and share ideas about how to use technology in their classrooms	2.70	2.96	2.93	2.64	3.80
I understand how I can use technology to help me attain school and district standards	4.11	3.73	3.64	3.12	4.80
I believe that the use of computers in education almost always reduces the personal treatment of students	2.26	2.55	2.50	2.76	3.00
Working with computers means working on your own, without contact with others	1.70	2.04	2.14	2.44	2.80
Sometimes I wish that technology would go away	1.48	1.82	2.00	2.32	2.40
Integration of technology into classrooms is a high priority for my school administrator(s)	3.33	3.59	3.50	3.40	4.40
Integration of technology into classrooms is a high priority for me	4.15	3.88	3.89	3.56	4.40
I have sufficient training in how to integrate technology into my classroom instruction	3.44	3.31	3.14	2.80	4.20
Technology has been helpful in meeting district and state standards	3.85	3.71	3.64	3.36	4.60
I feel that computers are important for student use	4.56	4.29	4.32	3.96	4.60
I use technology in my classroom to enhance student understanding	4.44	4.08	4.18	3.80	4.60
I use technology in my classroom to improve student skills	4.37	3.96	4.04	3.72	4.60
Technology helps me to accommodate different learning styles	4.44	4.06	4.11	3.76	4.60
Computers can be useful instructional aids in almost all subject areas	4.56	4.31	4.29	4.04	4.40
Computers can stimulate creativity in students	4.33	4.08	4.18	3.56	4.60
Available technology resources are sufficient to support student learning	3.74	3.35	3.04	2.84	3.80
I am willing to learn or continue to learn about integrating technology into my classroom	4.59	4.39	4.43	4.16	4.60
Teachers in my school are involved in decision making related to implementation of technology	2.96	3.20	3.54	2.88	4.40
I would like more training in integrating technology	4.30	3.76	4.29	3.88	4.20

The data showed several positive and negative relationships between the statements and participants' age. Below are five statements in which a negative relationship exists between age and participants' perceptions. This means that as the participants' age increased, the perception of the technology statement decreased.

- Technology makes my teaching more effective
- Integration of technology into classrooms is a high priority for me
- I believe that the use of computers in education usually reduces the personal treatment of students.
- Technology helps me to accommodate different learning styles

These negative relationships may exist because of the participants' neutral feeling about having sufficient time and training to integrate technology effectively. Participants' scores showed they tended to feel close to neutral (3.23) that they had adequate time for training and integration. Participants indicated that they are very willing to learn or continue to learn about effective technology integration because the average score for the age groups was 4.43.

The data indicated one negative and three positive relationships. The three positive relationships were negative statements about educational technology, which makes them negative relationships. In other words, with increasing age, teachers' statements were negative towards educational technology. The four negative trends were regarding adequate student access to computers, wanting technology to stay around, and computers increasing the personal connection with students. The data indicated that these negative feelings/trends may be due to the fact that participants felt as if they don't have adequate time or training and that their students do not have adequate access to computers.

The patterns that emerged were verified mathematically by calculating the Spearman rank order correlation coefficient (see Table 22). The table presents the information of the Spearman rank order correlation coefficient, $r(134) = -.246$, which was significant at the $p < .01$ level. Because there is a relationship between participants' age and their perception of educational technology and the data is significant and the .01 level, the null hypothesis is rejected. The correlation coefficient value of $r(134) = -.246$ represents a slight relationship. This correlation coefficient is useful in examining relationships between age and perception, but not necessarily accurate for group or individual predictions of those variables (Lodico et. al., 2010). In other words, there was a negative correlation between participants' age and how they perceived educational technology. As teachers got older, they had a more negative perception of technology.

Table 22

Correlations between Teachers' Age and Technology Perception

Measure	Age	Perception
Age	__	-.246*
Perception	-.246*	__

Note. *N* =134. * Correlation is significant at the .01 level (2-tailed).

The following information and data helped provide insights into Research Question 6, participants' age and integration of educational technology using questions 2, 12, and 18 from the survey (see Appendix D). The data indicated one negative relationship between various technologies' availability and participants' age (see Table 23). The negative relationship was projector availability. No positive relationships were found. Two age groups stood out as not having technology resources available to use. Combined participants aged 40-49 and 50-59 had the lowest average score on 75% of the availability of technology resources. When looking at low average scores of technology usage the age group 50-59 had the lowest average score on about 42% of the resources. Conversely, the age groups 20-29 and 60-69 had the highest average scores on two-thirds of the resources. Interestingly, participants in the age group 20-29 also scored the lowest usage on about 42% of the resources. Every age group revealed that projectors were the most available resource and the most usage resource by all groups except 60-69, which rated digital cameras as the highest. Airliners and gaming devices were the least available.

Table 23

Technology Availability and Use by Age

Technology Resource	Age 20-29		30-39		40-49		50-59		60-69	
Projector	2.81	**3.52**	2.67	**3.37**	2.57	**3.39**	2.52	**3.04**	2.20	**2.40**
Videoconference	1.19	**1.00**	1.22	**1.06**	1.14	**1.04**	1.16	**1.08**	1.40	**1.40**
Interactive Whiteboard	2.11	**2.37**	2.29	**2.57**	2.21	**2.61**	1.68	**1.48**	1.80	**1.80**
Clickers	1.52	**1.26**	1.69	**1.45**	1.64	**1.71**	1.32	**1.28**	1.40	**1.00**
Digital Cameras	1.89	**1.81**	1.92	**1.88**	1.82	**2.07**	1.96	**2.20**	2.00	**2.80**
iPod/MP3 Player	1.26	**1.22**	1.35	**1.33**	1.29	**1.54**	1.20	**1.20**	1.40	**1.60**
Document Camera	1.81	**1.81**	1.76	**1.63**	1.86	**2.04**	1.52	**1.52**	1.80	**2.20**
Scanner	1.96	**2.22**	1.92	**2.20**	1.93	**2.18**	1.96	**1.96**	1.80	**2.20**
Tablets	1.41	**1.63**	1.65	**1.76**	1.29	**1.75**	1.44	**1.56**	1.80	**2.60**
DVD/VCR	2.70	**2.41**	2.47	**2.57**	2.32	**2.54**	2.56	**2.72**	2.40	**2.40**
Airliner	1.04	**1.00**	1.31	**1.12**	1.61	**1.39**	1.28	**1.40**	1.40	**1.20**
Gaming Device	1.11	**1.07**	1.24	**1.14**	1.14	**1.07**	1.08	**1.12**	1.40	**1.20**

Note. Nonbold is availability (scale 1-3). Bold is usage (scale 1-4).

The data in Table 24 indicated that participants aged 30-39 scored the lowest on about 70% of the student activities in which educational technology was used. These participants scored the highest when it came to using technology for learning or practicing basic skills. Participants in the age group 60-69 had the highest average scores on about 70% of the student activities. As previously mentioned, participants in the age group 60-69 may be an exception because the age group only contained five participants. If this age group is excluded, participants 40-49 had the highest average scores on about 70% of the student activities.

Table 24

Student Technology Use by Age

Student Activity	Age				
	20-29	30-39	40-49	50-59	60-69
Prepare written text	2.73	2.51	2.81	2.57	3.00
Create or use graphics or visual displays	2.68	2.29	2.71	2.40	2.40
Learn or practice basic skills	2.91	3.05	2.86	2.86	2.80
Conduct research	2.78	2.50	2.88	2.55	3.00
Correspond with others	1.82	1.72	2.16	1.74	3.00
Contribute to blogs or wikis	1.35	1.22	1.42	1.25	1.60
Use social networking websites	1.45	1.06	1.50	1.81	1.80
Solve problems, analyze data, or perform calculations	2.14	2.10	2.65	2.29	2.40
Conduct experiments or perform measurements	1.90	1.91	2.04	1.82	2.50
Develop and present multimedia presentations	2.32	2.05	2.44	2.11	2.60
Create art, music, movies, or webcasts	1.73	1.38	1.70	1.82	2.00
Develop or run demonstrations, models, or simulations	1.50	1.54	1.83	1.60	2.20
Design and produce a product	1.56	1.39	1.83	1.36	2.20
Other	2.33	1.58	2.00	1.90	1.67

Despite the several patterns that emerged, mathematically there was virtually no relationship between age and technology perception (see Table 25). The table presents the information of the Spearman Rank correlation coefficient, $r(134) = .053$, which was not significant at the $p < .05$ level. In other words, there was no correlation between participants' age and technology integration. The null hypothesis is accepted. Given the fact that there were no trends between age and integration, which was verified mathematically, Research Question 6 can be answered by saying there is no relationship between age and technology integration.

Table 25

Correlations between Teachers' Age and Technology Integration

Measure	Age	Integration
Age	__	.053
Integration	.053	__

Note. *N* =134.

To help answer Research Questions 5 and 6, as a whole, Table 26 was created to display the overall average scores on perception, availability, teacher integration, and student use for each age group. The data showed that participants aged 60-69 had the highest scores on technology perceptions and student use. Participants aged 30-39 had the highest score on available resources and participants age 40-49 scored the highest on teacher integration. Participants in the age group 50-59 had the lowest scores in technology perception, resource availability, and teacher integration. The randomness of the information makes it difficult to determine one age group that has the best technology score. It can be easily determined that participants aged 50-59 are not fond of technology because they scored the lowest on 75% of the technology components.

Table 26

Overall Technology Scores by Age

Technology Component	Age				
	20-29	30-39	40-49	50-59	60-69
Technology Perception	3.98	3.80	3.81	3.48	4.22
Resource Availability	1.73	1.79	1.74	1.64	1.73
Teacher Integration	1.78	1.84	1.94	1.71	1.90
Student Use	2.09	1.88	2.20	2.01	2.37

Teaching Experience Comparison: Technology Perception and Integration

Research Questions 7 and 8 regarding participants' years of teaching experience and perception and integration of technology used items from the educational technology statement and teacher and student use of educational technology. To answer Research Question 7, questions 7 and 13 from the survey were used (see Appendix D). The data only showed one negative relationship between years of experience and perception regarding technology increasing the personal contact with others. In other words, the more years of teaching experience the participant had, the more they thought technology reduced personal contact with students. Teachers with 1-9 years of experience scored 3.11 and teachers with 30+ years of experience scored 2.50.

The data indicated that one group of participants perceived technology highly and another group did not (see Table 27). Participants with 1-9 years of teaching experience had the highest average score on about 75% of the statements. Conversely, participants with 20-29 years of teaching experience had the lowest average score on about 75% of the statements. Participants with 30+ years of teaching experience had the second highest average score on the remaining 25% of the statements. Participants from the highest and lowest groups had the highest perceptions of educational technology and participants with 20-29 years of experience had the least favorable perceptions.

It was mathematically confirmed that participants with 1-9 years of experience scored the highest and participants with 20-29 years of teaching experience scored the lowest (see Table 28). The table presents the information of the Spearman rank order correlation coefficient, $r(134) = -.227$, which was significant at the $p < .01$. The correlation coefficient value represents a slight negative relationship. Because there is a significant negative relationship between years of experience and technology perceptions, the null hypothesis is rejected.

In other words, there was a negative correlation between participants' experience and technology perception. This means that the higher a teachers' experience level, the lower their perception of technology. Moreover, the lower a teachers' experience level, their technology perception increased. The slightly negative correlation means there is a dramatic difference between experienced and nonexperienced teachers' perceptions of technology. It is consistent with previous research that indicates older teachers are less familiar and less positive about technology. The data did not show much in the terms of revealing trends or patterns. However, mathematically there was a negative relationship between years of teaching experience and perception, answering Research Question 7.

Table 27

Educational Technology Statements by Experience

Technology Statement	Experience			
	1-9	10-19	20-29	30+
The school administration encourages the use of technology	4.08	4.26	4.10	4.57
My students have adequate access to computers	3.64	3.38	3.60	3.64
My school administrator(s) understands how technology can be integrated into the classroom to improve student learning	3.91	3.96	3.80	4.21
I am provided with adequate access to computers for myself.	4.13	4.02	3.60	3.93
I know how other teachers in my school use technology in their classrooms	3.60	3.60	3.25	3.50
I have sufficient time to integrate technology into my classroom instruction	3.62	3.06	2.80	3.36
Teachers in my school meet and share ideas about how to use technology in their classrooms	2.94	2.81	2.60	3.21
I understand how I can use technology to help me attain school and district standards	3.89	3.57	3.45	3.93
I believe that the use of computers in education almost always reduces the personal treatment of students	2.43	2.55	2.50	2.93
Sometimes I wish that technology would go away	1.58	1.96	2.40	2.21
Integration of technology into classrooms is a high priority for my school administrator(s)	3.51	3.40	3.55	3.86
Integration of technology into classrooms is a high priority for me	4.08	3.77	3.75	3.86
I have sufficient training in how to integrate technology into my classroom instruction	3.40	3.09	2.95	3.57
Technology has been helpful in meeting district and state standards	3.85	3.57	3.55	3.71
Technology makes my teaching more effective	4.11	3.91	3.60	3.79
I feel that computers are important for student use	4.53	4.28	4.00	4.07
I use technology in my classroom to enhance student understanding	4.25	4.13	3.95	4.07
I use technology in my classroom to improve student skills	4.15	4.00	3.80	4.07
Technology helps me to accommodate different learning styles	4.30	4.11	3.65	4.07
Computers can be useful instructional aids in almost all subject areas	4.42	4.36	4.00	4.14
Computers can stimulate creativity in students	4.21	4.13	3.70	3.93
Available technology resources are sufficient to support student learning	3.51	3.13	3.00	3.36
I am willing to learn or continue to learn about integrating technology into my classroom	4.57	4.34	4.20	4.29
Teachers in my school are involved in decision making related to implementation of technology	3.19	3.19	3.05	3.57
I would like more training in integrating technology	4.21	3.79	4.20	3.79

Table 28

Correlations between Teachers' Experience and Technology Perception

Measure	Experience	Perception
Experience	__	-.227*
Perception	-.227*	__

Note. *N* =134. *. Correlation is significant at the .01 level (2-tailed).

To help answer Research Question 8, availability and integration data were categorized according to participants' years of teaching experience (Table 29 and Table 30) using questions 7, 12, and 18 from the survey (see Appendix D). Participants with 10-19 years of experience had the highest average score on about 60% of the resources, regarding availability, which was the most of any group. The next highest was participants with 30+ years of experience with 25% of the highest average scores. Conversely, participants with 20-29 years of experience had the lowest average scores on about 60% of technology resource availability. Each group indicated that projectors were the most available and most widely used resource.

Table 29

Technology Availability and Use by Experience

Technology Resource	Experience							
	1-9		10-19		20-29		30+	
Projector	2.66	**3.38**	2.68	**3.32**	2.55	**3.40**	2.50	**2.86**
Videoconference	1.19	**1.06**	1.19	**1.02**	1.20	**1.05**	1.21	**1.21**
Interactive Whiteboard	2.15	**2.47**	2.19	**2.38**	2.00	**2.25**	1.79	**1.93**
Clickers	1.47	**1.38**	1.74	**1.53**	1.45	**1.20**	1.50	**1.21**
Digital Cameras	1.83	**1.83**	1.91	**1.96**	1.90	**2.25**	2.14	**2.43**
iPod/MP3 Player	1.28	**1.36**	1.34	**1.34**	1.20	**1.30**	1.29	**1.29**
Document Camera	1.79	**1.77**	1.74	**1.66**	1.60	**1.75**	1.79	**1.86**
Scanner	1.92	**2.30**	1.89	**2.00**	2.05	**2.15**	1.93	**2.14**
Tablets	1.58	**1.75**	1.45	**1.57**	1.30	**1.75**	1.57	**1.93**
DVD/VCR	2.55	**2.49**	2.57	**2.77**	2.25	**2.35**	2.43	**2.50**
Airliner	1.28	**1.17**	1.28	**1.21**	1.45	**1.35**	1.36	**1.36**
Gaming Device	1.13	**1.11**	1.23	**1.06**	1.05	**1.10**	1.29	**1.29**

Note. Nonbolded is availability (scale 1-3). Bolded is usage (scale 1-4).

Table 29 also shows that participants with 30+ years of teaching experience had the highest average usage score on 50% of the resources, which was the highest of any group. Participants with 10-19 years of experience had the lowest average score on about 42% of the resource, which was the lowest scores of any group. Two negative trends were found between resource integration and years of teaching experience. The two resources were interactive whiteboards and iPod/MP3 players. Teachers with 1-9 years of experience had a usage score of 2.47 for interactive whiteboards. This score decreased with each grouping, finally ending with a score of 1.93. Similar results occurred for the iPod/MP3 Players. As participants had more years of teaching experience, the less they used interactive whiteboards and iPod/MP3 Players.

Another measure of teacher integration was student use. Table 30 displays the average scores for various activities in which students use educational technology. To summarize the data, I tabulated the percent of average scores for each experience bracket. Just like teacher use, participants with 30+ years of teaching experience had the highest average score on 50% of the activities. Participants with 20-29 years of experience came in a close second with about 43%. Therefore, 20-30+ years of experience (combining the top two categories) had the highest average score on about 93% of the student activities, which is all but one. That one activity was “other” activities, clearly not important; showing that in this sample, years of experience increases teacher integration of technology into student activities.

In contrast, participants with 10-19 years of experience scored the lowest on the majority of the questions (50%). In other words, the combined two categories of 1-19 years of experience were lower than 20-30+ years of experience. In order to test if experience and technology use were significantly different. A Spearman rank-order correlation was conducted on experience and student technology use and found the correlation coefficient to be $r(134) = .100$ and not statistically significant at $p < .05$. A Spearman rank-order correlation was also conducted on experience and teacher technology use and found the correlation coefficient to be $r(134) = .033$ and not statistically significant at $p < .05$.

Table 30

Student Technology Use by Experience

Student Activity	Used			
	1-9	10-19	20-29	30+
Prepare written text	2.62	2.63	2.94	2.57
Create or use graphics or visual displays	2.49	2.43	2.75	2.36
Learn or practice basic skills	2.85	3.07	3.12	2.57
Conduct research	2.74	2.67	2.82	2.64
Correspond with others	1.93	1.71	2.13	2.08
Contribute to blogs or wikis	1.28	1.16	1.46	1.67
Use social networking websites	1.33	1.12	1.85	1.92
Solve problems, analyze data, or perform calculations	2.21	2.29	2.69	2.46
Conduct experiments or perform measurements	1.82	1.85	2.08	2.50
Develop and present multimedia presentations	2.20	2.10	2.27	2.64
Create art, music, movies, or webcasts	1.65	1.45	1.79	1.92
Develop or run demonstrations, models, or simulations	1.57	1.51	1.91	2.00
Design and produce a product	1.54	1.42	1.73	1.92
Other	2.04	1.85	1.73	1.88

Despite the several trends that emerged, mathematically there is no relationship between years of teaching experience and technology integration (see Table 31). The table presents the information of the Spearman rank order correlation coefficient, $r(134) = .079$, which was not significant at the $p < .05$ level. The correlation coefficient value of $r(134) = .079$ indicates no relationship between the variables. The null hypothesis is accepted. In other words, there was no correlation between participants’ age and how they perceived educational technology.

Table 31

Correlations between Teachers' Experience and Technology Integration

Measure	Experience	Integration
Experience	__	.079
Integration	.079	__

Note. *N* =134.

Each table in this section has provided valuable and insightful data. However, Table 32 displays each group's overall technology score for perception, resource availability, teacher integration, and student use. The data indicates an unclear distinction for any category because each category has the highest score in one of the technology components, except 30+ years. However, on the low end, participants with 10-19 and 20-29 years of experience each scored the lowest on two categories. When combined together, these two groups had the lowest score for all of the technology components. One would assume that participants with 1-9 or 30+ years of experience would have the best overall technology score because neither group had one of the lowest scores. If this information is paired with the correlation coefficients, it is clear to see that there is no true relationship between years of teaching experience and technology perception and integration.

Table 32

Overall Technology Scores by Experience

Technology Component	Teaching Experience (Years)			
	1-9	10-19	20-29	30+
Technology Perception	3.93	3.74	3.58	3.80
Resource Availability	1.74	1.77	1.67	1.73
Teacher Integration	1.84	1.82	1.83	1.83
Student Use	2.02	1.95	2.23	2.22

Subject Comparison: Technology Perception and Integration

Research Questions 9 and 10 regarding participants' teaching subject area taught and perception and integration of technology used items from the educational technology statement and teacher and students use of educational technology. To answer Research Question 9, questions 5 and 13 from the survey were used (see Appendix D). The cross tabulation of educational technology statements and subject area taught provided wonderful data. Not surprisingly, the highest overall score was for participants who taught technology courses. Technology participants had the highest average score on about 35% of the questions. Foreign language participants were a close second with the highest on about 32% of the questions. The visual/performing arts had the lowest average scores. They scored the lowest on about 32% of the questions.

Participants who taught technology courses scored the lowest average on whether or not they would like more training on technology integration. Conversely, language arts had the highest average score. Participants also rated their level of priority for technology integration. Special education participants had the highest average rate with technology teacher a close second. However, the visual/performing arts, vocational education, and

Health/P.E had the lowest average rates. The special education teachers also were the most passionate about not wishing technology would go away (*n* = 12).

When looking at the core subjects, language arts scored at the top the most and elementary and mathematics scored at the bottom the majority of the time. When looking at the noncore subjects, technology teachers scored the highest with foreign language teachers coming in second. The lowest scoring noncore subject was visual/performing arts.

Table 33 compares the average statement scores of the core subjects versus the noncore subjects (see Table 33). The second table, Table 34, highlights some of the major perception differences between the two subjects. The core subject scored higher on nearly 70% (17/25) of the educational technology statements.

The biggest difference between core and noncore average scores (0.47) was on the statement about wishing educational technology would go away. As noted in the second table below, Table 34, when you combine the agree and strongly agree into one category only seven percent of core teachers disagreed or strongly disagreed with this statement as opposed to the 24% of noncore teachers. Core teachers were more passionate about *not* wanting technology to go away.

The next biggest difference, in which core participants scored higher (0.34), was their perception about administration encouraging technology integration. The data indicated a 20-percentage point difference between core and noncore participants (85% and 65%, respectively). There was also about a 20-percentage point difference in perception regarding wanting additional technology integration training. Once again, core participants agreed with this statement more than noncore participants (65% and 8%, respectively). Table 34 reinforces the information just presented, except through percentages. The table also provides detailed information about how participants answered.

Table 33

Educational Technology Statements by Subject

Technology Statements	Subjects	
	Core	Noncore
The school administration encourages the use of technology	4.15	3.82
My students have adequate access to computers	3.40	3.65
My school administrator(s) understands how technology can be integrated into the classroom to improve student learning	3.94	3.92
I am provided with adequate access to computers for myself.	3.90	4.06
I know how other teachers in my school use technology in their classrooms	3.49	3.49
I have sufficient time to integrate technology into my classroom instruction	3.14	3.49
Teachers in my school meet and share ideas about how to use technology in their classrooms	2.91	2.90
I understand how I can use technology to help me attain school and district standards	3.69	3.65
I believe that the use of computers in education almost always reduces the personal treatment of students	2.47	2.59
Working with computers means working on your own, without contact with others	2.04	2.33
Sometimes I wish that technology would go away	1.73	2.20
Integration of technology into classrooms is a high priority for my school administrator(s)	3.48	3.57
Integration of technology into classrooms is a high priority for me	3.96	3.73
I have sufficient training in how to integrate technology into my classroom instruction	3.11	3.31
Technology has been helpful in meeting district and state standards	4.15	3.84
Technology makes my teaching more effective	3.97	3.78
I feel that computers are important for student use	4.31	4.24
I use technology in my classroom to enhance student understanding	4.14	4.12
I use technology in my classroom to improve student skills	4.12	4.04
Technology helps me to accommodate different learning styles	4.15	3.94
Computers can be useful instructional aids in almost all subject areas	4.32	4.29
Computers can stimulate creativity in students	4.13	3.96
Available technology resources are sufficient to support student learning	3.15	3.51
I am willing to learn or continue to learn about integrating technology into my classroom	4.42	4.31
Teachers in my school are involved in decision making related to implementation of technology	3.21	3.29
I would like more training in integrating technology	4.12	3.84

Table 34

Significant Perception Differences on Technology Statement According to Subject

Technology Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The school administration encourages the use of technology	35%	50%	11%	5%	0%
	22%	**43%**	**29%**	**6%**	**0%**
My students have adequate access to computers	18%	34%	19%	27%	2%
	22%	**43%**	**12%**	**22%**	**0%**
I have sufficient time to integrate technology into my classroom instruction	17%	27%	18%	28%	10%
	10%	**51%**	**18%**	**18%**	**2%**
Sometimes I wish that technology would go away	2%	5%	11%	28%	54%
	4%	**20%**	**8%**	**27%**	**41%**
Available technology resources are sufficient to support student learning	12%	34%	19%	28%	7%
	12%	**51%**	**16%**	**16%**	**4%**
I would like more training in integrating technology	33%	50%	13%	5%	0%
	22%	**43%**	**31%**	**4%**	**0%**

Note. Nonbolded values are core subjects and bolded values are noncore subjects

There is more to technology than just teachers' perceptions. Table 35 and Table 36 display participants' integration according to core and noncore subjects. To answer Research Question 10, questions 5, 12, and 18 from the survey were used (see Appendix D). Technology resource availability and use are similar between core and noncore participants. Each group scored the highest on half of the resources. For resource availability, noncore participants had seven high average scores and core participants only had five. However, a huge difference exists regarding student activities that utilize technology. Noncore participants scored higher on about 80% of student activities that utilize technology. Noncore teachers use more educational technology with student activities than core teachers do.

Table 35

Student Technology Use by Subject

Technology Resource	Subject			
	Core		Noncore	
Projector	2.70	**3.45**	2.47	**2.98**
Videoconference	1.14	**1.06**	1.24	**1.08**
Interactive Whiteboard	2.14	**2.55**	1.90	**1.94**
Student Response Systems (Clickers)	1.61	**1.54**	1.43	**1.18**
Digital Cameras	1.87	**2.00**	1.96	**2.10**
iPod/MP3 Player	1.27	**1.37**	1.31	**1.33**
Document Camera	1.80	**1.92**	1.59	**1.49**
Scanner	1.91	**2.29**	2.02	**2.00**
Tablets	1.44	**1.60**	1.53	**1.92**
DVD/VCR	2.50	**2.52**	2.39	**2.57**
Airliner	1.29	**1.21**	1.29	**1.24**
Gaming Device	1.18	**1.12**	1.24	**1.24**

Note. Nonbolded is availability (scale 1-3). Bold is usage (scale 1-4).

Table 36

Student Technology Use by Subject

Student Activity	Use	
	Core	Noncore
Prepare written text	2.57	2.88
Create or use graphics or visual displays	2.38	2.59
Learn or practice basic skills	3.17	2.68
Conduct research	2.66	2.98
Correspond with others	1.74	2.24
Contribute to blogs or wikis	1.25	1.30
Use social networking websites	1.27	1.58
Solve problems, analyze data, or perform calculations	2.29	2.20
Conduct experiments or perform measurements	2.12	1.80
Develop and present multimedia presentations	2.22	2.41
Create art, music, movies, or webcasts	1.45	1.90
Develop or run demonstrations, models, or simulations	1.64	1.79
Design and produce a product	1.57	1.64
Other	1.72	2.23

The four core subject data were analyzed according to availability and usage. Math and science responses and language arts and social studies responses were paired together. The pairings were made because of the natural interdisciplinary connections between the subjects. The data indicated no large difference between these subjects availability. The biggest difference was 0.26 on interactive whiteboards. The usage data also did not show any large differences. The biggest difference was 0.63 on tablets. The same set of core subjects was compared according to various types of activities where students use technology resources. The same results were revealed. Neither group performed any of the activities more than the other group. There is no difference in technology resource availability, use, and student activities between core subjects.

An answer to Research Question 9, regarding teachers perception of educational technology according to subject, is hard to determine. As stated above, core and noncore teachers each have positive perceptions about different aspects of educational technology. Table 37 displays an overall score for technology perception and core and noncore participants virtually had the same score. Answering Research Question 10, regarding technology integration according to subject, is slightly easier to determine than Research Question 9. However, there is no clear-cut winner for integration because higher integration depends on the type.

To illustrate how close core and noncore are with technology perception and integration, an overall technology score was calculated from the four components in the table. The calculations indicated an almost identical technology score between core and noncore teachers (2.36 and 2.34, respectively). Core participants are better at integrating technology resources than noncore participants (1.89 and 1.76, respectively). Noncore teachers are better at integrating technology with student activities than core participants (2.16 and 2.00, respectively).

Table 37

Overall Technology Scores by Subject

Technology Component	Subject	
	Core	Noncore
Technology Perception	3.81	3.75
Resource Availability	1.74	1.70
Teacher Integration	1.89	1.76
Student Use	2.00	2.16

Grade Comparison: Technology Perception and Integration

Another teacher characteristic compared to the participants' perceptions, on various educational technology statements, was participants' grade level. To answer Research Question 11, questions 6 and 13 from the survey were used (see Appendix D). Looking at each grade level individually the prekindergarten grade level scored the lowest on about 56% of the statements. However, it is worthy of noting that only one participant comprised the data. If one were to exclude the prekindergarten category, the kindergarten grade level scored the lowest on about 28% of the statements. Two grade levels scored the highest on about 25% of the questions, kindergarten and eighth grade.

The data were categorized into traditional grade bands, Pre-K-3, 4-8, and 9-12 (see Table 38). The grade level bands showed many positive perceptions between participants' grade level and the technology statements.

Nearly 40% of the statements resulted in a positive perception of technology. The data indicated three statements that had large differences between Pre-K-3 and 9-12. The three statements were about students having adequate access to computers, participants having adequate technology integration training, and participants using technology to enhance student learning (0.54, 0.66, 0.43, respectfully). The data only indicted one negative perception and that was positive for their appreciation of technology integration: Participants want more technology integration training.

Table 38

Educational Technology Statements by Grade

Technology Statements	Grade		
	Pre-K-3	4-8	9-12
The school administration encourages the use of technology	4.03	4.09	4.24
My students have adequate access to computers	3.18	3.64	3.72
My school administrator(s) understands how technology can be integrated into the classroom to improve student learning	3.89	3.96	3.92
I am provided with adequate access to computers for myself.	3.79	4.02	4.11
I know how other teachers in my school use technology in their classrooms	3.42	3.70	3.53
I have sufficient time to integrate technology into my classroom instruction	3.16	3.21	3.51
Teachers in my school meet and share ideas about how to use technology in their classrooms	2.97	2.98	2.90
I understand how I can use technology to help me attain school and district standards	3.71	3.82	3.78
Working with computers means working on your own, without contact with others	2.29	2.35	2.13
Sometimes I wish that technology would go away	1.95	1.86	2.14
Integration of technology into classrooms is a high priority for my school administrator(s)	3.37	3.54	3.64
Integration of technology into classrooms is a high priority for me	3.84	3.80	3.90
I have sufficient training in how to integrate technology into my classroom instruction	2.95	3.05	3.60
Technology has been helpful in meeting district and state standards	3.68	3.74	3.70
Technology makes my teaching more effective	3.84	3.99	3.92
I feel that computers are important for student use	4.39	4.33	4.27
I use technology in my classroom to enhance student understanding	3.79	4.14	4.22
I use technology in my classroom to improve student skills	3.68	3.95	4.05
Technology helps me to accommodate different learning styles	3.74	4.12	4.09
Computers can be useful instructional aids in almost all subject areas	4.26	4.31	4.33
Computers can stimulate creativity in students	3.95	4.08	3.85
Available technology resources are sufficient to support student learning	3.26	3.47	3.38
I am willing to learn or continue to learn about integrating technology into my classroom	4.24	4.40	4.42
Teachers in my school are involved in decision making related to implementation of technology	3.32	3.36	3.21
I would like more training in integrating technology	4.00	3.97	3.89

Table 39 displays teachers' responses regarding technology availability and usage according to grade levels. The data indicated a clear distinction between technology availability/use and participants' grade level. Six positive trends were revealed in technology availability and six positive trends were revealed in teacher use of technology resources. The same six technology resources provide the trends in each category (projector, videoconference, iPod/MP3 player, scanner, airliner, and gaming device). These positive trends reinforce the data about pre-K-3 participants who generally scored lower on technology availability and usage. Meanwhile 9-12 participants generally scored higher. Leaving the teachers in Grades 4-9 feel in the middle most of the time regarding technology availability and technology usage. There is an inverse U-shape for document cameras. In other words, teachers in Grades 4-9 use documents cameras the most and teachers in pre-K-3 and 9-12 are lower.

Table 39

Technology Availability and Use by Grade

Technology Resource	Grade Level					
	Pre-K-3		4-8		9-12	
Projector	2.47	**2.89**	2.53	**3.09**	2.66	**3.20**
Videoconference	1.16	**1.03**	1.23	**1.06**	1.26	**1.09**
Interactive Whiteboard	1.89	**2.11**	1.89	**2.04**	2.18	**2.31**
Clickers	1.55	**1.34**	1.53	**1.38**	1.59	**1.27**
Digital Cameras	2.00	**2.16**	1.83	**1.85**	1.96	**2.07**
iPod/MP3 Player	1.03	**1.05**	1.26	**1.33**	1.43	**1.47**
Document Camera	1.76	**1.82**	1.83	**1.90**	1.75	**1.63**
Scanner	1.79	**1.82**	1.91	**2.06**	1.96	**2.12**
Tablets	1.29	**1.32**	1.61	**1.93**	1.48	**1.67**
DVD/VCR	2.61	**2.61**	2.37	**2.54**	2.47	**2.41**
Airliner	1.08	**1.03**	1.31	**1.24**	1.40	**1.36**
Gaming Device	1.00	**1.00**	1.20	**1.13**	1.21	**1.17**

Note. Nonbolded is availability (scale 1-3). Bolded is usage (scale 1-4).

To help answer Research Question 12, data of student use of technology resources during various activities were collected (see Table 40) using questions 6, 12, and 18 from the survey (see Appendix D). The data showed similar results as teacher integration. Many positive relationships existed between student activity and participant grade level. High school teachers were engaging students the most in about 65% of the student activities. In other words, high school teachers had students performing activities supplemented by technology more frequently than middle or elementary teachers.

Table 40

Student Technology Use by Grade

Student Activity	Pre-K-3	4-8	9-12
Prepare written text	2.08	2.60	2.98
Create or use graphics or visual displays	1.80	2.65	2.73
Learn or practice basic skills	3.06	2.80	2.65
Conduct research	2.03	2.60	2.97
Correspond with others	1.33	1.79	2.20
Contribute to blogs or wikis	1.78	1.45	1.40
Use social networking websites	1.87	1.42	1.48
Solve problems, analyze data, or perform calculations	2.36	2.19	2.45
Conduct experiments or perform measurements	1.91	1.95	2.07
Develop and present multimedia presentations	2.00	2.26	2.48
Create art, music, movies, or webcasts	1.23	1.74	1.87
Develop or run demonstrations, models, or simulations	2.00	2.26	2.48
Design and produce a product	1.28	1.57	1.64
Other	1.81	2.20	1.95

The information from the section has provided the needed information to answer Research Question 11, “What is the relationship between a teacher’s grade level and their perceptions of educational technology?’, and Research Question 12, “What is the relationship between a teacher’s grade level and their educational technology integration?” As previously stated, the data have indicated that there is a positive connection between technology and grade level. The sections above helped provide overall answers to Research Questions 11 and 12, overall scores for perceptions availability, and integration were calculated (see Table 41). The overall technology scores also received a positive association between the technology components and grade level. One can conclude the higher-grade level a participant teaches, the higher the level of technology perception and integration.

Table 41

Overall Technology Scores by Grade

Technology Component	Grade Level		
	Pre-K-3	4-8	9-12
Technology Perception	3.67	3.81	3.82
Resource Availability	1.64	1.71	1.78
Teacher Integration	1.68	1.80	1.81
Student Use	1.90	2.11	2.24

Education Level Comparison: Technology Perception and Integration

To answer Research Question 13, regarding perception and highest level of educational attainment, questions 3 and 13 from the survey were used (see Appendix D). The level of educational attainment revealed many relationships (see Table 42). There were 13 negative and three positive relationships found after the average scores were calculated. The three positive relationships of highest level of educational attainment and agreement with statements were:

- The school administration encourage the use of technology
- My students have adequate access to computers
- Teachers in my school are involved in decision making related to implementation of technology.

The negative responses came from a wide range of topic statements. Below are a few of the statements that resulted in negative relationships. The higher the education level, the less participants agreed with the following statements.

- Integration of technology into classrooms is high priority for me.
- I feel that computers are important for student use.
- Technology helps me accommodate different learning styles.
- I am willing to learn or continue to learn about integrating technology into my classroom.

Table 42

Educational Technology Statements by Education Level

Technology Statement	Education Level		
	Bachelor's	Master's	Professional
The school administration encourages the use of technology	4.18	4.19	4.50
My students have adequate access to computers	3.50	3.55	4.00
My school administrator(s) understands how technology can be integrated into the classroom to improve student learning	3.95	3.93	4.00
I am provided with adequate access to computers for myself.	3.93	4.02	4.00
I know how other teachers in my school use technology in their classrooms	3.66	3.47	3.75
I have sufficient time to integrate technology into my classroom instruction	3.43	3.20	3.25
Teachers in my school meet and share ideas about how to use technology in their classrooms	2.93	2.84	3.00
I understand how I can use technology to help me attain school and district standards	3.89	3.63	3.75
I believe that the use of computers in education almost always reduces the personal treatment of students	2.41	2.59	3.75
Working with computers means working on your own, without contact with others	2.05	2.12	2.25
Sometimes I wish that technology would go away	1.82	1.91	2.75
Integration of technology into classrooms is a high priority for my school administrator(s)	3.41	3.56	3.75
Integration of technology into classrooms is a high priority for me	3.98	3.86	3.75
I have sufficient training in how to integrate technology into my classroom instruction	3.32	3.17	3.75
Technology has been helpful in meeting district and state standards	3.73	3.67	3.75
Technology makes my teaching more effective	4.05	3.88	3.75
I feel that computers are important for student use	4.45	4.26	4.00
I use technology in my classroom to improve student skills	4.00	4.06	4.00
Technology helps me to accommodate different learning styles	4.23	4.06	4.00
Computers can be useful instructional aids in almost all subject areas	4.50	4.23	3.75
Computers can stimulate creativity in students	4.18	4.03	3.75
Available technology resources are sufficient to support student learning	3.34	3.28	2.75
I am willing to learn or continue to learn about integrating technology into my classroom	4.43	4.41	4.00
Teachers in my school are involved in decision making related to implementation of technology	3.11	3.23	3.75
I would like more training in integrating technology	4.05	4.01	3.75

In addition to the perceptions, the data showed trends of participants with bachelors and professional degrees scoring high and low on the various educational technology perception questions. Participants with bachelor's degrees had the highest average score on about 58% of the questions. Participants with professional degrees had the highest average scores on seven of the statements. Despite participants having the highest average score on seven of the statements, they also had the lowest score on 10 of the statements. This indicates that participants with professional degrees positively perceive some aspects of educational technology and negatively perceive others. It is hard to draw clear answers to the research question about educational level and perception of educational technology.

To answer Research Question 14, "What is the relationship between a teacher's highest level of college attainment and their educational technology integration?", questions 3, 12, and 18 from the survey were used (see Appendix D). The data showed some differences between availability and use when cross-referenced against the highest level of educational attainment (see Table 43). The data indicated that participants with bachelor's and master's felt that projectors were the most accessible resource and participants with professional degrees felt it was interactive whiteboards. However, regardless of the level of education, all participants indicated they utilized projectors the most. The least available and utilized resource, for any level of education, was gaming devices. The data indicated two positive relationships between availability and educational level including interactive whiteboard and airliners. As they had these resources, it is logical that teachers had decreased availability of DVD/VCRs. Interestingly, there was also a negative relationship with digital cameras and scanners. In terms of technology, an overall positive relationship existed between the actual use of 50% of the resources and educational level including video conference, interactive whiteboards, iPod/MP3 players, scanners, airliners, and gaming devices.

Table 43

Technology Availability and Use by Education Level

Technology Resource	Education Level					
	Bachelor		Master		Professional	
Projector	2.64	**3.16**	2.65	**3.38**	2.25	**3.25**
Videoconference	1.27	**1.02**	1.15	**1.06**	1.25	**1.50**
Interactive Whiteboard	1.91	**1.93**	2.19	**2.53**	2.50	**3.00**
Clickers	1.52	**1.27**	1.59	**1.48**	1.50	**1.25**
Digital Cameras	1.93	**1.84**	1.91	**2.08**	1.50	**2.00**
iPod/MP3 Player	1.25	**1.16**	1.31	**1.41**	1.25	**1.75**
Document Camera	1.70	**1.70**	1.79	**1.78**	1.25	**1.75**
Scanner	1.95	**1.98**	1.94	**2.23**	1.50	**2.25**
Tablets	1.48	**1.73**	1.51	**1.67**	1.25	**2.25**
DVD/VCR	2.61	**2.43**	2.47	**2.64**	2.00	**2.50**
Airliner	1.20	**1.14**	1.35	**1.24**	1.75	**1.75**
Gaming Device	1.20	**1.07**	1.15	**1.13**	1.25	**1.25**

Note. Bolded is usage (scale 1-3). Nonbolded is availability (scale 1-4).

The data showed many positive relationships between students' use of technology resources with completing various activities and the highest level of educational attainment (see Table 44). Positive relationships existed for 50% of the student activities. Just reviewing the data between bachelors and masters degrees, about 65% of the student activities using educational technology increased. However, student activities that decreased from bachelor's degree to master's degree were higher-ordered activities. These activities included collaborating, creating blogs/wikis, conducting experiments and measurements, and creating art, music, movies, or webcasts. Bachelor's and master's participants revealed that students use educational technology the most for learning or practicing skills, but participants with professional degrees have students use educational technology the most for solving problems, analyzing data, or performing calculations.

Table 44

Student Technology Use by Education Level

Student Activity	Education Level		
	Bachelor	Master	Professional
Prepare written text	2.47	2.74	3.00
Create or use graphics or visual displays	2.39	2.51	3.00
Learn or practice basic skills	2.89	2.96	2.75
Conduct research	2.65	2.75	2.75
Correspond with others	2.00	1.82	2.67
Contribute to blogs or wikis	1.47	1.30	3.00
Use social networking websites	1.53	1.42	1.75
Solve problems, analyze data, or perform calculations	2.17	2.30	3.33
Conduct experiments or perform measurements	1.83	1.53	3.00
Develop and present multimedia presentations	2.03	2.30	3.00
Create art, music, movies, or webcasts	1.63	1.58	2.50
Develop or run demonstrations, models, or simulations	1.46	1.71	2.75
Design and produce a product	1.30	1.75	2.50
Other	1.43	1.93	2.67

The information from the section has provided the information needed to answer Research Question 13, what is the relationship between a teacher’s highest level of educational attainment and their perceptions of educational technology?, and Research Question 14, what is the relationship between a teacher’s highest level of educational attainment and their educational technology integration? The details of the analyses have been shared in the previous sections. To help provide overall answers to Research

Questions 13 and 14, overall scores for perceptions availability, and integration was calculated (see Table 45). The overall score for participants' perceptions are diverse. The data showed an overall negative relationship between educational level and perception of technology. In other words, the higher the participant's education level, the lower their perception of educational technology.

The last three components of Table 45 help answer Research Question 14, teacher integration of technology. The data shows a positive relationship between the level of educational attainment and educational technology integration. In other words, the higher the participants' level of education, the more participants integrate technology into their lessons and student activities. However, there is a negative relationship between education level and perception. In other words, the higher the participants' level of education, the less favorable their perception of educational technology.

Table 45

Overall Technology Scores by Education Level

Technology Component	Education Level		
	Bachelor	Master	Professional
Technology Perception	3.85	3.77	3.69
Resource Availability	1.72	1.75	1.60
Teacher Integration	1.70	1.89	2.04
Student Use	1.95	2.04	2.76

Conclusions

The purpose of this study was to investigate the relationships between teachers' perceptions and integration of educational technology and various teacher characteristics. This section summarizes the findings from the data collected from the quantitative technology survey. The findings are presented according to the order of the research questions that were previously presented.

Research Question 1

What are teachers' perceptions about educational technology?

Despite some positive and negative perceptions about the various educational technology statements, participants' overall feeling was close to agreement (3.80). Participants' had a general positive feeling about educational technology.

They also had a very positive perception (4.4 / 5) of their willingness to learn about ways to integrate educational technology. This average score indicates that teachers are willing to learn about integrating educational technology. Without adequately training teachers on technology and integration, technology can only play a limited role in student learning and success (Overbay et al., 2010). Researchers have found that effective technology integration cannot occur without administrative support (Keengwe et al., 2008; Lu & Overbaugh, 2009; Pierce & Ball, 2009; Schrum et al., 2011). Technology integration can only be as strong as the PD support and leadership provided by the administration (Brown-Joseph, 2010; Schaffhauser, 2009).

Indeed, participants felt as if technology integration was a not a high priority for administrators. The lack of technology integration being a high priority for administrators may stem from inadequate training. Lu and Overbaugh (2009) explained that the lack of technology training for administration could have devastating effects because administrative support and knowledge is vital for teachers' success.

Teachers need to be included in decisions about technology because teachers are at the forefront of educational reform (Wachira & Keengwe, 2011). Participants were willing to integrate technology into classroom instruction. The adoption of classroom technology largely depends on teachers' beliefs and perceptions about personal benefits and the ability to extend learning (Project Tomorrow, 2012).

Research Question 2

What are teachers' current levels of educational technology integration?

The data of technology integration indicates that participants do not integrate technology often. The overall average score for technology was a 1.95/4, which is rated as rarely. The data also indicated that when participants do utilize educational technology, with their student learning activities, technology resources are used with low-level applications.

Researchers have indicated that inadequate access causes teachers to become reluctant for integration and occasionally give up on integration all together (Hutchison & Reinking, 2011; Keengwe et al., 2008; Lu & Overbaugh, 2009; Martin, 2011; Pac, 2008; Wachira & Keengwe, 2011). Teachers must be able to overcome these barriers before they are able to use technology resources effectively (An & Reigeluth, 2011).

Access is important, but does not guarantee effective use of educational technology. When compared previously in Table 13, it was clear that NCES participants did a much better job integrating technology resources for student learning even though my participants had more technology resources readily available. Previous literature indicated that inadequate training is a major barrier for teachers trying to integrate technology into classroom instruction (An & Reigeluth, 2011). When teachers face perceived barriers in technology integration they are more likely to become frustrated and stop trying to utilize the technology (Miranda & Russell, 2011; Wachira & Keengwe, 2011).

Using low-level activities instead of authentic learning collaborations has a small impact on individual classrooms; however, when applied to the whole district, it creates a huge impact on student learning and achievement (Miranda & Russell, 2011). Teachers need to shift their instructional practices to include authentic learning experience such as constructivism because researchers are discussing that constructivism is the best learning theory for students (Overbay, Patterson, Vasu, & Grable, 2010; Powell & Kalina, 2009). Constructivist learning approaches provide students with deep, rich, and authentic learning experiences (Fox-Turnbull & Snape, 2011), which make information easier to apply and recall (Powell & Kalina, 2009).

Research Question 3

What is the relationship between a teacher's gender and their perceptions of educational technology?

Each gender scored highest on various statements. However, male participants scored higher than female participants (3.73 vs. 3.59, respectively). In other words, male participants had a better/higher overall perception of educational technology than female participants.

Research Question 4

What is the relationship between a teacher's gender and their educational technology integration?

The data on gender and integration revealed that male participants have more technology available and they integrated these resources more so than female participants. Male participants scored higher on about 65% of the available resources and integration pieces than female participants.

Research Question 5

What is the relationship between a teacher's age and their perceptions of educational technology?

This question can be answered using patterns or trends and verified by Spearman rank-order correlation coefficients. While the data yielded an encouraging finding that the four oldest participants had an overall positive view of technology, the trends observed in the descriptive statistics were confirmed by the correlation. There was a negative correlation between participants' age and how they perceived educational technology. In other words, the older the participant, the less favorable feeling they have about technology.

Research Question 6

What is the relationship between a teacher's age and their educational technology integration?

Technology integration and participant age did not seem to have a dominate age group for integration. This conclusion was established from the patterns, trends, and a Spearman rank-order correlation coefficient. Berry (2011), Brunk (2008), and Inan and Lowther (2010) conducted technology experiments and they found that age did not seem to play a role in determining the amount of technology integration, which verified the results of this study.

Research Question 7

What is the relationship between years of teaching experience and a teacher's perceptions of educational technology?

Even though there were no distinct patterns or trends, using a Spearman rank-order correlation coefficient, mathematically a negative relationship between years of teaching experience and perception existed. In other words, the more years of teaching experience, the less favorable teachers' perception of educational technology.

Research Question 8

What is the relationship between years of teaching experience and a teacher's educational technology integration?

Coupled with the fact there were no distinct patterns and the Spearman rank-order correlation coefficient indicated no relationship: There is no relationship between teachers' years of teaching experience and technology integration. Other researchers have also found that there is a negative correlation between age and technology integration (Lee & Tsai, 2010; Inan & Lowther, 2010).

Research Question 9

What is the relationship between a teacher's subject area and their perceptions of educational technology?

Participants who teach core subjects have a slightly higher average overall perception of educational technology than participants who teach noncore subjects (3.62 and 3.59, respectively). Core teachers were 17 percentage points more passionate about not wanting educational technology to go away than noncore teachers.

Research Question 10

What is the relationship between a teacher's subject area and their educational technology integration?

The closeness of scores that existed in perception between core and noncore subjects continued to be present regarding integration. If we view technology integration as a whole, there is no relationship between the subject being taught and the amount of technology integration. In other words, there is not a relationship between the teachers' subject and the amount of technology integration.

Research Question 11

What is the relationship between a teacher's grade level and their perceptions of educational technology?

The overall technology perception scores indicated a positive association between grade level and perceived educational technology. In other words, teachers who teach higher-grade levels tend to have a more positive perception of educational technology than participants who teach lower grade levels. These findings align with the information found in Pac's (2008) study. Pac's study showed that 90% of high school teachers had a strong positive perception of educational technology and that technology plays an important role in promoting student learning within the classroom.

Research Question 12

What is the relationship between a teacher's grade level and their educational technology integration?

Overall technology integration scores were calculated to help provide an overall answer for Research Question 12. The overall integration scores also indicated a positive association between grade level and technology integration. In other words, the higher the grade level for participants, the more technology integration the participants used. The data shows that the higher the grade level, the more technology students use to perform various activities. These findings align with Lu and Overbaugh's (2009) study of 177 K-12 teachers, which contradicted Pac's (2008) study. Pac indicated that availability and access seemed to be more of a problem with teachers from upper grade levels than lower grade level teachers. Different samples often yield different findings, and that is why it is important to make data-driven decisions based on local research such as this study.

Research Question 13

What is the relationship between a teacher's highest level of college attainment and their perceptions of educational technology?

A negative relationship was determined between educational level and perception. In other words, higher technology perceptions are from participants with bachelor's degrees and lower perceptions are from participants with professional degrees. In other words, participants with the lowest level of degree (bachelor) had the best perceptions of educational technology.

Research Question 14

What is the relationship between a teacher's highest level of college attainment and their educational technology integration?

The data showed a positive relationship between integration and education level. In other words, the higher the participants' degree, the more technology they integrate. These findings contradict Brunk's (2008) study of 148 participants. Brunk indicated that educational level and other factors do not play a role in determining the level of technology integration.

Summary

Table 46 presents a summary of the findings for each research question. In general, teachers' perceptions are primarily positive with little to no differences on the characteristics of age, experience, subject, grade-level, nor educational attainment. Teachers' perceptions were somewhat more positive for higher grade-level and male teachers. In terms of actual integration of technology, the overall sentiment was negative with again no differences for age, experience, and subject. Again, teacher integration was somewhat more positive for higher grade-level and male teachers. In addition, more educational attainment was positively related with integration. This is surprising given the above finding that perception was negatively correlated with educational attainment. In conclusion, teachers have positive perceptions of technology, negative levels of integration, and a few characteristics have minimal influence on this situation. The research findings cited also noted that there is slight to no influence, sometimes with results that are opposite for different samples. This makes sense because of the wide variability across the United States and points to the importance of research-based decisions. It was a pleasure to tell administrators that everyone, regardless of their demographic categories, had a positive perception of educational technology and wanted assistance to integrate it into their classrooms more.

Table 46

Results of the Research Questions

Research Question	Results
1. What are teachers' perceptions about educational technology?	Overall positive feeling about educational technology
2. What are teachers' current levels of educational technology integration?	Low technology integration and technology resources are used with low-level applications
3. What is the relationship between a teacher's gender and their perceptions of educational technology?	Males have higher perception of technology
4. What is the relationship between a teacher's gender and their educational technology integration?	Males have more technology available and integration more technology
5. What is the relationship between a teacher's age and their perceptions of educational technology?	Slight negative correlation between age and technology perception
6. What is the relationship between a teacher's age and their educational technology integration?	No correlation between age and technology integration
7. What is the relationship between years of teaching experience and a teacher's perceptions of educational technology?	Slight negative correlation between years of teaching experience and technology perception
8. What is the relationship between years of teaching experience and a teacher's educational technology integration?	No correlation between years of teaching experience and technology integration
9. What is the relationship between a teacher's subject area and their perceptions of educational technology?	Core teachers have a slightly higher perception of educational technology
10. What is the relationship between a teacher's subject area and their educational technology integration?	No real difference regarding teaching subject and technology integration
11. What is the relationship between a teacher's grade level and their perceptions of educational technology?	Higher grade level teachers have a more positive perception of technology
12. What is the relationship between a teacher's grade level and their educational technology integration?	Higher grade level teachers have a more technology integration
13. What is the relationship between a teacher's highest level of college attainment and their perceptions of educational technology?	There is a negative relationship between educational attainment and technology perception
14. What is the relationship between a teacher's highest level of college attainment and their educational technology integration?	There is a positive relationship between educational attainment and technology integration

Overall Technology Perception

Participants had a general positive perception of educational technology (3.80). The data indicated negative trends between age, experience, and the level of educational attainment. The data also showed a positive trend between perception and teachers' grade level. Lastly, male participants and teachers from core subjects had higher perceptions. Male teachers who are 20-29 years old, have 1-9 years of teaching experience, have bachelor's degree, and teach high school core classes have the best perception of educational technology. In other words, these characteristics are potential predictors of positive educational technology perception.

Overall Technology Integration

The data indicated that teachers do not integrate educational technology, regardless of the different ways I looked at the data. However, the only relationship that existed was a positive relationship with grade level. The only other standout teacher characteristic was gender. Male participants used educational technology resources considerably more than female participants. However, the other teacher characteristics of age, years of teaching experience, educational level, and teaching subject did not have any standout results. Age, years of teaching experience, educational level, and teaching subject are not considered potential predictors for demonstrative technology integration in this sample of teachers from this county at this time.

In terms of moving forward from data analyses, there are two primary themes: Teachers are eager to learn about technology and teachers are not using technology they have to its greatest potential. These are both good findings because teachers may be receptive to my PD project and I know exactly what to help them with. While Table 46 above did an excellent job of bringing together the findings from the study, many of which found no or slight differences between groups of subjects. While this may be perceived as a drawback of the study, indeed it is a great success. The data showed that age, education level, years of teaching experience, and level of educational attainment were not barriers to teachers learning of technology. Differences in gender and grade level indicate that work needs to be completed to reduce the gap between these two characteristics.

In conclusion, the overall perception of educational technology within this particular county during the fall of 2013 was positive. Teachers indicated being very willing to further their knowledge and understanding of technology integration by enrolling in PD. The fact that teachers are willing to further their technology knowledge is crucial because the participants do not use technology, as they should. When teachers do use technology for student learning, the data indicated that students were presented with low-level applications instead of authentic learning experiences. This provided a very clear direction for creating a PD project for this country. It has a great likelihood of being a rousing success.

Assumptions

1. The e-mail went go to the participants’ inbox and not their spam folder.
2. Participants were able to read and understand the directions as to why they were chosen to complete in the survey
3. Participants were able to open the e-mail that contained the survey link. After opening the e-mail, the participants were able to click on the link and complete the online survey.

4. Participants would not experience any technically difficulties while taking or submitting the survey.
5. Participants completely understood the survey questions and answered every question honestly and to the best of their ability.
6. Participants did not complete the survey more than once.

Limitations

1. Participants were from only one Ohio County, which only included public schools. The data did not represent private school educators.
2. Participants were predominantly Caucasian.
3. The study was limited to rural and suburban schools districts because the county did not contain any urban school districts.
4. Only quantitative data was collected, which did not permit participant elaboration on the questions.
5. Participants self-report survey data, which could introduce participant bias.
6. Data collection is at a single point in time (Fall 2013).
7. Given that the data were analyzed using descriptive statistics and correlation coefficients, generating cause and effect relationships was not valid.

Scope and Delimitations

I focused on pre-K-12 teachers' characteristics and how they used and perceived educational technology. Data were also collected on how the educators used technology with their students to enhance learning. Data were not collected from any administrators.

The study was delimited to the pre-K-12 educators, of a western county in Ohio, teaching in public schools. This one county contained five school districts, located in rural or suburban regions. Teachers had bachelor’s degrees, or higher, from accredited universities and teaching certificates issued by the Ohio Department of Education.

Protection of Participants

The consent form provided a short description of the purpose of the study, expected duration to complete the survey, and the data collection process. The consent form detailed how the participants remained protected throughout the data collection process and revealing of the data. The form explained that the participants’ participation was complete voluntary. I provided my contact information if participants had questions or comments. Penalizing nonparticipants would not occur and the teachers did not have to sign the consent form.

After participants completed and returned the survey, participants’ could not remove their data because I collected no identifying factors. The raw data will be kept for five years from the completion of the survey. Google Drive automatically recorded and stored participants’ responses on my private account upon submission of the survey. I am the only person who knows the information required to gain access to the account. To increase participant protection, I did not collect identifying characteristics.

The consent form also explained that I would never share individual responses with members outside the research team. I would only share the summary, findings, and conclusions with members outside the research team, which will still not contain any identifying characteristics associated with the data. I would be the only person to have access to this information and it is stored in safe, secure, and password protected account and location. The consent form also indicated that participants would encounter no or minimal risks greater than normally occurred during daily life. The study may have included the protected populations of pregnant women, economically disadvantaged, crisis, and elderly. I did not know if any participants were part of the protected populations. If respondents were part of a protected population, the survey did not cause any additional stress beyond normal daily activities. The fact that a participant was pregnant, economically, elderly, or in a crisis played no importance to their response. The initial e-mail and three reminder e-mails were sent to participants. The reminder e-mails thanked those teachers who already completed the survey and let the teachers who had not completed the survey that there is still time. No more than three reminder e-mails were sent to prevent coercion and harassment.

Section 3: The Project

Professional Development Project

High-quality PD aligns with school goals, teacher evaluations, and state and district standards and assessments, focuses on core content, actively teaches new teaching strategies, provides opportunities for collaboration, and provides continuous support and feedback (Croft et al., 2010). These qualities align with the PD established by the Ohio Department of Education. The following PD program is designed to increase teachers' use of educational technology for student learning. Institutions of higher education deem PD programs effective when participants use technology-rich instructional practices (Smolin & Lawless, 2011).

The focus for the following PD is on the importance of technology integration and ways these resources can be applied to teachers' classrooms. Regardless of the PD program, the program must include high-quality factors of long duration, readily available, constant coaching and support, and close connections to practice (Martin et al., 2010). The project was focused on document cameras and student response systems. Teachers are provided hands-on activities to help with classroom integration, by technology staff, via Google Hangout. There is also a presentation on authentic student learning, which provide teachers with authentic learning resources supplemented by technology.

Teachers may learn to make the transition through instructor organized sessions, self-paced learning, and collaborative learning approaches. Andragogy learning philosophies and principles guided and informed instructional practices and activities. The program can provide teachers with new strategies, supplemented with technology, to help students understand and solve authentic and real-world problems. The program aligns with teachers' technology and PD standards. Teachers need support that is immediate, continuous, and provides follow up activities. The program aligns with teachers' individual needs by being content specific and providing support, which will increase motivation, implementation, and student success.

Administrations are encouraged to participant so they may offer genuine support and foster the PD continuous cycle. Ohio also published a five-step PD continuous cycle of professional learning for educators (ODE, 2007). The five steps process is as follows: (a) educators examine the data through self-assessments and available data, (b) determine learning priorities by analyzing the data to identify specific goals, (c) align the initiatives to specific activities and actions that will promote professional learning, (d) develop implementation strategies and a plan for evaluation, (e) monitor, assess, and reflect on the effectiveness of the PD activities and efforts.

Goals

- The PD program provides teachers with a structured and sustained program.
- Increase teacher knowledge of technology integration use and application
- Investigate how to use document cameras and student response systems and their associated benefits for teachers and students.
- Change teachers' integration of document cameras and student response systems so that a short and long-term positive social change occurs through individual and collaborative strategies.

- The program may get teachers to transition their low-level technology application into authentic and meaning full applications to align with constructivist philosophies.

Rationale

Before professional develop programs can be conducted, teachers need to be willing to participant. The PD program will not be effective if teachers are not motivated or willing to learn new material and instructional practices. Participants from my study indicated they were willing to participant in technology integration PD. Ninety-three percent of participants indicated they were willing to learn how to integrate technology for student learning effectively.

Because adults learn differently from children, adults need to be provided with different instructional strategies, especially when the adults are well-educated teachers (Beavers, 2009). PD programs should integrate research-based components that allow practitioners to make connections to everyday classroom procedures (Martin et al., 2010; Richards & Skolits, 2009; Slepkov, 2008). Adult learners learn information largely because they are experiencing a level of inadequacy in life (Knowles & The American Society for Training and Development, 1973). In other words, adults learn information that will help them in their personal or professional lives.

The PD programs are appropriate to conduct because the data revealed that participants did not utilize these two educational technology resources effectively, despite these resources being available. PD sessions need to be conducted on technology integration and using document cameras and students response systems. Compared to the national average, participants are close on availability, but extremely behind in usage.

The national average for student response systems use is 35% compared to only 1% from my study. Similarly, the national use of document cameras was 56% compared to 13% from my study.

Literature Review

For this PD study, it is important to know and understand some learning theories and best practices for implementing a PD program. Three learning theories associated to PD programs are metacognition, transformative learning, and andragogy. These learning theories provide educators with the information to teach adult learners by making material authentic and relevant. These learning theories also indicate that adults and children learn differently, which means that educators need to be aware of their intended audience before providing any type of instruction.

The articles for this literature review were found by using the following databases: ERIC, Academic Search Complete, Education Research Complete, Teacher Reference Center. In each of these databases, I conducted keyword and keyword Boolean searches to find relevant articles. The keywords included: *adult learning theory, andragogy, barriers, benefits, collaboration, educational technology, factors, metacognition perceptions, professional development, professional learning communities, resources, support, technology, technology integration* and *transformative learning*. I also reviewed each articles' reference list to find additional articles that would benefit my research. To ensure the highest quality of research was being used, I only reviewed peer-reviewed journals. The articles also had to be within the last five year, unless it was an original publication about a learning or educational theory. After conducting a search or a Boolean search, I review each articles' abstract. If the abstract seemed to fit my needs, I saved the article for in-depth reading and analysis at a later date.

Metacognition

Despite the effectiveness and wide use of PD, there have been minor attempts to ground PD within a theoretical framework (Eun, 2008). Establishing a theoretical framework is important so educational leaders can devise and align plans that will contribute to the effectiveness of teacher PD (Eun, 2008).

Metacognitive learning approaches raise teachers' awareness of areas of knowledge or skills that are deficient (Phelps & Graham, 2008). The metacognitive learning approach also provides teachers with strategies to acquire the necessary skills (Phelps & Graham, 2008). The approach allows users to move outside their comfort zone (Phelps & Graham, 2008). If teachers are able to think metacognitively, then they are able to teach students how to think metacognitively (Prytuia, 2012). The metacognitive approach encourages teachers to take control of their learning, develop confidence, and willingness to learn and implement new ICT resources (Phelps & Graham, 2008).

When teachers implement metacognitive approaches, several factors influence the ICT learning of teachers: self-efficacy, support, perceived usefulness, time, problem solving, memory and retention, and anxiety (Phelps & Graham, 2008). This model of learning is influenced by affects, motivation, and strategies, which also encourages teachers to reflect on their learning experiences (Phelps & Graham, 2008).

Prytuia (2012) conducted a study to understand how teachers describe their metacognition, what servers as catalysts, and how metacognition influences their work.

The study was primarily conducted because a gap exists in discovering and understanding teachers' metacognitive thought process.

Transformative Learning

Transformative learning theory helps explain that collaborative learning is not merely a social setting but an appropriate learning and communicative framework (Servage, 2008). Transformative learning requires teachers to explore, articulate, and revise their beliefs (Servage, 2008). Teacher learning must be integrated and job-embedded (Battey & Franke, 2008). Factors influencing a teacher's identity are experiences, emotions, values, and school culture (Battey & Franke, 2008). Teacher identity can provide insight into why PD can look different as teachers implement new ideas and strategies into practice (Battey & Franke, 2008).

Teachers rarely develop their identities in isolation (Battey & Franke, 2008). Participation allows teachers to acquire new knowledge and skills (Battey & Franke, 2008). Shaping or reshaping teachers' identities are acquired skills and knowledge (Battey & Franke, 2008). Teachers' identities also influence the new knowledge and skills they seek to learn (Battey & Franke, 2008). Gaining new knowledge through PD can reshape teachers' identity (Battey & Franke, 2008). Only after reshaping teachers' identity are classroom norms reshaped to accommodate the new skills and knowledge learned in a PD session or program (Battey & Franke, 2008).

The goal of collaboration within PLCs is to create profound and positive change, which leads to personal transformations (Servage, 2008). PLCs have the power to create lasting affects in the learning environment (Prytuia, 2012). Transformation occurs when members collaborate, build strategies, share accountability (Prytuia, 2012), and reflect

(Schols, 2012). Teacher reflection is one key component of transformative learning (Schols, 2012). Two types of reflections that are important for improving practice are reflection in the practice and reflection on the practice (Brooks & Gibson, 2012). Educators reflect in practice when they are reviewing assessments and procedures (Brooks & Gibson, 2012). When educators reflect on their practices, they are reviewing their motivations and beliefs about how their traits influence their practice (Brooks & Gibson, 2012). Teachers' personal transformations will create school transformations (Servage, 2008). However, teachers struggle sustaining transformative practices without support and collaboration (Smolin & Lawless, 2011).

Transforming public education requires a new vision of teaching (Council of Chief State School Officers [CCSSO], 2013). The Model Core Teaching Standards articulate what effective teaching and learning looks like for the transformation to occur. The standards serve as a resource for districts, states, teachers and educational programs to prepare, support, and evaluate teachers. The standards are based on current research of best practices of teaching and learning. The standards have four general categories: the learner and learning, content, instructional practice, and professional responsibility. Five key themes emerge within the standards (CCSSO, 2013).

- Personalized learning for diverse learners – teachers must understand that students bring a variety of learning experiences, talents, and prior knowledge as well social, cultural, and family diversity. Teachers need to provide multiple and personalized learning approaches to meet everyone's needs.

- Stronger focus on application of knowledge and skills – the Common Core State Standards include rigorous content and application knowledge via higher-ordered skills. Students need multiple perspectives and opportunities to explore ideas and solve problems.
- Improved Assessment Literacy – the core teacher standards recognize the importance of developing a range of assessments, both formative and summative. Teachers also must be able to analyze the data effectively to provide feedback, record student progress, and plan and adjust instruction.
- Collaborative professional culture – Teacher collaboration allows teachers to deliver rigorous and relevant instruction. The standards require teachers to open their practice to observations and scrutiny and participate in continuous job-embedded professional learning.
- New leadership roles for teachers and administrators – teachers and administrators must share responsibility for creating a shared vision and goal to improve student learning.

Adult Learning

Adults learn differently from students (Doherty, 2012; Taylor & Kroth, 2009). Adult learners are diverse and bring a wide variety of features that are not always considered in PD programs (McDonald, 2009). Adult cognition relates to life experiences and is applicable to adults with various personal, professional, and social characteristics (Goddu, 2012). Knowles’ writings on adult learning has transformed and reenergized PD (Taylor & Kroth, 2009) because when learning experiences are coupled with theory, learning is maximized (Goddu, 2012).

Knowles and the American Society for Training and Development (1973) believed that andragogy learning theory (adult learning theory) has four different basic assumptions from pedagogy learning theory. The first different assumption is that learners mature from complete dependence to self-directedness. Experience perceived to be childish hinders learning. The second assumption is the role experience plays. As individuals mature, they accumulate vast amounts of experience. This increased reservoir makes the learning a rich and authentic experience. If individual differences in children are important, then individual differences in adults are even more important because of their greater experiences. The third assumption is that as individuals mature, their level of readiness to learn transitions from ought to learn to need to learn because the learner has roles as workers, spouses, parents, and leaders. The time of learning experiences must coincide with the learners' task. The fourth assumption is that children have a subject-center orientation and adults have a problem-centered orientation. For example, what children learn in grade school helped them get into high school, what they learned in high school helped them in college, what they learned in college helped them get a career job. Adult learners learn information largely because they are experiencing a level of inadequacy in life.

Andragogy has a long history of understanding adult learning and continues to be a driving force in guiding teachers of adults (Henschke, 2011). Educators accept Knowles' concept of andragogy. Six principals are the focus of andragogy: self-directedness, need to know, learning experiences, readiness to learn, learning orientation, and internal motivation (Chan, 2010). Andragogy puts the focus on the learner, not the teacher (Holyoke & Larson, 2009).

Adult learners need more than passive learning experiences, which explains why pedagogical approaches are less effective for adult learners (Chan, 2010). The problem with the pedagogy model is that more effort is often required of the trainer than the learner (Steinke, 2012). When the teacher is working harder than the students, modest learning is taking place (Steinke, 2012). Self-directed learning reverses this role because the teacher assumes the role of facilitator (Steinke, 2012). PD providers need to understand that adult learners do not favorably respond to traditional methods of learning (Potter & Rockinson-Szapkiw, 2012). However, adult learners are often receptive to social constructivist pedagogy methods (Potter & Rockinson-Szapkiw, 2012). Learning activities should be applicable that allows participants to use prior experiences to extend their knowledge (Potter & Rockinson-Szapkiw, 2012).

Adult learners need to be actively engaged in learning so that learners can construct and apply the knowledge, which fosters creativity and innovation, allowing individuals to be competitive in a 21st century workforce (Chan, 2010). Adults learn the best when participating in authentic and real-world experiences (Doolittle, Sudeck, & Rattigan, 2008; Karge, Phillips, Jessee, & McCabe, 2011) because adult learners have the benefit of having life experiences to apply their skills (Doherty, 2012). Actively engaged adults develop critical thinking skills, efficiently gain knowledge, and receive social support (Karge et al., 2011). Understanding adult learners enhances instruction and learning (Karge et al., 2011).

Adults learn differently from students in numerous ways (McGrath, 2009). Adult learners tend to take responsibility for their learning, unlike most students (McGrath, 2009). Pedagogical theory assumes that students will learn new information because learning new information is an obligation (McGrath, 2009). However, attention spans between adults and children are not that different (O'Toole & Essex, 2012). Presenters need to change classroom dynamics to keep interest and engagement (O'Toole & Essex, 2012).

Pedagogy is the primary method of PD for teachers (Steinke, 2012) because PowerPoint presentations frequently dominate adult education courses and programs (O'Toole & Essex, 2012). Adult learner presenters must use a variety of techniques that involve learners instead of relying on word-heavy presentations or lectures (ASSE Training & Communication, 2013). Active participation has proven to increase long-term retention (ASSE Training & Communication, 2013). Additional practice and participation produces developed and implemented skills (ASSE Training & Communication, 2013). It is appropriate to use traditional methods of learning when participants are completely unfamiliar with the information (Steinke, 2012),

PD presenters should abandon traditional teacher-centered approaches and adopt andragogical and constructivist learning approaches (Chan, 2010; Potter & Rockinson-Szapkiw, 2012) because adults have far less tolerance and acceptance for poor classroom strategies and methods (O'Toole & Essex, 2012). Activity-based PD models usually have constructivism learning theories at the heart of the activity (Cornelius, Gordon, & Ackland, 2011). Learners are required to construct a relationship between new knowledge, past experiences, and the professional context (Cornelius et al., 2011). Activity-focused models provide flexibility to learners by providing a variety of formats and resource styles, supports collaborative inquiry into professional problems, and meets individual needs and interests (Cornelius et al., 2011).

Andragogy methods have five key areas (McGrath, 2009). Adults are aware why they are learning the new material. Considering the learners' self-concept is important. Learning focuses on the learners experience and the role the experiences play in the classroom. Adult presenters should encourage collaboration and dialogue. Students are motivated to learn and participate. Giving praise and building self-esteem increases motivation. The presenter provides a safe learning climate.

Because adults learn differently from children, different instructional strategies must be used with each group, especially when the adults are well-educated independent teachers (Beavers, 2009). Valuable information is often unheard or overlooked when PD presenters are utilizing ineffective teaching strategies (Beavers, 2009). Adult learners should also be viewed as unique learners, just as youth learners (Beavers, 2009). When PD presenters are working with adult learners, presenters should follow the following principals (Beavers, 2009):

- Allow teachers to provide input and utilize a variety of learning experiences
- Keep information practical and applicable
- Facilitate and encourage problem-solving collaboration
- Provide multiple learning styles
- Encourage teachers to facilitate learning instead of educational leaders
- Create an atmosphere that encourages diversity and openness
- Support theories and reflections

Adult learners need to understand why they are learning new knowledge and how the new knowledge is relevant before they will actively participate and by ready to learn (McGrath, 2009; O'Toole & Essex, 2012). Adults are able to determine easily the value and relevance of learning (O'Toole & Essex, 2012). Adult learners are also receptive to new material when presented as real life situations (McGrath, 2009). However, adult learners tend to be resistant to learning when it does not align with their learning philosophy (Beavers, 2009). Using andragogical principles allows instructors to meet students' interests and needs by involving students in planning learning objectives and activities (Chan, 2010). Improving communication and involving students in the planning of learning objectives and activities promotes trust between students and instructor (Chan, 2010). Successfully completing programs or courses largely depends on the support adult learners receive and the interactions between learners and presenters (Zacharakis, Steichen, Diaz de Sabates, & Glass, 2011).

The key to improving adults' learning experience is acknowledging that adults have different needs, expectations, experiences, and limitations than children (O'Toole & Essex, 2012). PD sessions and programs must meet the diverse needs of adult learners by blending expertise and resources (Doolittle et al., 2008). Providing adult learners with support during and after programs is crucial for effective learning (Cornelius et al., 2011).

Professional developers for the Adult Basic Literacy Education (ABLE) systems in Ohio have been working diligently over the past several years to engage adult learners in the PD sessions and programs they offer (Uslu & Bumen, 2012). Ohio's ABLE system is divided into four regions. Each region has a lending library with a special collection of assessment materials, instructional aides, adaptive technologies, and various other classroom resources. The materials can be borrowed and implemented within the classroom. ABLE representatives created an on-site PD model, which uses research-based classroom activities for specific content areas. The model indicated that the PD was more effective when teachers and administrators transitioned from observer to participants.

Adults possess 80% of the knowledge presenters want them to learn (ASSE Training & Communication, 2013). However, the challenge is getting learners to understand how they can apply their knowledge to the work environment (ASSE Training & Communication, 2013). To create an effective learning environment suitable for learning, presenters must understand the various ways in which adults learn and comprehend information (ASSE Training & Communication, 2013). Presenters must communicate how the material is relevant to the learners (ASSE Training & Communication, 2013). Presenters should provide the audience with important information multiple times and in multiple representations and provide learners the opportunity to reflect and connect the new material to current job context (ASSE Training & Communication, 2013). Multiple representations can be through photos, personal stories, questioning, or hands-on activities (ASSE Training & Communication, 2013).

For PD programs and sessions to be truly effective, presenters need to understand learner characteristics, such as learning styles, values, and preferences of each generation (Holyoke, & Larson, 2009). Each generation brings with it a unique set of characteristics that influences learning (Holyoke, & Larson, 2009). Presenters create a unique learning experience when they combine generational and adult learning theories (Holyoke, & Larson, 2009).

In order to inform PD experts understanding of generational differences the researchers collected data, using surveys, from 60 adults enrolled in two graduate classes (Holyoke, & Larson, 2009), which were from three different locations and two different formats: online and hybrid. Fifty percent of the students were from Generation-X, 30% were Baby Boomers, and 20% Millennia. The researchers revealed that all three generations were most engaged to the material and lesson when they were able to make connections between the material and their lives. Generation-X students wanted personal connections, Baby Boomers wanted deeper life understanding connections, and Millennials' wanted hands-on connections. Each generation also wanted immediate application of theory into practice. Personalizing the materials meets each generation's needs. Authentic applications of theory provide a natural direction for learning new theories. The data also indicated that presenters needed to discover and implement factors that motivate each generation. The researchers recommended starting with small group discussions, to build trust, before moving into whole group discussions.

Many adult learners only know learning through pedagogical approaches (McGrath, 2009). Adult learners are reluctant to pursue adult education for the fear of learning through pedagogical approaches instead of andragogical approaches (McGrath, 2009). Adult instructors need to utilize pedagogical approaches when the adult students have no background knowledge of the content (McGrath, 2009). In time, the instructor should shift from pedagogical to andragogical teaching methods (McGrath, 2009).

Adult learners may not be ready for their existing beliefs to be challenged (McGrath, 2009). Adult learners can feel threatened and not participate when their existing ideas are challenged because they struggle to accept that their beliefs were inaccurate or not the most effective (McGrath, 2009). However, adult learners usually enroll in classes or programs with a readiness to learn (Holyoke, & Larson, 2009). Learning is a process that involves change and growth over time. Andragogy is more about the process than the content (Goddu, 2012; Holyoke, & Larson, 2009). The one-size-fits-all pedagogy theory approach to adult education is ineffective (Jackson, 2009).

Professional Development

To help teachers incorporate effective instructional strategies and practices into teaching and classroom practices, countless PD programs and initiatives are presented across the nation (Richards & Skolits, 2009). PD, occasionally referred to as professional learning, refers to learning that practitioners' participant in to increase their skills and knowledge, regardless of the profession (Brink, Vourlas, Tran, & Halversen, 2012). Professional learning is important because it allows individuals the opportunity to be active learners and stay current in their profession (Brink et al., 2012). Because teachers are at the foundation of the educational system (Beavers, 2009), teachers cannot reach just the top 20%, top 50%, or even the top 80% of the students (Commission on Effective Teachers and Teaching [CETT], 2012). Teachers must receive appropriate and effective training (Beavers, 2009; CETT, 2012).

Federal policies have focused on increasing teacher effectiveness by encouraging states and districts to participate in programs such as Race to the Top, the Teacher Incentive Fund, and School Improvement Grants (Croft, Coggshall, Dolan, Powers, &

Killion, 2010). One effective way to improve teaching and learning procedures is to provide teachers with PD (Eun, 2008; Morewood & Bean, 2009; Petrie & McGee, 2012; Slepkov, 2008) and through formal evaluations of teacher and student needs (Croft et al., 2010). Another key factor of effective PD is when states' policies and systems ensure accountability and monitor progress (Jaquith, Mindich, Wei, & Darling-Hammond, 2010).

PD is a necessary factor of teaching and is an integral part of creating an effective classroom where students are successful (Potter & Rockinson-Szapkiw, 2012). PD should foster student improvement and performance and must consist of professional learning (National Staff Development Council, 2010). Teachers' professional learning must align with state standards and local and school goals, conducted with a team of educators, facilitated by effective leaders, occur several times a week, and engage teams in the continuous improvement cycle (National Staff Development Council, 2010).

High-quality PD must be at the center of any educational system improvement initiative (Martin et al., 2010). Teachers' self-reports and opinions determines the effectiveness of PD programs, which often falls short of determining if the PD changed learning, teaching and/or affected student learning (Pierson & Borthwick, 2010). The most optimal PD program is the program that best fits the contextual factors (Eun, 2008; Lieberman & Miller, 2011). Effective PD approaches often follow a constructivist learning approach where learning is long-term, collaborative, and with varied instructional and pedagogy approaches, which takes into account participants' needs, beliefs, and practices (McDonald, 2009).

Effective PD does not stem from one single factor, but a collection of factors that meet the unique needs of each learning environment (Guskey, 2009; Ohio Department of Education [ODE], 2007). The one-size-fits-all approach is not acceptable in PD sessions and programs (Eros, 2011; Guskey, 2009). The ultimate goal of a PD session or program is to create changes in pedagogical practices and create a culture of learning (Pierson & Borthwick, 2010). Teachers are more likely to implement new instructional strategies when they can see the direct benefit to student success (Morewood & Bean, 2009). New PD may redefine what it means to be a teacher within a particular learning environment because PD is learning about new ways to relate teaching and students (Battey & Franke, 2008). Effective PD must emphasize the relationship between teaching and learning and provide ongoing support consistent with the integration (Hixon & Buckenmeyer, 2009).

The No Child Left Behind Act of 2001 recognized the importance of effective PD and the shortage of highly effective PD programs for teachers (Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). The act emphasized that every student must receive a quality education (CETT, 2012; Chambers, Lam, & Mahitivanichcha, 2008). This quality education starts with teachers' professional growth through PD (Brink et al., 2012; Chamber et al., 2008). The act created five criteria that effective programs must meet (Yoon et al., 2007). The PD must be sustained, intense, content specific, aligned with standards and assessments, improve teachers' knowledge of content and effective instructional strategies, and regularly evaluates effects on student and teacher achievement (Yoon et al., 2007). Effective teachers are the single most important factor for students to receive a high quality education (CETT, 2012).

PD is effective when it is intense, sustained, content or pedagogy focused, job embedded, collaborative, and supports ongoing teacher or school improvements (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Richards & Skolits, 2009). Effective PD needs to influence teachers' practice directly (Croft et al., 2010). A teacher's deep understanding of content, pedagogy, and curriculum creates a learning environment where effective instructional strategies thrive and frequently occur (Morewood et al., 2010). The better teachers understand the connections among content, pedagogy, and curriculum, the more likely their teaching will be altered (Morewood et al., 2010). Individuals must understand how PD has influenced teachers' knowledge of content, pedagogy, and curriculum before connections can be drawn between teachers' knowledge and student learning (Morewood et al., 2010).

To increase student learning to higher levels, the proposed change must relate to student learning (Croft et al., 2010) and increase students' intrinsic and extrinsic motivation (Karge et al., 2011). When teachers participate in PD, student achievement is affected in three ways: Increases and enhances teachers' knowledge and skills, increases teachers' skills in using effective instructional strategies, and improve teaching cause student achievement to increase (Yoon et al., 2007). However, if one component is missing, increased student learning cannot be expected (Yoon et al., 2007). Teachers also have to apply the new knowledge and skills to increase achievement (Yoon et al., 2007). Teachers have to make decisions regarding how they are going to apply the new knowledge gained from PD in their teaching and learning approaches (Battey & Franke, 2008).

Presenters cannot assume that every educator will make the connection that learning is relevant. Communicating the purpose of the professional learning is important (Beavers, 2009; Brink et al., 2012) because participants could see the activities as being unrelated, more work than good, and a waste of time (Brink et al., 2012). Communicating the purpose helps the buying-in process (Brink et al., 2012).

PD must include critical personal reflection, active learning and participation, a willingness of participants to share challenge others perspectives (Beavers, 2009), mentoring, participant growth in knowledge and concept, and social learning opportunities (McDonald, 2009). PD should provide teachers with the opportunity to engage in collaborative support and training to overcome barriers occurring in and out of the classroom (Beavers, 2009). The PD atmosphere should encourage self-expression, exploration, and reflection while encouraging diversity and healthy disagreements (Beavers, 2009). Teachers will not adopt new instructional strategies when they are not provided with the skills and resources needed to overcome barriers they may face (Richards & Skolits, 2009).

The idea of PD is not a new concept to the education world; however, using contemporary teaching and learning methods is a relatively new way to increase knowledge and skills among educators (Brooks & Gibson, 2012). PD providers need to move away from traditional methods and utilize tools and resources of the present time (Brooks & Gibson, 2012). Traditional methods of delivering PD, one-day workshops, continue to be the norm even though they often lack participant collaboration (MacDonald, 2008). Traditional methods do not assist teachers in creating constructivist and inquiry-based learning experience, for either teachers or students (Brooks & Gibson, 2012). The way in which teachers learn new skills and materials is likely the way they transfer skills and knowledge to students (Brooks & Gibson, 2012). Modeling effective practices and strategies during PD is important (Brooks & Gibson, 2012). For meaningful PD to occur, it must be ongoing, diverse, and centered on ways teachers can create a positive social change within the learning environment (Drage, 2010). Teachers must feel that PD sessions are relevant and worthwhile for teachers to get truly involved (Drage, 2010). When teachers see the value of PD, they tend to participate in more PD opportunities, which improves student improvement and reinforces the teachers' understanding of the importance of becoming a life-long learner (Morewood, Ankrum, & Bean, 2010; Prytula & Weiman, 2012). Authentic and relevant PD help attract and retain teachers (Croft, et al., 2012).

In the last decade, job-embedded PD has become increasingly common for teachers (Croft, et al., 2012). Job-embedded PD refers to teachers learning material that will directly affect student learning (Croft, et al., 2012). Job-embedded PD is an application of an adult learning principle that infuses teacher practice into daily practice (Croft, et al., 2012; Mullen & Hutinger, 2008). The closer the learning activities are to teachers' learning and teaching strategies, the more job-embedded the activity (Croft, et al., 2012). Job-embedded PD affects the teacher's students or is practice-based (Croft, et al., 2012). Job-embedded PD is likely to occur within the course of the school day and is always about current work within the educational learning environments (Croft, et al., 2012). Researchers argue that professional learning is best-accomplished embedded in teachers' practices (Riveros, Newton, & Burgess, 2012). Formal and informal interactions are significant parts of job-embedded PD, such as a professional learning community (Croft, et al., 2012). Teacher collaboration is essential for growth, and a main source for professional learning (Croft, et al., 2012). Three key factors promote individual growth through professional learning: context, specific content, and support (Council of Chief State School Officers, 2013).

For teachers to be continually effective in the classroom, teachers must be life-longer learners because reforms and initiatives continually change the educational setting (CETT, 2012; Morewood et al., 2010). Teachers must learn and understand the initiatives and reforms to provide students with the best possible education (Morewood et al., 2010). Producing life-long learners starts with quality PD opportunities for teachers (Morewood et al., 2010). Providing quality PD usually falls on the shoulders of administrators (Morewood et al., 2010). Teachers and administrators need to comprehend the importance of becoming and promoting life-long learning (Morewood et al., 2010). However, teachers cannot create life-long learners if they are not life-longer learners themselves (Slepkov, 2008). Quality PD must be a continuous process embedded in daily work and routines; with educators being a part of the planning, implementation, reflection, and maintaining process (ODE, 2007).

Researchers conducted literature reviews of high-quality PD and found five essential characteristics (Croft et al., 2010). High-quality PD aligns with school goals, teacher evaluations, and state and district standards and assessments, focuses on core content, actively teaches new teaching strategies, opportunity for collaboration, and 5) provides continuous support and feedback (Croft et al., 2010). Schools that implement PD effectively should expect higher quality of teaching and increased student achievement (ODE, 2007). However, schools continue to implement PD sessions and programs that lack the five characteristics of high-quality PD (Croft et al., 2010).

Administrators and educational leaders are becoming more responsible for determining, implementing, and delivering PD sessions within their buildings and districts (Blank & de las Alas, 2009; Lutrick & Szabo, 2012). PD coordinators face the difficult task of determining if teachers should be provided development in content knowledge or pedagogy (Stanley, 2011). Administrators and leaders must understand the characteristics of effective PD (Lutrick & Szabo, 2012) and choose the development that is most suited for the needs of the educators (Stanley, 2011). Leaders must begin PD sessions by focusing on learning and the learners, by carefully planning, providing insights, and considering context (Guskey, 2009). Educational leaders such as district personal, administrators, policymakers often decide teacher PD without consulting the teachers first (West, 2011).

When conducted effectively, researchers have found that PD can positively influence teacher motivation (McDonald, 2009) and retention (Drage, 2010). Motivated learners are responsive and attentive during programs (ASSE Training & Communication, 2013). The PD process is affected by factors such as how teachers learn, teachers' motivation to learn, quality of program, the teachers' willingness to change, and the teachers' professional demands (McDonald, 2009). Substantial change in behavior and practice is difficult for most teachers (McDonald, 2009). However, when teachers change practices, attitudes, and beliefs, students also experience a positive social change (McDonald, 2009). Croft et al. (2008) found a positive correlation between teachers' PD growth and student growth.

The essential goal of every PD is to change teachers, which in return will change students (McDonald, 2009). However, educational leaders may ask newer teachers to change instead of veteran teachers because newer teachers are accustomed to and expect change (Steinke, 2012). Veteran teachers may see change as a significant challenge (Steinke, 2012). Training sessions for newer teacher can often be overwhelming (Steinke, 2012) because they trying to find their teaching philosophy and methods while trying to learn new material at the same time.

Guskey (2009) described several core elements of PD: time, collaboration in problem solving, school specific requirements, and strong leadership. Teachers need time to deepen and process their understanding, analyze student work and learning, and prepare and implement new teaching and learning strategies. Adding professional learning opportunities does not ensure positive change within learning environments. Appropriately using time in the learning environments matters the most (Guskey, 2009). Without structure, proper management, and skilled leadership, collaborative problem solving can unexpectedly have significant negative consequence such as lacking a common goal or vision and unity. When implementing collaborative problem solving correctly, participants gain a sense of community and take ownership of their learning. When schools are implementing PD sessions, sessions must meet the specific needs of the school (Guskey, 2009). However, other schools probably have had a similar problem. Schools do not need to reinvent the PD wheel. Ideas from other educators can initiate and sustain learning improvements. Teachers are not going to organize groups for school improvement spontaneously. Strong leadership is essential in creating school improvement groups and initiatives (Guskey, 2009).

Ohio also published a five-step PD continuous cycle of professional learning for educators (ODE, 2007). Step 1 has educators examine the data through self-assessments and available data. Step 2 determines learning priorities by analyzing the data to identify specific goals. Step 3 requires educators to align the initiatives to specific activities and actions that will promote professional learning. Step 4 is to develop implementation strategies and a plan for evaluation. The final step is to monitor, assess, and reflect on the effectiveness of the PD activities and efforts. Ohio's most current standards for PD contain six distinctive standards. Quality PD is a purposeful, structured, and continuous process that occurs over time. Quality PD is informed and supported by multiple sources of data. Quality PD is collaborative in nature. Quality PD accommodates individuals' knowledge and skills by utilizing varied learning experiences. Evaluating Quality PD by short and long-term influence on student achievement and teaching profession. Quality PD results in teachers gaining, enhancing, and refining skills and knowledge.

Researchers explained that three primary stakeholders for PD exist: funders, institutions of higher learning, and teachers (Smolin & Lawless, 2011). Each group has different definitions of what constitutes an effective PD program (Smolin & Lawless, 2011). Funders are most interested in knowing how the program affects teachers and students and considers the program a success if the students are positively affected (Smolin & Lawless, 2011). Funders are reluctant to provide funding to programs that cannot be sustained long-term (Smolin & Lawless, 2011). Institutions of higher education have two important roles in PD: Creating new frontiers and provide a pipeline of teachers proficient in technology (Smolin & Lawless, 2011). Institutions of higher education deem PD programs effective when participants use technology-rich instructional practice

(Smolin & Lawless, 2011). Finally, of course teachers are at the forefront of the PD sessions because they have the opportunity to adjust the content and technology to meet the needs of unique students (Smolin & Lawless, 2011). These three stakeholders must align their goals and coordinate their efforts to ensure positive outcomes.

PD is often challenging and complex because it is a systematic approach to changing values, beliefs, and skills of teachers, as well as influencing student learning (McDonald, 2009). Teachers' beliefs regarding learning and instructional practices affect their perceptions of PD (Morewood et al., 2010), which should be respected and valued (MacDonald, 2008). When designing PD sessions, programs should integrate research-based components that allow practitioners to make connections to every day classroom procedures (Martin et al., 2010; Richards & Skolits, 2009; Slepkov, 2008). High-quality factors include long duration, readily available, constant coaching and support, and close connections to practice (Martin et al., 2010).

Regardless of the level at which teachers instruct, teachers often wonder how PD sessions will effectively address real and perceived weaknesses in teaching (Uslu & Bumen, 2012). Teachers are more likely to participate in PD that aligns with their life-long learning goals when provided with PD program choices (Moorewood et al., 2010). When provided with PD options, teachers' beliefs concerning the effectiveness of the activities change (Morewood & Bean, 2009). A noticeable difference in the level of excitement exists when assigning teachers to sessions instead of them choosing their sessions (Brink et al., 2012). Teachers are often unsatisfied with mandated PD (Croft et al., 2012). Teachers' needs are often unmet as a result (Morewood & Bean, 2009).

Consequently, teachers must be fully committed professional learning (Brink et al., 2012).

Previous researchers found two main types of PD: traditional and integrated (Chambers et al., 2008). Traditional PD activities (college course, conferences, or workshops) usually occur after school hours or covered by substitute teachers (Chambers et al., 2008). Traditional methods are usually passive approaches (Croft et al., 2010). Integrated PD activities must be embedded within teachers' daily classroom teaching (Chambers et al., 2008). Such activities include collaboration, mentoring, coaching, and observations (Chambers et al., 2008). The sit and get approach misses the definition of rigor and relevance because the approach is lacking research questions, planned designs, and multiple data collection methods (Pierson & Borthwick, 2010). PD needs to continue to shift from passive and consumptive learning to teacher-directed and participatory learning (Brooks & Gibson, 2012).

Certain K-12 schools create partnerships between their district and universities (Doolittle et al., 2008). Forming a PD partnership occurs when teachers have the benefit of closely working with content area experts, which allows customized PD to meet individual needs (Smolin & Lawless, 2011). University members need to spend a considerable amount of time reflecting with clinical teachers on observations and experiences (Doolittle et al., 2008). Teachers are more likely to apply their knowledge because the knowledge and feedback is specific to the teacher's classroom (Smolin & Lawless, 2011) and they helped create a shared vision of improving student knowledge (Doolittle et al., 2008). The established relationship helps districts function better as a learning community (Doolittle et al., 2008).

State educational agencies need to build a common vocabulary, provide assistance, monitor PD implementations, identify successful practices, align requirements with PD, and build data systems (Croft et al., 2010). District leaders need to engage in long-term planning, develop a school culture that emphasizes the important of continued learning, offer incentives and support, and create opportunities for teachers to advance as instructional leaders (Croft et al., 2010). District leaders need to help principals identify effective facilitators, plan and support implementation, align teacher evaluations with PD, and provide collaborative learning time for teachers (Croft et al., 2010). School leaders need to show the importance of continued learning to faculty, develop a school culture where continued learning is essential, identify effective facilitators, provide support and common learning time, and use student data to inform decisions (Croft et al., 2010). The most successful PD occurs when leaders work together to promote a culture of continued learning, acknowledge and praise effective teachers and leaders, and align teacher evaluations and evidence to PD (Croft et al., 2010).

Because teachers have such an influence on student achievement, schools and districts cannot be any more effective than the teachers working within the learning environment (Croft, et al., 2010; Guskey, 2009; Morewood & Bean, 2009). Teachers begin with a certain degree of knowledge and skills, which must continually grow over the years (Slepkov, 2008). Effective PD is essential to provide educators with the knowledge and experiences needed to foster professional growth (Guskey, 2009; ODE, 2007). Producing high-quality teachers starts with high-quality PD (Morewood, Ankrum, & Bean, 2010). Existing literature has not provided a single case of school improvement without PD occurring (Guskey, 2009).

Currently, professional learning is poorly perceived and flawed because teachers lack time to observe other teachers, work with mentors, and work collaboratively (Darling-Hammond et al., 2009). Numerous PD programs do not provide adequate time for teachers to develop their learning (Petrie & McGee, 2012). Improving professional learning is a crucial step in improving schools and the academic achievement they provide (Darling-Hammond et al., 2009). Intense job-embedded PD is not a common feature in schools across the nation even though educators and policymakers understand the increasing importance (Darling-Hammond et al., 2009).

A gap exists in beliefs of what constitutes effective PD and the evidence used to confirm this belief (Guskey, 2009). Budget cuts have almost become the norm for schools, which hinders long-term, content-specific PD (Croft et al., 2010). School, districts, and states cut PD funding because it does not directly establish the basic teaching and learning of the school (Croft et al., 2010). Because of budgets cutbacks, teachers are often required to teach multiple content areas (Petrie & McGee, 2012). This presents a challenge for teachers because they have to engage in multiple PD programs to stay current on content and pedagogical approaches (Petrie & McGee, 2012).

PD presenters also need to understand the potential barriers teachers face during the development (Richards & Skolits, 2009) because the path towards higher levels of development is not a straight and smooth path (Eun, 2008). Developers must recognize and understand that teachers learn in different ways and the countless factors that influence learning (Pierson & Borthwick, 2010). Occasionally, teachers need to take steps backwards before they are able to make forward growth (Eun, 2008). Researchers believe that if PD participants do not experience difficulty, then PD is not requiring a deep level of change (Frost, Akmal, & Kingrey, 2010). The process of change is just as important as the intended outcome (Frost et al., 2010).

Scheduling time for teachers to overcome barriers and difficulties is a necessity (Frost et al., 2010). Regardless, there needs to be continued support and follow-up of the teachers PD experiences (Eun, 2008; Hixon & Buckenmeyer, 2009). Teachers need varying levels of support and encouragement depending on the PD (Slepkov, 2008). However, providing support is not sufficient; educators must understand the value of the learning experience (Brink et al., 2012).

One challenging factor of effective PD is transforming the school context to meet teachers' needs and efforts (Eun, 2008). Time is another factor that prevents high-quality PD because teacher contracts usually describe the amount of time available for PD and other items (Croft et al., 2010). Providing time for teachers to engage in PD promotes teacher engagement, which creates an effective and quality learning experience for students (Morewood & Bean, 2009). Another significant challenge for effective PD is determining what developmental experiences will benefit participants teaching and learning the most (Brooks & Gibson, 2012). After determining teachers' PD needs, teachers are not always able to implement the material learned during the development program because of factors out of their control, such as workplace characteristics (Stanley, 2011). Providing support for teachers is an excellent way to overcome barriers (Stanley, 2011).

Educational leaders face frustrations from the lack of high-quality PD evaluations because leaders are uncertain which tools, approaches, and programs to endorse (Croft et al., 2010). The lack of quality evaluations can be contributed to being difficult, time consuming, and costly. Quality evaluations are important because they provide evidence of effectiveness, drive educational decisions, advance the field of education, and ensures time and resources are not wasted (Croft et al., 2010).

Several types of evaluation systems can help leaders determine the effectiveness of programs (Croft et al., 2010). A process evaluation evaluates how implementing change agents affects the learning environment (Croft et al., 2010). The evaluation focused on participation, implementation, staff qualification, administration support, and if the change agents are being implemented as designed (Croft et al., 2010). In addition to the component of a process evaluation, an impact evaluation analyzes the results for the desired short- and long-term goals (Croft et al., 2010). The last evaluation method is the cost benefit/effectiveness evaluations (Croft et al., 2010). This evaluation looks to identify which change agents are worth the investment to the educational institution (Croft et al., 2010). However, this method is rarely used because of the difficulty in placing monetary value on various resources (Croft et al., 2010).

Teachers who need the most PD, are often the ones who attend the least (Steinert et al., 2009). Teachers may not attend workshops because of workload, lack of time, time of workshops, location, lack of financial or personal reward, and the lack of classroom connection (Steinert et al., 2009). When PD interferes with normal teaching duties, PD can be more harm than good (Steinke, 2012). Too often PD is removed from classroom practices (CETT, 2012). Forcing mandates upon teachers often causes anger and frustration (Schols, 2012).

In-service teachers go through several stages through their teaching careers (Eros, 2011). Eros refereed to the stages collectively as a learning cycle. Teachers in different stages require different PD activities (Eros, 2011). The learning cycle revealed that if teachers are to continue to grow, they must engage in sustained and authentic PD throughout their careers (Eros, 2011; Potter & Rockinson-Szapkiw, 2012). Just because teachers have years of teaching experience does not mean that they do not need PD (Eros, 2011). Administrators and providers must acknowledge the career cycle of teachers so appropriate PD can be implemented (Eros, 2011). Ultimately, teachers need to understand the educational theory or practice, make observations, make connections to current instructional strategies, and receive support both during and after the development (Richards & Skolits, 2009).

A consensus among most researchers and practitioners has been reached that short training programs, sessions, or courses are highly ineffective because teachers are often provided general strategies or solutions (Padwad & Dixit, 2008). Short-term transmission models are ineffective forms of PD because the models often pay no attention to individual teacher needs and school context (Petrie & McGee, 2012). Effective PD models encourage teachers to be active learners. Actively engaged learners learn through open-ended questions, case studies or scenarios, and collaboration (ASSE Training & Communication, 2013). Exploration allows learners to find new solutions and helps connect and retain the information (ASSE Training & Communication, 2013). Teachers need to continue to grow in knowledge, understanding, and skills through long-term PD (ASSE Training & Communication, 2013).

Reflective teachers often reflect in an intentional and systematic way to improve their teaching (West, 2011) because reflecting helps learners better understand and deepen their knowledge of the information (Brink, 2012). Reflective learning is an effective form of PD (West, 2011). The reflective practitioner approach engages teachers in a continuous learning process of observation, reflection, discussion, theory, and practice (McDonald, 2009). Educational leaders must provide teachers with the resources and pathways to utilize this continuing education approach (West, 2011).

In 2005, the Council of Chief State School Officers began conducting a study of teacher PD programs involving mathematics and science funded by the National Science Foundation (Blank, de las Alas, & Smith, 2008). States nominated mathematics and science PD programs to the council. The council worked with local program directors and evaluators to determine the quality of each PD using a common rubric. The council evaluated 24 PD programs from 14 different states.

Researchers found that one third of the PD programs had measurable effects on teachers' PD, which subsequently had an effect on student achievement (Blank et al., 2008). The measured effects were on content knowledge and instructional practices. The researchers also indicated significant effects when the programs provided training of content knowledge and pedagogical content knowledge. However, researchers found that significant effects occurred only when teachers participated in 50 or more hours of PD. The evaluation of the studies also indicated that one third of the programs had measurable effects on students or changed instructional strategies when implementing purposeful evaluations. The researchers also indicated that educational leaders should consider evaluations that link data from standardized assessments with data on PD for teachers. Regardless of the PD program, evaluations measuring effects over time require careful planning and data collection instruments and procedures. The researchers also revealed the important of sharing evaluation results with decision-makers throughout the study, if applicable, or shortly after the conclusion of the program, not long after the conclusion of the program. Lastly, researchers indicated that partnerships between higher education institutions and school districts did not add to the ability of PD evaluations.

Researchers conducted research on the effectiveness of three types of PD: conference presentations, workshops, and intensive training sessions (Dunst & Raab, 2010). The researchers used a convenience sample of 255 early childhood teachers from 26 states. The conference presentations lasted between one and three hours. The PD sessions occurred at state or national conferences where teachers learned about classroom practices, intended outcomes, and differentiation. The workshops lasted anywhere from 1-3 days, ranging from four to 14 hours. The workshop presented teachers with the same elements as the conference, but also gave teachers the opportunities to engage in various activities. There were two types of in-service programs: weeklong training and on-site training. The weeklong trainings were held on five consecutive days and the on-site training consisted of three or four visits lasting two or three days, over six or seven months. The training entailed observations, feedback, and active participation. The researchers found that intensive in-service training was more effective than presentations and workshops. In-service training is more likely to improve instructional practices. Three characteristics made intensive PD training stand out were multiple opportunities to learn and master skills, receiving feedback and coaching on implemented practices, and teacher collaboration of new skills.

Lutrick and Szabo, (2012) conducted a study that contained two elementary principals and three elementary assistant principals from one suburban district in Texas. Researchers collected data through individual interviews and transcribed the interviews verbatim and then coded into themes (Lutrick & Szabo, 2012). Coding the data revealed several themes regarding effective PD: ongoing, collaborative, data and interest driven, and interactive (Lutrick & Szabo, 2012). Every participant felt that ongoing PD is an essential element because it helps educators form learning communities. Learning communities help promote active engagement, which can promote changes in teaching and learning practices. Participants also believed that collaboration must be presented in effective PD sessions because conversations can occur in a nonthreatening environment. Nonthreatening conversations center on professional learning communities that may be about strategies that are working or not working, student problems, or lesson planning. The participants also thought that effective PD should be data driven. Choosing PD topics should begin with reviewing student scores and walk-through assessments.

The three assistant principals mentioned that effective PD also needed to be designed with the teachers' interests in mind because interests get teachers involved in the learning process and internalize new information. The principals indicated that effective PD must be interactive. The researchers compared the beliefs of the participants to PD research and the national learning standards. The data indicated that the participants' beliefs regarding effective PD where similar to the national PD standards. The data also indicated that the participants also implemented the PD standards within their schools.

The Council of Chief State School Officers conducted a meta-analysis of research that focused on the effects of teacher PD within math and science settings (Blank, & de las Alas, 2009). The researchers followed four basic steps: identification and collection of studies, determination of study eligibility, data analysis, and reporting and dissemination.

The programs placed a strong emphasis on learning specific content and pedagogy. Programs also included multiple activities, follow-up, assistance, and support. All but two of the programs lasted six or more months with an average of 91 contact hours. The number of participants in the studies ranged from less than ten to more than 90. There was a stronger change in elementary level teachers than middle or high school teachers. The researcher indicated that the mathematics PD could statistically have a positive influence on student achievement. Sixteen of the studies reported having significant effects on improving student achievement. There was a positive relationship between student outcomes and key features of effective PD.

Morewood et al., (2010) conducted a study that focused on teachers' perceptions of how PD changed their knowledge of content, pedagogy, and curriculum. The researchers conducted the study in a small southwestern Pennsylvania city Title I school district with 71% being White/Other and 29% Black. The participants of the study were seven teachers who were conveniently selected. The teachers participated in preobservations interviews, classroom observations, and postobservation interviews. Each interview was audio taped, transcribed, and coded. The first phase of coding focused on teachers' perceptions of how the PD influenced their knowledge of content, pedagogy, and curriculum with literacy. The second phase was a more detailed coding of phase one. Teachers felt their participation in the PD affected their knowledge of content, pedagogy, and curriculum because it gave them the opportunity to make connections between teaching experiences and teacher learning.

Morewood and Bean (2009) conducted a survey to understand teachers' perceptions of what they considered effective PD for reading instruction. Researchers conducted the study in a Title I school in the northeastern United States. The study employed a purposeful sample to select the school and then used a convenient sample to select the participants. Data were collected using classroom observations and pre and postobservation interviews. Teachers indicated they valued PD activities that gave them the opportunity to participate in the activities and when the activities aligned with state, district, and personal goals, and standards. The researchers also found that different teachers perceived different PD as being effective, which indicated that teachers have different needs for PD. The researchers also revealed that teachers applied the knowledge learned from the PD to classroom practices.

The researchers applied a three-phase approach to understanding the potential effects on students and teachers (Martin et al., 2010). Researchers collected data from three levels: PD, teachers, and students. Participants (*N* = 287) were from elementary or middle school buildings. There were 71 different schools from 10 different districts. Researchers attempted to collect three pieces of data: lesson plans, classroom observations, and PD faithfulness.

Teachers who were completely committed to the PD session demonstrated higher-quality lesson plans because they contained components discussed in the program (Martin et al., 2010). The researchers also indicated a positive association between commitment to PD and time spent lesson planning, reflecting on practice, and problem solving. Higher commitment resulted in teachers requesting pedagogically oriented activities. Martin et al. suggests that high-quality PD results in improved teacher and student knowledge, creating a positive social change for the learning environment. PD has to have a positive influence on the teachers because students can feel the positive influence. However, different instructional practices presented in the PD may be more effective for different age groups. Technology utilization seemed to have the biggest influence across all grade levels.

Highly effective teachers have several distinct characteristics that define who they are, how they handle challenges, and how they learn (Beavers, 2009). Effective teachers also continually research and implement new teaching and learning strategies to create the best learning environment for students (Beavers, 2009). A PD program's ultimate goal should be to increase teachers' knowledge and pedagogy (Morewood et al., 2010) while helping teachers succeed in the process (Beavers, 2009)

Technology in Professional Development

Advances in educational technology allow educators to provide students with new instructional teaching and learning practices (Schols, 2012). Consequently, there needs to be a shift in PD provided to teachers (Schols, 2012). Many educators find integrating emerging technologies into the classroom setting a complex and difficult process (Schols, 2012). Integrating new technologies often requires teachers to adopt new educational pedagogy (Schols, 2012). Teachers need compelling reasons why to "abandon" their current ways and adopt new learning and teaching practices (Schols, 2012). Emerging technologies are being developed so rapidly that teachers have a difficult time keeping up with changes, which causes teachers to be overwhelmed and frustrated (Schols, 2012). As technology resources transform the educational environment, educational leaders must provide technology PD sessions and programs (Martin et al., 2010; Schols, 2012). States have taken steps to ensure that teachers are proficient in technology by adopting standards and other incentives (Hixon & Buckenmeyer, 2009). However, never use technology for technology's sake, but use technology to enhance instructional practices and content (Martin et al., 2010).

Historically, there is a lack of alignment between technology PD and content areas provided to teachers (Martin et al., 2010). The current format for technology integration is inadequate because PD sessions lack continuity, which hinders teachers from gaining confidence and self-efficacy (Polly & Hannafin, 2010). The misalignment makes it difficult to shows connections between technology PD and student results (Martin et al., 2010). Assessing the effectiveness of educational technology PD requires more than just obtaining feedback from participants' perceptions and level of satisfaction (Uslu & Bumen, 2012). Effective and meaningful assessment requires designing methods that are consistent with existing teaching and learning practices and methods (Uslu & Bumen, 2012). The assessment must recognize that students and teachers change, which means that evaluation methods must evolve to meet the needs of the individuals (Uslu & Bumen, 2012).

Veteran teachers are often resistant to technology and technology integration because they are unable to see how the resources relate to their content responsibilities (Polly & Hannafin, 2010). Even when teachers know how technology can relate to their content, they often struggle deciding which tools are best for the content (Polly & Hannafin, 2010). If the technology seems out of place or more complex than the content, most likely the proper technology tool was not selected (Polly & Hannafin, 2010). Effective technology PD allows teachers to make properly informed decisions, preventing choosing the wrong resource (Polly & Hannafin, 2010). When teachers experience technology PD that is research-based and implemented with faithfulness, teachers gain a better understanding of the content, which increases student knowledge (Martin et al., 2010).

Teachers can use technology to transform the learning environment and prepare students for the local and global context (Smolin & Lawless, 2011). However, the evaluation of technology integration and technology integration PD has done little to define effective practices (Smolin & Lawless, 2011).

Even if adults have technology skills, adult learners have dramatically different habits when utilizing resources (Doherty, 2012). When integrating technology, teachers need close and constant support to answer questions and fill gaps that occur from the rapid change of technology (Polly & Hannafin, 2010).

Leaders must understand that teachers need more than skill instruction when teachers lack skills and knowledge (Blocher, Armfield, Sujo-Montes, Tucker, & Willis, 2011). Providing teachers with PD on computers or specific software does not ensure that teachers are able to understand how to align the resources with teaching practices (Blocher at al., 2011). Technology PD presenters need to understand and identify where teachers are at with technology integration (Eun, 2008; Hixon & Buckenmeyer, 2009). Presenters must constantly reassess and redefine PD strategies as the program continues to move forward (Hixon & Buckenmeyer, 2009). The comfort level of technology integration can determine the approach taken by the presenter (Hixon & Buckenmeyer, 2009) because providing instructional PD does not ensure that teachers will change their attitudes or beliefs concerning educational technology resources (Blocher at al., 2011). Integrating educational technology into the curriculum should create an environment of higher ordered thinking (Potter & Rockinson-Szapkiw, 2012).

Digital natives are often comfortable with technology, even if they do not possess knowledge of a specific resource (Blocher at al., 2011). Digital natives' basic knowledge of technology and concepts is easily transferable (Blocher at al., 2011). Digital natives are more apt to learn and implement technology resources more quickly (Blocher at al., 2011), which school leaders must consider when creating PD (Blocher at al., 2011).

Effective educational technology PD should include technology operation because teachers need to know how to use the software before they can be expected to implement the resource (Potter & Rockinson-Szapkiw, 2012). Learning about a specific technology is different from learning how to use technology to enhance student achievement (Harris, Mishra, & Koehler, 2009). However, this component of the PD should not be the focus because technology operation has a small effect on classroom pedagogy (Potter & Rockinson-Szapkiw, 2012).

Effective technology PD should include technology application because teachers are more likely to implement resources if solid pedagogy connections have been established (Potter & Rockinson-Szapkiw, 2012). Teachers are likely to continue using technology resources to create technology-rich environments when provided with quality opportunities and relevant activities (Potter & Rockinson-Szapkiw, 2012). The last area that effective technology PD needs to include is support (Potter & Rockinson-Szapkiw, 2012). Teachers need assistance and support aligning resources with student learning (Potter & Rockinson-Szapkiw, 2012). This support needs to be spread out over time and provides follow-up activities (Potter & Rockinson-Szapkiw, 2012). Support is most effective when it occurs within the classroom because allowing teachers to integrate technology haphazardly is no longer effective or acceptable (Polly & Hannafin, 2010).

Just like other aspects of life, the more one practices an activity, the more likely that activity becomes habit; the same holds true for effective technology integration (Potter & Rockinson-Szapkiw, 2012). Increased usage should lead to increased student achievement (Potter & Rockinson-Szapkiw, 2012). Teachers must have ample time for self-reflection (Potter & Rockinson-Szapkiw, 2012) because self-reflection is a way for meaningful change to occur (Slepkov, 2008).

Educational technology is a powerful resource that teachers can utilize to transform teaching and learning (Kadijevich, 2012). However, many teachers do not possess the sophisticated knowledge to support effective technology integration because effective integration requires a balance of content, pedagogical, and technology knowledge (Kadijevich, 2012). Teachers must understand the importance of developing and applying integrated and interdependent resources when working with technology, pedagogy, and content, which referred to as TPCK (Harris et al., 2009). TPCK emphasis the connections and interactions between technology, pedagogy, and content knowledge (Harris et al., 2009). Using TPCK is not a rigid set of procedures or practices, but flexible procedures because teachers find unique situations with interdependent factors (Harris et al., 2009). Key features that teachers must keep in mind when using TPCK: open to new possibilities, ongoing reflection and commitment, willingness for new instructional strategies, awareness that technology has strengths and weaknesses, and collaboration with peers (Morsink, 2011). When conducting technology PD, presenters should balance the relationship between technology, pedagogy, and content (Blocher et al., 2011; Harris et al., 2009; Pierson & Borthwick, 2010). Presenters can achieve interconnectedness in a variety of ways (Harris et al., 2009). Supporting the balance point between technology, pedagogy, and content is a cyclical process of reflection, inquiry, collaboration, and sharing (Pierson & Borthwick, 2010). Evaluating the effectiveness of PD sessions according to TPCK must consider how competent teachers are to use technologies in content specific ways as well as being able to use technology with multiple teaching and learning strategies (Pierson & Borthwick, 2010).

Researchers conducted a PD study in 13 districts in a southwestern state (Blocher at al., 2011). The researchers designed and implemented a long-term PD to enhance teachers' skills, knowledge, and ability to integrate technology into the classroom and teaching practices. Teachers were from a variety of grade levels. The researchers conducted the PD over three years and with 20 educators participating the entire time. After the completion of the second year of PD, participants self-reported levels of technology skills, self-efficacy, and professional use. The PD modeled technology integration and embedded technology skills within various activities aligned with content and pedagogy. This approach showed the participants the balance point of knowledge and technology integration.

The researchers showed that participants' competencies of technology integration increased significantly in two years (Blocher at al., 2011). Participants reported that students' use of technology also increased during the same period. Most of the participants reported gains in comfort or confidence. Researchers conjectured that if teachers' self-efficacy increases, effective technology integration would also increase.

The University of Alabama created the Master Technology Teacher partnership to supplement the university's Preparing Tomorrow's Teachers to Use Technology initiative (Wright, 2010). The Master Technology Teacher grant wanted to establish collaboration opportunities, increase knowledge and awareness of new technologies, provide multiple PD programs, and encourage best practices of technology resources. Researchers did not recruited teachers based on technology ability, but based on their desire to learn technology to enhance instructional practices. Participants were two teachers from each content field, preservice teachers, and faculty members. Researchers added one content area teacher, for each subject, because of the program's first year success.

Wright (2010) revealed that participants were able to utilize emerging technologies to supplement their content. The participants were often able to use knowledge learned from PD sessions to meet specific needs of their schools to improve learning. The program also provided participants the opportunity to overcome personal and professional barriers through collaboration. This demonstrated that the program could help teachers overcome barriers and close the gap in technology integration. The program also helped teachers see ethical issues when using educational technology. Over the past 10 years, the program has affected 14 schools and more than 15,000 students.

Professional Learning Community

The idea of a professional learning community (PLC) is that teachers can learn from each other through collaboration (Lieberman & Miller, 2011). PLCs also create environments that promote collaboration, honest discussions, and a commitment to growth and development (Lieberman & Miller, 2011; Linder, Post, & Calabrese, 2012). Growth and development is increased through examination of practices, trying new ideas, and reflecting on what strategies work and why (Lieberman & Miller, 2011). PLCs build an environment of trust, share a common goal, provide opportunity for reflection and dialogue, and provide accountability for results (Prytuia, 2012). A safe environment allows group members to share shortcomings, experiment with new teaching strategies and practices, and challenge their own philosophies (Mullen & Hutinger, 2008).

Teacher PLCs are groups of teachers and administrators who meet on a regular basis to increase student and personal learning (Mindich & Lieberman, 2012; Pella, 2011). PLCs and group learning serve as an excellent source of professional collaboration (Croft et al., 2010). This collaboration provides an opportunity for educators to enhance their knowledge and support change about instructional and learning practice by affording and eliciting feedback because educators will deem the PD activities as being relevant to their classrooms (Croft et al., 2010).

The knowledge teachers develop within the PLC is influenced by the views and perspectives of group members (Pella, 2011). PLCs represent various groups based on grade levels, interdisciplinary, or subjects assembled together to work together and collaborate for a variety of reasons (Teague & Anfara Jr., 2012). PLCs are self-help groups because teachers voluntarily meet to address classroom and school problems to develop professionally (Padwad & Dixit, 2008). Group members must establish and build relationships with each other (Teague & Anfara Jr., 2012). The relationships built around professionals in PLCs are key factors influencing student learning (Leclerc, Moreau, Dumouchel, & Sallafranque-St-Louis, 2012).

The PLC model benefits teachers in collective work, shared responsibility, and social relationships (Servage, 2008). Shared practice, purpose, vision, mission, values, respect, and trust are all important elements of effective PLCs (Teague & Anfara Jr., 2012). The groups shared vision and values influence how the group interacts with each other to reach their common goal (Teague & Anfara Jr., 2012). Shared elements motivate teachers to have high levels of confidence and expectations for increasing student learning (Teague & Anfara Jr., 2012). Collaboration allows for professional growth (Potter & Rockinson-Szapkiw, 2012).

PLCs allow teachers to shift from product-oriented to process-oriented learning (Padwad & Dixit, 2008). PLCs are teacher-driven communities that provide unique opportunities for teachers to synthesize and integrate a variety of educational practices, strategies, and theories (Pella, 2011). Many schools implement PLCs in a way to sustain change within the school environment (Mindich & Lieberman, 2012; Teague & Anfara Jr., 2012). Sustain change requires adequate time, effort (Doolittle et al., 2008), leadership, and direction (Teague & Anfara Jr., 2012). Teachers appreciate when administrators help develop and provide time, resources, space, expertise, and stipends (Linder et al., 2012).

The PLC model has three core beliefs: teacher PD is crucial for enhancing student achievement, PD is most effective when peer collaboration is utilized, and the collaborative work should include inquiry and problem solving in authentic contexts (Servage, 2008). PLCs regularly bring teachers to collaborate on planning, curriculum, and assessment (Servage, 2008). PLCs are an effective PD method for teachers (Jacobs & Yendol-Hoppey, 2010; Linder et al., 2012; Padwad & Dixit, 2008; Servage, 2008) as long the PLC is conducted in an appropriate manner.

Several factors characterize PLCs (Nelson, LeBard, & Waters, 2010).

- Time, resources, and intellectual support for teachers
- Collaborative environments that promote trust, risk-taking, and interdependence

- Collaborative conversations are reflective, inquiry-based, and directly related to student and teacher learning.
- Conversations should support the development of the schools shared mission, vision, and values.
- Strong leadership shared among teachers and administrators
- New understanding of teaching, learning, learners, and curriculum are established meaningful connections other learning institutions initiatives

PLCs bring like-minded individuals together to improve teaching practices and student learning. Building trust and encouraging critical reflection allows for discussing and questioning deeply held values and beliefs (Servage, 2008). PLCs help bridge the gap between professional and student learning (Lieberman & Miller, 2011). Teachers strive to implement new teaching practices and strategies they learned in PLCs (Mullen & Hutinger, 2008). Teachers involved in PLCs have the students' best interest in mind because teachers are working to increase student achievement (Lieberman & Miller, 2011).

PLCs also eliminate teacher isolation by creating collaborative opportunities and support to enrich student learning through authentic interactions (Leclerc et al., 2012; Lieberman & Miller, 2011). The underlying assumption in PLCs is that peer collaboration has the potential to transform teaching strategies and approaches to increase student achievement (Riveros et al., 2012). Peer collaboration needs to engage in deep reflection, especially those concepts that involve teachers learning and actions (Riveros et al., 2012). PLCs provide teachers an opportunity to collaborate and provide support for personal and professional growth (Padwad & Dixit, 2008). Continued support creates a safe environment where participants are not afraid to take risks (Potter & Rockinson-Szapkiw, 2012). A strong PLC supports teacher change (Riveros et al., 2012) and emphasizes personal change (Servage, 2008).

Teachers in PLCs often have an expertise not taught in courses or workshops (Lieberman & Miller, 2011). Teachers that participate in PLCs are collaborative, self-directed, inquiry-driven, and empowered (Linder et al., 2012). PLCs have the ability to make a difference in schools if priority is given to teachers' learning (Riveros et al., 2012). PLCs are not a standalone goal, but a means to improve the school environment (Riveros et al., 2012). PLCs rely on the assumption that elements of the school environment need to change or transform (Riveros et al., 2012). The school environment is a crucial element in determining the effectiveness of a PLC (Leclerc et al., 2012). Within the learning environment, adequate guidance and a supportive atmosphere are necessary for a PLC to be effective (Leclerc et al., 2012; Mindich & Lieberman, 2012).

In order for a school's PLC to improve, schools must abandon the traditional hierarchy model and embrace a form of distributed pedagogical leadership (Leclerc et al., 2012). PLCs involve members with on-site, on-going, and collaborative PD, which is a sharp contrast to traditional PD methods (Linder et al., 2012). Once PLCs are established, teachers are able to continue to move forward with their PD (Linder et al., 2012). PLCs enable teachers to customize and personalize their PD, which creates motivation ownership (Linder et al., 2012). Ownership of the learning process occurs when teachers identify their current needs and interests (Schols, 2012).

A PLC must have a shared vision for the community to be effective (Lunenburg, 2010). Fully integrated PLCs use shared leadership and decision making for school improvements, creating a democratic environment (Teague & Anfara Jr., 2012). Members of a PLC share an understanding of how to achieve the vision, with everyone fully committed to the vision, and every member wants to help the other members succeed (Lunenburg, 2010). All stakeholders must be aware and support the shared vision (Lunenburg, 2010). Collaboration will increase teachers' commitment to the school's goal, mission, vision, and values (Leclerc et al., 2012). Teachers' understanding of teaching and learning is enriched (Leclerc et al., 2012). Addressing and eliminating teacher isolation can occur by establishing and creating shared values, goals, missions, and visions (Lujan & Day, 2009). One way for principals to create a sense of community and decrease isolation is by incorporating distributed leadership techniques, which allows shared responsibilities during PD and study group activities (Mullen & Hutinger, 2008).

Teachers must meet on a regular basis in grade-level or content area teams (Darling-Hammond et al., 2009). Learning teams need to follow a continuous improvement cycle, which examines student data to determine the strongest need, determine areas where teachers need additional development, create learning experiences to address their needs, apply new classroom strategies, refine learning to establish more effective lessons and assessments, and reflect on student learning (Darling-Hammond et al., 2009). The cycle must repeat every time the team introduces a new goal (Darling-Hammond et al., 2009). PLCs are effective because teachers can adapt and adjust the learning model to meet member needs (Pella, 2011).

Effective PLCs are able to monitor the group progress and achievement of goals and objectives effectively (Doolittle, 2008). To create an effective PLC, members must have a general idea concerning the change process (Doolittle et al., 2008). Four components also must be infused into the group for success: communication that provides meaningful feedback and effectively handles tension, a mission with goals and objectives, a strategy for accomplishing the group's goals, and group decision making (Doolittle et al., 2008). The mission, goals, and objectives must be specific, quantifiable, and outcome-based (Doolittle et al., 2008).

When entering a school with an effective PLC, individuals should be able to gain a sense of what is important and that teachers are working collaboratively to achieve the schools' goals (Lunenburg, 2010). PLCs do not just consist of teachers collaborating behind closed doors (Teague & Anfara Jr., 2012). Peer observations, sharing feedback, and/or mentoring are all major components of effective PLCs (Teague & Anfara Jr., 2012). Lieberman and Miller (2011) developed a list of additional factors for effective PLCs.

- Meet regularly to establish trust and openness
- Establish a focus and purpose
- Create routines and rituals such as disclosure and honest talk
- Engage in observations, problem solving, support, and peer learning
- Use activities that enhances learning for adults and students
- Use collaborative inquiry
- Develop a core set of strategies of best practice for student learning

Principals play an important role in creating PLCs (Lunenburg, 2010). Administrators should encourage teachers to participate in PLCs and celebrate milestones and success of groups (Linder et al., 2012). Principals need to communicate expectations, build capacity, monitor and review group progress effectively (Teague & Anfara Jr., 2012), and invest time and money to ensure effectiveness of PLCs (Prytuia, 2012). Principals set the tone for personal and professional interactions within their learning environment (Teague & Anfara Jr., 2012). Educational leaders can help sustain and enhance PLCs by providing teachers with opportunities to have open-ended conversations to engage one another (Servage, 2008).

School leaders can utilize professional learning communities to promote and foster a school culture of continuous learning and teamwork (Croft et al., 2010). Principals have four important roles in creating a PLC within their building (Lunenburg, 2010). The first role is to create a mission statement for the community. The group needs to engage in deep conservations to establish a relevant and meaningful mission. The next step is to establish a vision of what the community is hoping to become. The vision should have commonalities that all members can identify and endorse. The third step in creating a PLC is to work with colleagues to identify values that members pledge to demonstrate to move the school closer to the shared vision and establishing the groups' goals. The fourth and final step is to collaborate with faculty and other stakeholders to establish goals. The goals should serve as guidelines for school improvement. When members have personal stake in the goals, members are likely to be committed to reaching this goal. Principals need to model and communicate the school's mission, vision, values, and goals so the statements becomes more than words.

Researchers explained three levels or progressions for PLCs (Leclerc et al., 2012). Initiation is the first stage and the day-to-day operations that do not reflect the vision of the school. Minimal collaboration exists and administrators make key decisions and distribute those decisions to staff. Group members use student data inaccurately to help inform decisions regarding achievement and intervention. The second stage is the implementations stage. During this stage, the PLC has clear, defined, and shared visions reflected in certain day-to-day activities. The collaborative culture of the school is more evident because teachers and administrators are starting to share key decisions. The PLC team occasionally uses student data to help inform decisions about achievement and intervention. The third and final stage that PLCs enter is integration. At this point, the PLC has understandable, defined, and shared visions, reflected in all day-to-day activities. A well-established and supported collaborative culture exists that promotes sharing and questioning. Administrators share power and encourage teachers to develop and enhance leadership skills and abilities. Teachers use student data accurately to improve student achievement and intervention. During this stage, collaboration occurs when teachers' grade level and classrooms are close to each other because knowledge can be easily shared.

Researchers conducted a collective case study that identifies factors that lead to successful integration of PLCs, how faculty members facilitated the formation of the PLC, and how positive relationships were established between school members and university faculty (Linder at al., 2012). The researchers established a partnership between community schools and three university faculty members. There were three PLCs formed for this study: formative assessment, developing math sense, and effects on poverty on teaching and learning. The formative assessment PLC consisted of four female middle school teachers. The math numbers sense PLC consisted of 12 general education and intervention specialist teachers from Grades K-5. The effects of poverty PLC consisted of 13 K-6 teachers.

The data revealed that participants were highly motivated to attend their PLCs because of the opportunity to engage in topics chosen by group members, instead of topic imposed by administration (Linder et al., 2012). Participants also valued that they were able to select, implement, and collaborate with other members. Each PLC group valued the assistance of university faculty members. The success of each PLC was to do the camaraderie that was established. The sense of community energized members to meet, collaborate, and have a positive difference in the learning environment. However, one challenge for all groups was time, which caused additional stress. Certain participants struggled with the need to investigate and challenge existing beliefs and experiences concerning teaching and learning.

One challenge to PLCs is there is no fast track in creating an authentic experience (Lieberman & Miller, 2011). The amount of time teachers put into a PLC can be both frustrating and rewarding (Nelson et al., 2010). Effective PLCs take considerable time to establish mainly because of the time it takes to establish trust and openness (Lieberman & Miller, 2011). Once the PLC is established, it needs to become part of everyday life within the school and learning community (Lieberman & Miller, 2011). However, the most common concern for teachers with PLCs is finding time for collaboration (Mindich & Lieberman, 2012).

Principals are faced with major challenges when teachers are not able to work together (Mullen & Hutinger, 2008). Additional problems arise when teachers experience conflicting duties or schedules, personal commitments, or teacher disinterest (Mullen &

Hutinger, 2008). Administrators can intrude if they are not a regular part of the PLC (Mullen & Hutinger, 2008). Principals may rely on predetermined agreements and documents to monitor group progress and dynamics (Mullen & Hutinger, 2008).

One crucial element of effective PLC is time (Leclerc et al., 2012; Teague & Anfara Jr., 2012). Effective collaboration occurs when regularly scheduled times allotted for collegial work and planning exist (Lujan & Day, 2009). However, difficulties can arise when teachers must attend meetings outside school hours (Leclerc et al., 2012). The value of everyone’s time needs to communicated to all and be part of the community’s norms (Lujan & Day, 2009). Effectively using PLC time is important because each member has committed time to work towards the shared goals of the PLC (Lujan & Day, 2009). Resolving questions or topics, through e-mail, must occur when possible instead of using group time (Lujan & Day, 2009). New members joining the PLC need to understand the preestablished norms of the community (Lujan & Day, 2009). Another barrier of PLCs is proximity to group members, schedules, common planning times and pressures to meet job demands influence PLCs (Teague & Anfara Jr., 2012).

Lujan and Day (2009) conducted a study to investigate teachers’ perceptions of roadblocks faced when implementing PLC models. The study’s participants were 37 elementary educators’ located in southeastern United States. Researchers collected data using an open-ended survey, interviews, and observations. The researchers found that participants wanted to have common planning time with other group and nongroup members and would be content meeting once a month during school hours. The researchers also revealed that the implementation of a PLC within the school improved collaboration on consistency and authentic discussions. The PLC also provided structured meetings, shared goals, shared teaching strategies, and greater discussion of curriculum and common assessments. The PLC had a significant improvement in the learning environment and collaboration.

PLCs do not have to be conducted in the traditional brick-and-mortar setting. With the advancement of technology, teachers can now participate in authentic and effective PLCs with teachers around the state, country, and world. This global interaction is achieved by teachers subscribing to blogs, online communities, websites, and online discussions as a means of learning and improving teaching practices (Trust, 2012). Teachers are building a professional learning network (PLN) when they subscribe such resources (Trust, 2012).

PLN provide users with instant information and connection to thousands of experts (Trust, 2012). PLNs are transforming PD for educational professionals through informal learning (Trust, 2012). PLNs allow users to share information, connect with other experts, obtain feedback, and receive help (Trust, 2012). Teachers participate in PLNs to grow professionally, collaborate with other professionals, and contribute to the educational community (Trust, 2012). Researchers recommend that teachers start by adding one tool to their PLN (Trust, 2012). As teachers become comfortable, they can gradually add more resources to their PLNs (Trust, 2012).

Two types of PLNs exist: information compilation and social media (Trust, 2012). Information compilation PLNs allows teachers to stay informed on current information by following multiple websites and news sources using Really Simple Syndication (RSS), which allows users to follow a particular website on another website (Trust, 2012). For example, users can follow information on the National Education Association’s website and the New York Times Education Column on another website like Google Reader (Trust, 2012). RSS readers save teachers time because they do not have to visit multiple sites to receive updated information (Trust, 2012). Another form of information compilation is when users receive e-mail subscriptions. Subscribers are sent an e-mail when there is a new post or update (Trust, 2012). As previously mentioned, the other PLN is social media connections (Trust, 2012). Social media PLNs uses social media tools to connect educators around the world (Trust, 2012). The social media tools include social networking sites and real-time interaction tools such as chat rooms and instant messaging (Trust, 2012).

Teacher Collaboration

Teacher collaboration is an effective way teachers continue to learn and grow to improve their teaching (CETT, 2012; Mindich & Lieberman, 2012; Stanley, 2011). Collaboration must provide a means of prolonged and effective PD because each member is equipped with different perspectives and connections, making it easier to accomplish the goal (Frost et al., 2010).

Teachers find the idea of small, focused groups as an effective and attractive way to learn and grow (Stanley, 2011). This attraction is partially because teachers traditionally have had little or no say in their PD and collaboration was not part of traditional PD methods (Stanley, 2011). PD that contains collaboration provides participants a sense of initiative and control of their learning (Stanley, 2011). Collaboration provides multiple paths for learning (Stanley, 2011) and opportunities to collaborate with colleagues regarding common issues related to teaching (Eun, 2008). The collaborative PD model is in sharp contrast to the traditional method of PD where participants are presented with the information, which does not allow participants to reflect on teaching practice (Stanley, 2011).

Collaboration is so important and effective that grants often require teacher collaboration (Frost et al., 2010) because collaboration creates meaningful learning (Potter & Rockinson-Szapkiw, 2012). However, teachers must invest time and resources into the group (Stanley, 2011). Knowledge of other teachers allows group members to break down privacy barriers so that they feel comfortable disagreeing with or providing feedback and suggestions to other group members (Eun, 2008; Stanley, 2011). The overall school climate is more conducive to learning when teachers collaborate (Potter & Rockinson-Szapkiw, 2012).

Effective collaborative groups are flexible to meet the diverse challenges of the profession and working with others (Stanley, 2011). The group must evolve and adapt at every meeting (Stanley, 2011). Collaborative PD is also effective when the collaboration is rich in content and honors the expertise of the members (Stanley, 2011). New knowledge can occur when teachers collaboratively work together to solve problems (Prytuia, 2012). Collaborative problem solving results in the deconstruction and reconstruction of knowledge (Prytuia, 2012).

Teachers need training on how to collaborate effectively with their colleagues (Lujan & Day, 2009). The training allows teachers to engage and overcome conflicts when they arise because teachers will accept responsibility and act as professionals (Lujan & Day, 2009). With or without outside leadership, the most successful collaborative groups have a common goal and improve the knowledge most important to group members (Stanley, 2011).

Researchers describe four central ideas to collaborative program evaluations (Smolin & Lawless, 2011). Collaborative evaluations are built on creating collaborative partnerships, adjusting the program during implementation based on information, are involving participants in developing instruments, and analyzing the data, which informs the overall evaluation (Smolin & Lawless, 2011). Researchers discussed three different types of collaborative evaluation models: developmental, responsive, and layered research (Smolin & Lawless, 2011). Developmental programs support growth, change, and continuous progress because goals and outcomes emerge throughout the learning process instead of being preset (Smolin & Lawless, 2011). The model is more interested in evolving to meet the needs of the participants (Smolin & Lawless, 2011). The responsive model focuses on how teachers are learning and the setting in which the learning is occurring, both in the PD setting and classroom setting (Smolin & Lawless, 2011). Layered research evaluation occurs when participants and evaluators develop questions and data collection tools to utilize in program evaluation (Smolin & Lawless, 2011).

Collaborative approaches shift the processes used in program evaluations from identifying questions and measuring results to an inclusive approach of gathering multiple perspective from stakeholders (Smolin & Lawless, 2011). Gaining multiple perspectives will create and foster multiple definitions of successful PD (Smolin & Lawless, 2011). Collaborative approaches portray teaching and learning within the PD and classroom environment (Smolin & Lawless, 2011). Finally, findings are reported during PD sessions so participants know the influence of their PD experience (Smolin & Lawless, 2011).

Historically, teaching is an isolated profession (CETT, 2012; Mindich & Lieberman, 2012). When teachers work in isolation, they are not exposed to different ways of teaching and assessing students, which may cause teachers to believe they have the best method of teaching and assessing (Council of Chief State School Officers, 2013; Prytula & Weiman, 2012). Isolation also causes teachers to improve and revamp teaching methods and strategies alone (Prytula & Weiman, 2012). When teachers move from isolation to collaboration, teachers often change their practices and identity (Prytula & Weiman, 2012).

Predetermined activities for PD are usually the main reason for teacher collaboration (West, 2011). Otherwise, teachers work in isolation because of insecurities and the lack of opportunities to work collaboratively (Mindich & Lieberman, 2012). Teachers benefit from social interactions and colleague connections (Mindich & Lieberman, 2012). Educators are more effective when collaboration and shared-decision making is promoted (CETT, 2012).

The purpose of Prytula and Weiman's (2012) case study research was to examine change in high school teachers' identify when participating in a collaborative PLC model. The study was conducted within one district with eight teachers being selected using a maximum variation sampling methods. The participants ranged from veteran to beginning teachers. Researchers collected data through written reflections and interviews throughout the school year.

The participants' perceptions of working collaboratively changed because of working in the PLC (Prytula & Weiman, 2012). The data indicated that teachers recognized the benefits that collaboration had on their work through sharing ideas. The

PLC collaboration allowed users to add new ideas and teaching strategies to their repertoire. The PLC provided teachers with affirmation of their good work and that every teacher struggles, which created a sense of comfort and trust. The researchers found that PLCs positively affected participants' identity.

Researchers indicated that the duration of learning activities within PD programs is statistically significant (Croft et al., 2010). When teachers receive 50 or more hours of support with high-quality approaches, student test scores increased an average of 21% (Darling-Hammond, Wei, & Adamson, 2010). However, the United States is far behind other countries in providing teachers with opportunities to participate in extending and collaborative learning (Darling-Hammond et al., 2010). Many nations provided approximately 100 hours of PD, in addition to 15-25 hours a week for collaborative learning and planning, about five times more than United States teachers (Darling-Hammond et al., 2010). Teachers receiving short-term PD (8 hours or less) significantly increased in the past four years (Darling-Hammond et al., 2010).

Teachers often face challenges when working collaboratively, causing sporadic and uneven results (Mindich & Lieberman, 2012). Several factors hinder teacher collaboration: time, the isolated nature of teaching, and different views among teachers (Lujan & Day, 2009). Effectively established PLCs allows members to overcome the issues (Lujan & Day, 2009). However, PLCs provide teachers with the time and space needed to discuss challenges, solutions, and successes collaboratively (MacDonald, 2008). Too collaboratively share the experiences, a high level of comfort and trust must be established (MacDonald, 2008).

Summary

PD is not only required of teachers, but teachers cannot simply go through the motions when participating in these sessions. To help motivate and engage the learners, presenters need to know their intended audience so they may make the information personal, relevant, and authentic. When participants understand that the material they are learning is important and directly influences them, they are more likely to retain and apply this new information to their classrooms.

Researchers found that the traditional sit-and-get method of PD is not appropriate or effective. Too often participants passively go through these sessions missing valuable information. Presenters need to engage participant by making presentations, activities, discussions, and collaboration relevant. In addition to sit-and-get PD sessions being ineffective because participants passively attend the sessions, they are also too short. For PD to be truly effective, teachers need to attend 50 or more hours of development. These 50 hours do not have to be spent in training. Teachers need to spend part of these 50 in collaboration, observation, reflection, and participating in professional learning communities. Teachers and administrators need to work together. The traditional top-down structure is ineffective because teachers feel they do not have ownership over their learning.

Professional Development Project Description and Discussion

Beaver (2009) explained that teachers often miss valuable information in PD sessions because the information is being presented ineffectively. PD needs to continue to shift from passive and consumptive learning to teacher-directed and participatory learning (Brooks & Gibson, 2012). The project will address the technology integration problem in two ways. The first way is to provide teachers with a presentation that discusses the importance of technology and the associated benefits. The presentation will highlight two educational technology resources, document cameras and student response systems. The second way in which the problem of technology integration will be addressed is by conducting hand-on training for document cameras and student response systems.

Before starting the presentation or the hands-on activity, the presenter needs to know the audience. Using andragogy learning theories have already been discussed; however, when the audience has no background information about the topic, pedagogical learning theories need to be used in the beginning (McGrath, 2009). The presenter can quickly transition to andragogy approaches (McGrath, 2009). Information will be provided to each district's technology coordinators who will serve as the main trainer because the data indicated that most of teachers never used document cameras or clickers, and will need long term support instead of a single hands-on session. In other words, the technology coordinator will provide the training and support.

All too often PD sessions/programs are removed from classroom practice (Commission on Effective Teachers and Teaching [CETT], 2012). The PD activities will focus on implementation of authentic classroom uses of the document camera for the teachers. Teachers will be required to bring any upcoming lessons they think might be enhanced with document cameras making this an authentic activity for the teachers themselves. Integrating educational technology into the curriculum should create an environment of higher ordered thinking (Potter & Rockinson-Szapkiw, 2012). Effective educational technology PD should include how to use the technology resource because teachers need to understand the software before they can be expected to implement the resource (Potter & Rockinson-Szapkiw, 2012). However, operating the resource should not be the focus because technology operation has a small effect on classroom pedagogy (Potter & Rockinson-Szapkiw, 2012). We will seek to provide technical training, ongoing support, and authentic learning tasks for the teachers themselves.

The training session for the student response systems will be much more involved and detailed. The training will help teachers install, setup, manage, and implement. In other words, the project will not only show the teachers the importance and benefits of technology integration, but the project will also provide hands-on training of document cameras and student response systems. In addition, it will go a step further in helping teachers select, develop, use, and reflect on a classroom use of each technology.

The importance of continually highlighting authentic uses of technology cannot be stressed enough. The most common student activity where student utilized technology was for learning or practice basic skills, which 64% of the participants indicated completing this activity sometimes or often. Participants indicated that students only performed constructivist activities of designing or producing different products sometimes or often 12% of the time. More than 75% of the participants felt that computer access for students' was adequate, making a PD program logical to increase the beneficial implementations. A PD program that increases teachers' knowledge of how to utilize computers for student learning effectively is highly appropriate. Many nations provide teachers with about 100 hours of PD, in addition to 15-25 hours a week for collaborative learning and planning, about five times more than United States teachers (Darling-Hammond, Wei, & Adamson, 2010). This project should be equivalent to four-hour days dispersed across the year and led by different resource people including district technology directors, principals themselves learning to use the technology, grade level leaders, and collaborative groups who watch each other teach with their new technology.

Needed Resources

- Access to document cameras and student response systems
- Computer and Internet connection
- Webcam
- Google Hangout account
- Technical support before, during, and after integration
- Additional time to conduct collaboration, PLC, coaching, and mentoring
- Technology Integration and Authentic Learning PowerPoint Presentations (see Appendix A)
- McREL's supplemental materials on reflective dialog protocol and lesson planning (see Appendix A)
- Anticipation guide (see Appendix A)

Proposal for Implementation

The PD program will start with a PowerPoint presentation about technology integration and why technology integration should occur. The goal of the presentation is to increase knowledge of technology integration, investigate how to use document cameras and student response systems and their associated benefits, and create short and long-term positive social change. The presentation focuses on document cameras and student response systems because teachers will be provided with hand-on training for each resource. The presentation will be conducted as a whole district or building. Before the hands-on activities, teachers will be asked to watch a video tutorial on the student response systems they will be using.

To provide teachers with adequate time to obtain document cameras and student response systems from their districts, the technology staff will conduct the technology integration training 2-3 weeks after the presentation. The technology staff will use Google Hangout to conduct the training so teachers will be able to work with their own equipment in their classrooms. That is, the staff member will have several teachers on Google Hangout who are following the hands-on directions upon their own equipment in their own classrooms. Google Hangout is used instead of Skype because Google Hangout allows up to 10 users to interact, for free, at the same time. Skype is only free for 1:1 video calls.

There may need to be more than one session conducted depending on the number of teachers participating. Administration will be encouraged to participate and attend the training sessions so they can relate and provide teachers with support. Teachers who already use clickers will be encouraged to be mentors for teachers who just starting to implement clickers into their instructional practices. This training session will help teachers setup, manage, and start basic implementations. Teachers will be encouraged to collaborate with other teachers and/or their mentor because educators are more effective when collaboration and shared-decision making is promoted (CETT, 2012).

Teachers will spend the next month becoming more familiar with their clickers and effective ways to utilize them for student learning through self-paced learning, coaching, and collaboration. After that month, another training session will be conducted.

Multiple sessions will need to be conducted because teachers will be meeting with their department. Meeting in departments will ensure teachers are receiving authentic and content specific training. Teachers will share ideas and lessons they have utilized over the past month.

After this training session, teachers will be encouraged to continue to collaborate to ensure continued growth. Teachers will need to complete observations and reflective dialog with other teachers. In the past several years, job-embedded PD has become increasingly common for teachers (Croft, et al., 2012). Job-embedded PD is an adult learning principle that infuses teacher practice into daily practice (Croft, et al., 2012; Mullen & Hutinger, 2008). Job-embedded PD likely occurs within the course of the school day and is always about current work within the educational learning environments (Croft, et al., 2012).

Teachers must have ample time for self-reflection (Potter & Rockinson-Szapkiw, 2012) because self-reflection is a meaningful way to promote change (Slepkov, 2008). Teachers will be provided with McREL's material on reflective dialog protocol that will guide them through collaboration, reflection, and observations (See Appendix A). Teachers will also be provided with McREL's lesson plan format (See Appendix A). The format requires teachers to identify the technology resources needed and the national technology standards. The lesson plan helps ensure that teachers are not using technology for technology's sake. The technology resources and the content must complement each other. In other words, teachers must have high-quality lesson plans that address the connection between content and technology.

Once the teachers are comfortable utilizing document cameras and student response systems, the technology staff will deliver a presentation on authentic student learning. The presentation will focus on the benefits and importance of providing students with authentic learning. The presentation will also provide teachers with various resources, supplemented with technology, which can transition low-level applications to authentic learning experiences. Teachers will be encouraged to explore these different resources on their own time, with their mentor, and/or PLC. Teachers are each other's main source of professional learning, making collaboration essential for teachers' growth (Croft, et al., 2012). These sessions will be followed by with asynchronous reflection that is read by the principal or technology director and discussed with the PLCs during regularly scheduled meetings. As always, the emphasis will be on what you did in your classroom with technology and how did it help your students learn more?

Potential Barriers and Possible Solutions

- Technical support – a possible solution to this problem is establishing a professional learning team in which members provide support, encouragement, and guidance to other members. Another solution to the problems of technical support is to have one person from each department receive the training and resources needed to become a mentor. This person will transition from a mentee to a mentor. One person from each department is selected to be a mentor for others in the department to ensure relevant and specific training for participants. This relationship will also reduce the stress on the IT coordinator.
- Access to document cameras and student response systems – If the school district cannot provide these resources, the teacher will need to write a grant that will

provide funding to purchase the resources, such as the Butler Rural Grant. If this is appropriate or the grant money was denied, the teacher could see if another teacher would be able to share his or her resources. Sharing resources could be inconvenient, but it would allow the teachers to collaborate about problems, solutions, and best practices.

- Common time – It may be an issue finding when the teachers can get together for their hand-on training. One possible solution, and probably the most effective, is that teachers are provided time during the school day to attend the PD sessions because the training is not taking up their own time. Another possible solution is to provide multiple times and have teachers sign up for the time that is conducive to their schedule.
- Common Location – It may be difficult or inconvenient for teachers to meet at the same place. The hands-on activity will be more beneficial to the teachers if they each have their own system and set of clickers because they will get the hands-on experience instead of watching someone else. One solution to this problem is to use Google Hangout to connect everyone remotely. Participants will be able to setup, manage, ask questions, and interact with their own equipment. Google Hangout can also be used during mentoring, learning teams, coaching, or PLCs.
- Lack of Implementation – After the presentations and training sessions, there is the potential that teachers will not continue to implement the information learned. One solution is to hold teachers accountable by mentors/mentees, coaches, PLC, and/or administration.

Roles and Responsibilities for Members

- Technology Staff – Provide continued technical and integration support. Help teachers obtain technology resources and provide the minimal PD needed for the document cameras and clickers. Give the presentation on technology integration and authentic learning applications. Conduct the Google Hangout training sessions on document cameras and student response systems.
- Administration – Provide and encourage teachers with PD, both during and after the school day. They will also promote and support the PLC and mentoring established to help teachers with technology integration. Provide general support during the integration process. Work with teachers to make decisions about PD and technology integration. Help technology personnel with the two presentations. Principals may rely of predetermined agreements and documents to monitor progress and dynamics (Mullen & Hutinger, 2008).
- Teachers – Provide support, encouragement, advice, and professional learning to other teachers. Some teachers will take a mentor role and others will take a mentee role, depending on the level of comfort and knowledge. Work with administration to make decisions about PD and technology integration.

Project Evaluation

To determine the effectiveness of this PD project, participants will complete two separate evaluations. Participants will complete the outcome-based survey after the presentations on technology integration and authentic learning applications (see Appendix A). The open-ended survey asks participants to list information learned, how they can utilize the information learned, questions they still have, and any comments/suggestions. The survey will provide school leaders and technology coordinators with the needed information to determine if teachers learned the information from the two presentations. School leaders will use the two questions regarding things teachers were unclear about and comments/suggestions to improve the presentations.

The second outcome-based survey will be distributed at the end of the PD project (see Appendix A). This survey is a combination of Likert-scaled and open-ended questions. School leaders will provide the survey to participants at the end of program because the survey looks to determine if they changed their teaching methods and philosophies about technology integration and authentic learning applications. In other words, the survey will provide information about teachers' use of student response systems, document cameras, and authentic learning applications. These data will provide school leaders with the needed information to make data driven decisions about where their teachers are in terms of the goals of this PD experience. In addition, the full survey will be given to the district administration on Google Drive so they can conduct the full survey in the future to determine specific needs.

Project Implications

The PD program can lead to positive social change by increasing technology integration and authentic learning applications. The project provides teachers with the needed information and skills to increase technology integration, especially with clickers and document cameras, and have students utilize more higher-ordered learning applications. The PD program is important to local stakeholders because the program was designed around the information gathered from teachers within the local educational setting. In other words, the program was not arbitrarily designed around the information that I thought teachers should know. The program was based on the data collected from my survey and best practices for PD.

My project is also important to the larger educational community because my dissertation will be published in ProQuest UMI. The publication will allow other educators to review my research, results, and project so that they may use my information as a guiding or comparison tool for their study, especially when studying districts of similar demographics. In addition, locales with different demographics can make use of my innovative combination of the NCES and McCrel technology surveys. Indeed, I am sharing the Google Drive version of the survey with the school district so that they can electronically administer it in the future. My study allows other educators to become effective leaders in the technology education field. Leaders who can make decisions based on data from their actual location. As researchers reveals new information about teaching, technology, and best practices teacher must modify and evolve their research-based teaching practices and philosophies to fit these findings so they are making the biggest possible positive change in classrooms, schools, or community learning environments.

Section 4: Reflection

Completing the research study and PD project has shaped me both personally and professionally. Both of these processes have allowed me to discover things about myself that I never knew existed, and confirmed others. For example, I had no idea that I would enjoy completing the extensive literature review. In contrast, I am confident in my data analysis skills because I was able to analyze the data to find insightful trends and relationships successfully. These processes challenged some of my thoughts, which proved some of them wrong and confirmed others. For example, I was wrong about a correlation existing between age and integration. However, it was pleasurable to have been right about the negative correlation between age and technology perception. For conceptual change to occur, teachers need to be actively involved their own teaching and learning (Walker, 2010). The following information provides a glimpse into how I have grown both personally and professionally from my research and project study process.

One strength with my PD project was that it directly addresses the needs of the county teachers, increasing technology integration. The teachers reported that they had technology resources available to them, but did not frequently integrate these resources into instructional practices/lessons. This was especially true for document cameras and student response systems. Teachers who do not use educational technology to its fullest ability may be reluctant to do so because they doubt that the resources will make a difference, not because they are unmotivated to learn and implement these resources (Overbay et al., 2010).

Another strength for my project is that the presentations and activities were designed with adult learners in mind. Adults prefer to socially construct their knowledge with like-minded individuals in informal settings (Woolard, 2012). Prior to developing the presentations and activities, I conducted an extensive literature review on adult learning and andragogy learning philosophies and how they are connected to PD. This information helped guide the development of the presentations and activities around adult learning best practices and effective strategies as observations, continued support, mentoring, and collaboration.

The biggest limitation to my project is the duration of the PD program. Even though the presentations and activities will be conducted over a couple of months, teachers may not get the recommended hours of development to make a dramatic change. Researchers have found that for PD to be truly effective, teachers need to participant in 50 or more hour of training, which should be conducted over the course of the school year. This duration may not be met during my PD project because of the extensive resources needed to fulfill the time requirement.

Another way in which the problem of low technology integration of document cameras and students response system could have been reached was through extensive and long-term PD sessions. PD sessions and activities could have been schedule and implemented for a couple hours a week for the duration of the school year. This would ensure that teachers received 50 or more hours of technology integration training within a year. The same basic structure for this PD program would be followed except teachers would have more collaboration/mentoring time with each other, more observations from peers and administration, and more accountability procedures to complete.

Prior to starting my dissertation, I felt like I had a decent understanding of what research was all about and how it was conducted. However, I learned several things about research and scholarship during my dissertation process. The first is that it takes lots of time. I knew it would be a major time commitment and my research would not be done overnight, but I never expected it would take as long as it did. For example, I anticipated that I would be done collecting participant data within about two weeks. However, it ended up taking closer to five or six weeks to get the necessary responses. The next thing I learned from my research is that research reveals expected and unexpected results. I found that at times my research, whether in data collection or literature reviews, confirmed what I expected and provided new insights. For example, I fully anticipated that there would be a negative correlation between teachers' technology perceptions and age and years of teaching experience. My thought about high school teachers using more technology than elementary teachers was also confirmed. However, I predict within the next five years this will no longer be the trend because there will be no difference in technology integration between the two groups.

There were times that I found the exact opposite of what I expected. For example, I thought there would have been a negative correlation between technology integration and age and years of teaching experience. I was pleasantly surprised that my data found no difference in subject taught and the amount of technology integration.

This leads to the last thing I learn about research, you cannot let preconceived notions and perceptions influence your research. You always need to take what they data give you, even if it contradicts what you thought to be true. I would lose all creditability as a professional and researcher if I did not report the data accurately because it did not match what I believed to be true.

When creating the PD project I learned I needed to make decisions based on the data collected from the study. Prior to collecting my data, I had a broad and general idea of what my PD project would entail. However, I did not start creating the project until the data were collected and analyzed because you never know what the data are going to show. Another thing I learned from planning and designing this project is that there are many details that need addressed when designing a PD project. For example, I had to keep my intended audience in mind so that instructional practices and activities align. I also had to create and gather resources for the presentations and activities. I have attended many PD sessions before; however, this was the first one I designed. As a participant, you never realize how much work goes into the preparation and design. For example, Dr. Seymour and I had numerous correspondents regarding best practices, information that confirms the project is valid, and providing convincing information about the importance of implementing technology resources.

If had to redo the project again I would allow myself to play more of a role in the PD presentations and activities. I only designed the presentations and created basic outlines for the activities. These resources will be turned over to administrators and technology coordinator in each district. When districts receive the resources, they need to implement them the best way that fits their needs. The next time I would allow myself to work closely with each district to help present and implement the activities. I feel that collaborating with administrators and technology coordinators would allow for a better and more effective PD session for teachers. Everyone would bring a unique set of skills and expertise to the table. Above all, I would be able to put the cumulative understanding gained through my dissertation process into action, providing a more significant impact.

Future opportunities that I can envision to put this new knowledge to use for positive social change include being a leader within my school, district, and educational community and perhaps most importantly teaching aspiring teachers.

The biggest thing that I learned about being a scholar/researcher is that I really enjoyed all aspects of conducting research. Given my mathematics background, I knew I would enjoy collecting and analyzing the data from my research. However, I was not sure I would be overly thrilled conducting extensive literature reviews. This was not the case. I actually found the literature review process to be interesting and informative. I enjoyed reading the numerous different articles, which provided similar and different findings, concepts, philosophies, and study implementation procedures.

During the planning of the PD project, I learned that I would really enjoy teaching adults about education and the importance of integrating technology. Prior to this project, I had never planned a lesson for adults, especially on education. This project allowed me to express my love and knowledge of educational technology to other professionals. This project confirmed that I am making the correct career move toward teaching education classes at university. This project and research has definitely informed me on the current research for teaching adults and providing meaningful PD experiences to in-service teachers. The presentations and activities could easily be adapted for preservices teachers. Preservice teachers would implement these resources while completing their fieldwork and reflect how the learning environment has changed since integration.

Planning this PD project showed me two reasons why I enjoy working with other education professionals. The first reason is that I get to collaborate and work with other professionals about issues and topics that we are passionate about. While I am not an administrator, I believe I will be able to contribute what I have learned to people with the power to incite positive change. This leads to the second reason. I enjoy working with other professional so that we may improve ourselves as professional, which in return will be passed onto the students. We are not only making a positive social change for the profession, but also in the lives of our future generations.

I was so surprised how easily it was to implement what I learned from my literature review into the PD project. Part of my literature review for the project included a section on adult learning and andragogy learning philosophies. I was surprised how much I remembered from my research and how easy it was to find citations in my literature review to support my project design. It was easy to recall information about best practices and why these strategies are successful. It was surprisingly easy to implement these strategies into the presentations and activities. I feel this shows how literature reviews can be effective learning strategies. Professionals designing PD sessions for teachers will ultimately improve student learning. My proposal is well rationalized through the findings from current research.

Importance of Study

My study is important to the education community because it provided insight into teachers' educational technology perceptions and integration from one county. The information gathered from my study will be especially helpful to county leaders because the data has provided a snapshot of their teachers' current levels of perception and integration. It is important for teachers to understand that integrating new technology will cause pedagogical challenges, which is usually outweighed by the benefits of these resources (Lee & Spires, 2009). For example, leaders will be able to see that student use technology to help prepare written text and practice basic skills, both of which are low-level applications. This is exactly why the project study contains a presentation on authentic learning and application. Leaders will be implementing PD sessions/project that is data driven and creating a positive social change. My study is also important to the larger educational community because it includes data on teachers' perceptions and integration according to many different teacher characteristics. Even though my data did not have a correlation coefficient large enough to allow my results to generalizations to large groups, my research can serve as a starting point or comparison tool for other researchers, especially for the researcher who is looking at districts with similar demographics.

I learned countless pieces of information from this study. I learned how to effectively design, implement, and conduct scholarly research all while learning how to write and communication in a professional and scholarly manner. Part of being professional and scholarly is presenting accurate information. I quickly realized the importance of double-checking the analysis and only including information that is scholarly itself. It is of the utmost importance to be objective throughout the entire process. Professional writing and information is no place for personal opinions or beliefs. The data need to be presented accurately even though it may contradict your thoughts and feelings. For example, I was almost sure that my data would reveal a negative correlation between teachers' years of experience and technology integrations. However, the data indicated that there were no correlations between these variables. Another example is reporting that I could not find a difference in technology integration and subject. To some that may seem like bad data or they failed. However, no data is sometimes the best data.

Implications

Following an extensive analysis of the data, the following recommendations are provided to district and county leaders to help improve teachers' perceptions and technology integration. Teachers' overall perception of educational technology was positive. However, it was found that females, older teachers, teachers with more years of experience, noncore teachers, teacher who teach younger students, and teachers with higher level of educational attainment need additional assistance to increase their perception of educational technology. The data indicated that one way through which teachers' perception of educational technology can be increased is by providing teachers more time to learn and integrate these resources. Participants also indicated they had more training on integration technology resources for instructional purposes. The data also indicated that participants felt as if technology integration was not a high priority. When trying to increase teachers' perceptions of educational technology teachers need more time for learning and integration, more training, and getting administrators to display that technology integration is a high priority.

The factors that were just mentioned lead to implications of increasing technology integration, which is needed because technology integration did not frequently occur and when it did, it was often associated with low-level applications. The factors that participants indicated would increase their perceptions would almost naturally lead to increased technology. School leaders need to provide teachers with additional time for learning and integrating technology. This time could come through common planning time or providing teachers with time during the school day. Schools also need to provide teachers with time so they can attend PD sessions. The best way to increase attendance at the sessions is for the district to pay for the training and for the training to occur within the school day. If school leaders can provide teachers with more time and PD, almost certainly teachers would feel administrators are making technology integration a high priority.

Future Research

Despite the valuable information obtained from this study, there is additional information that can be obtained from future research. Researchers and professional often wondered why teachers do not use computers for student learning even though they use computer for their own productivity and efficiency (Groff & Mouza, 2008). This future research will provide information to understand technology integration better. The literature review indicates that technology integration is often met with barriers. These barriers often cause teachers problems when integrating technology. In other words, teachers get frustrated and discouraged and do not integrate the resources. One suggestion for future research would be to further analysis teachers' technology integration by investigating barriers that are preventing or inhabiting integration. This information would be particularly helpful because participants' technology integration was well behind the national average. The data provided the information needed to see that participants were behind in technology integration. However, the data did not provide minimal evidence as why participants were not integrating technology resources. Future research on technology barriers would provide insight into the lack of integration. The research would provide the evidence needed to determine if the lack of integration is occurring because of availability, internal barriers, external barriers, or any combination of the barriers.

Conclusion

The research and PD projects have provided me with a great deal of knowledge and information about research, data collection and analysis, and project design. It became clear early on that many aspects were going to take longer than expected because of factors outside of my control. The data collection and analysis indicated valuable information about technology perception and integration about participants from this county. The overall technology perceptions for the participants were positive. However, females, older teachers, teachers with more years of experience, noncore teachers, teachers who teach younger students, and teachers with higher level of educational attainment had lower perceptions of technology compared to their counterparts. Despite participants having a positive perception of technology, participants did not integrated technology frequently and when they did, it was often with low-level applications or instructional practices.

Even though educational technology has been in classrooms for many years, teacher are not completely sold on the idea and often do not integrate a variety of technology despite information indicating it improves students' motivation and achievement. For this reason, continued research needs to be conducted to identify problem areas and barriers so that educators can overcome these obstacles so that they might have an even bigger positive social change on students.

With continued research comes the need for continued PD. As research reveals new information about teachers, technology, and best practices teachers must evolve their teaching practices and philosophies to fit these findings. One effective way to stay current is through professional learning communities. My literature review for the project study showed a plethora of evidence supporting the effectiveness professional learning communities for increasing teacher knowledge. The evidence also suggested that professional learning communities are very effective for adult learners because they allow participants to collaborate, take ownership for their learning, and their learning is specific to the group.

My research and project study has provided with me an invaluable set of skills that I could have never learned and refined without this process. These new skills and talents will be carried with me into my next career endeavor, teaching education classes at a university. At the university, my skills in research and PD will continue to be further refined. The more I refine and hone my knowledge of research, PD, and other areas the more of a positive social change I will have on aspiring educators.

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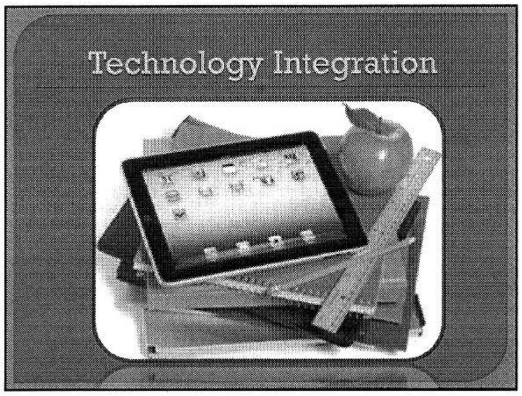
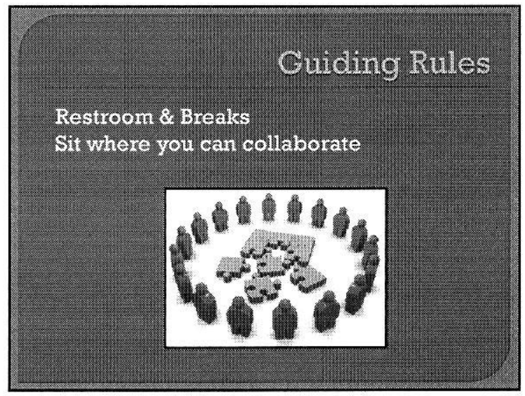
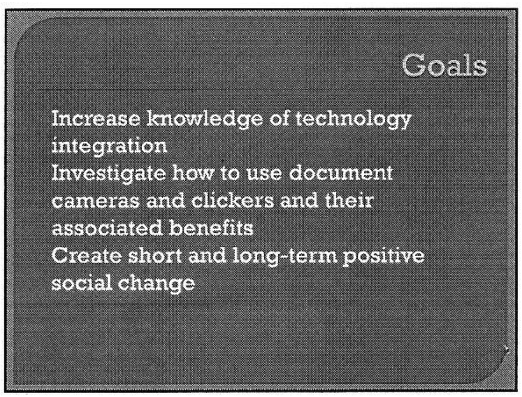
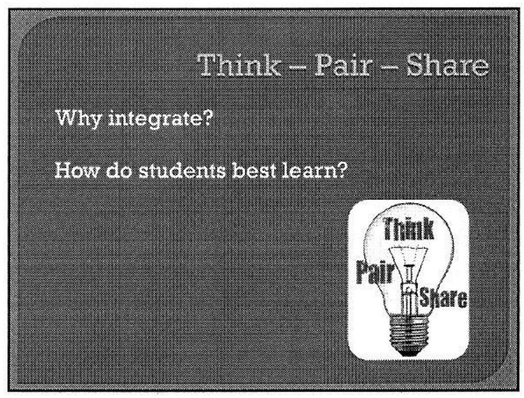
Appendix A: Project

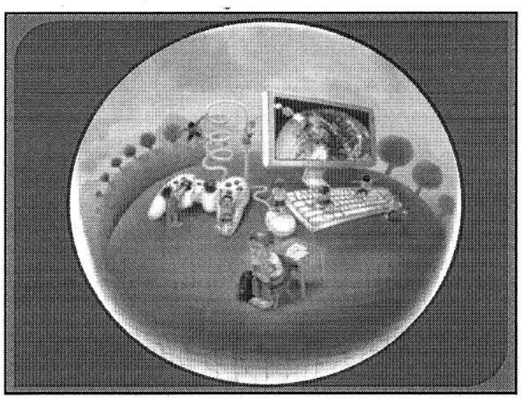
Technology Integration Presentation











Technology Integration

- Simply using technology does not ensure effective integration (Parker et al., 2008)
  - Need to know how and why
- Important factors (Gorder, 2008):
  - Teachers competency
  - Ability to meet student needs
- Allows students to perform powerful tasks of computation, construction, simulations, & visual representations (Wachira & Keengwe, 2011)
- Technology does not replace instructional practices, but supplements

Driving Force

- Preparing students for the 21st century
- Increase student knowledge and ability (Lowther et al., 2008)
- Thus, making student college and career ready.

The Data

- The participants from my study indicated
  - 93% want additional technology integration training
  - Only 47% felt they had sufficient training in technology integration
  - Despite teachers not feeling they have proper training, about 70% make technology integration a high priority.

More Data

- Comparison of national study to my study national study

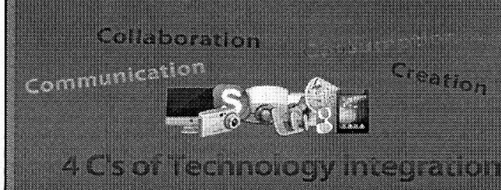
Study Comparison of Technology Resources Availability and Usage

Technology Resource	Availability (%) As Needed		Availability (%) In Classroom		Use (%) Often	
Projector	36	16	48	74	72	62
Interactive Whiteboard	28	16	23	47	57	34
Student Response Systems	22	45	6	6	35	1
Document Camera	22	27	17	24	56	13
Digital Camera	64	62	14	14	49	6

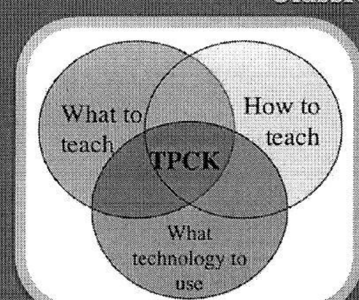
Note. White column percents from Gray, L., Thomas, N., Lewis, L., & National Center for Education Statistics [NCES] (2010). Grey column percents from my study.

Integration

- Before integrating technology, know the purpose



Infusing Technology into the Classroom



TPCK

Teacher must find a good balance between technology, pedagogy, and content (Lee & Spires, 2009)

Low TPCK can cause teachers to be reluctant to integrate (Pierce & Ball, 2009)

Don't integrate technology for technology's sake (Ottenbreit-Leftwich et al., 2010)

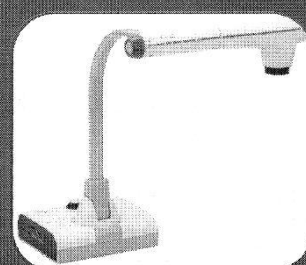
Obstacles for Technology Integration

Educational Technology Resources

Document Cameras
- 51% indicated available
- 74% never or rarely utilize

Student Response Cameras
- 51% indicated available
- 88% never or rarely utilize

Document Cameras



Think – Pair – Share

Do you currently use your document camera?

If you had one, how would you use it?

Basic Overview

http://www.youtube.com/watch?v=84GTIoWt3zM

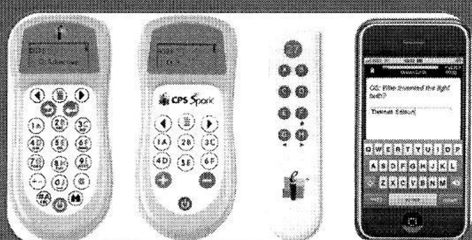
Benefits

- Reaches visual and hands-on learners
- Display student/teacher work
- Can zoom in on objects to show detail or make larger
- Images can be saved for later use
- Can be attached a microscope
- Reduces the need for multiple copies
- Demonstrations

iPad

- You can actually turn your iPad 2 into a document camera
- Many Youtube videos explaining

Student Response Systems (Clickers)



Benefits

- Instant results and feedback
- Allows teacher to make data driven decisions
- Increased interaction and class participation
- Teacher or student paced
- Reduced paperwork and grading
- Software usually provides many detailed reports
- Some systems allow multiple choice, numbers, and short answers.

Think – Pair – Share

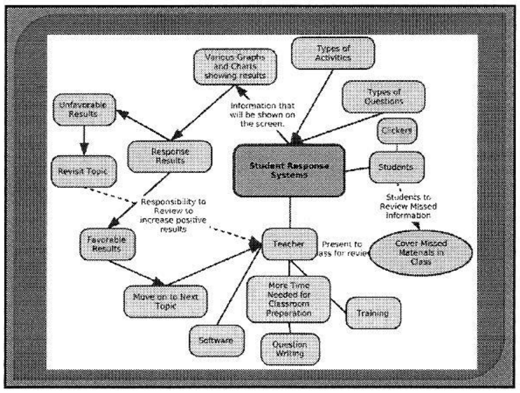
Do you currently use your document camera?

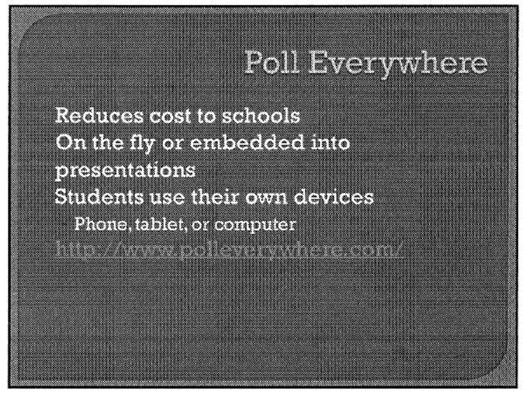
If you had one, how would you use it?

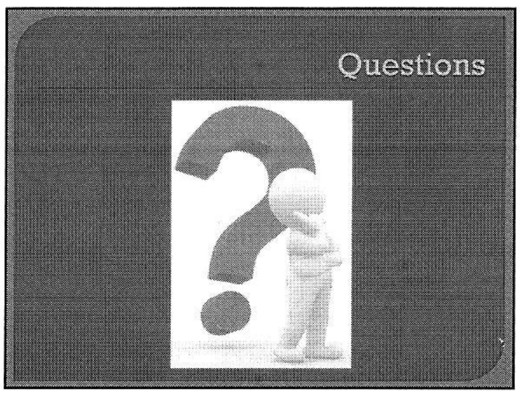
Still Not Convinced?

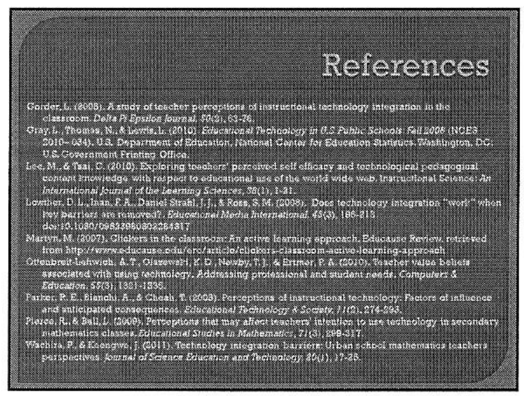
Survey Question	Used Clicker (n=45) Mean	Used Class Discussion (n=47) Mean
Participation with clickers (or class discussion) improved my grade in the course.	3.60	3.20
Participation with clickers (or class discussion) improved my understanding of the subject content.	4.03	3.61
Participation with clickers (or class discussion) increased my feeling of belonging in this course.	3.78	3.48
Participation with clickers (or class discussion) increased my interaction with the instructor.	4.15	3.62
Participation with clickers (or class discussion) increased my interaction with other students.	3.45	3.17
I enjoyed participation with clickers (or class discussion).	4.14	3.93
I would recommend using clicker (or class discussion) again in this course.	4.12	4.05

*Strongly Disagree = 1; Disagree = 2; Unsure = 3; Agree = 4; Strongly Agree = 5; Martyn (2007)


Various Graphs and Charts showing results
Types of Activities
Types of Questions
Information that will be shown on the screen.
Unfavorable Results
Clickers
Response Results
Student Response Systems
Students
Revisit Topic
Responsibility to Review to increase positive results
Students to Review Missed Information
Favorable Results
Teacher
Present to lass for revie
Cover Missed Materials in Class
Move on to Next Topic
More Time Needed for Classroom Preparation
Training
Software
Question Writing


Poll Everywhere
Reduces cost to schools
On the fly or embedded into presentations
Students use their own devices
Phone, tablet, or computer
http://www.polleverywhere.com/


Questions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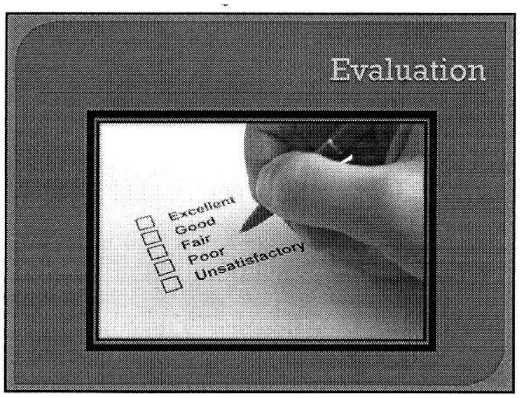
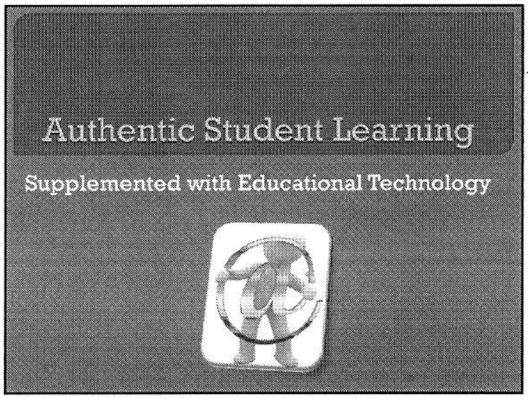
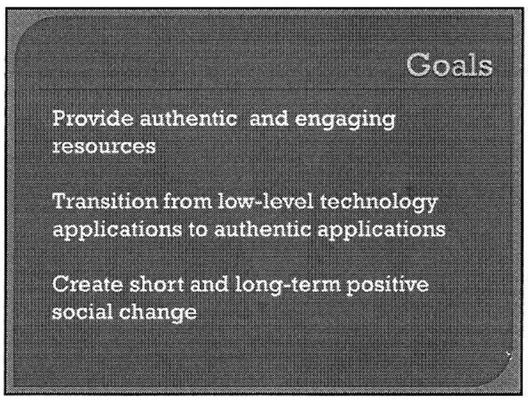
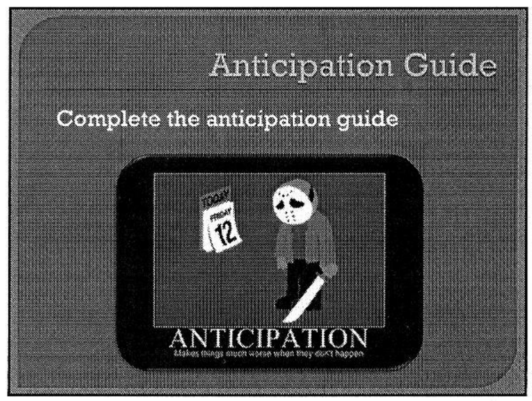
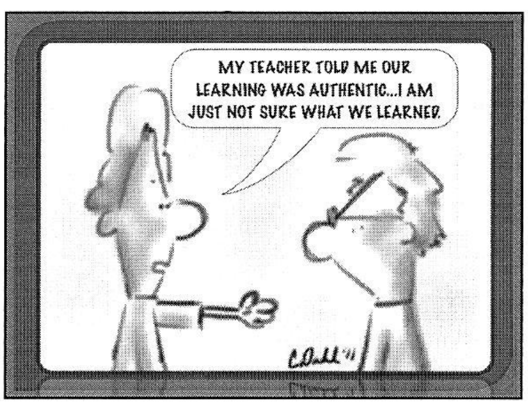

Evaluation
Excellent
Good
Fair
Poor
Unsatisfactory

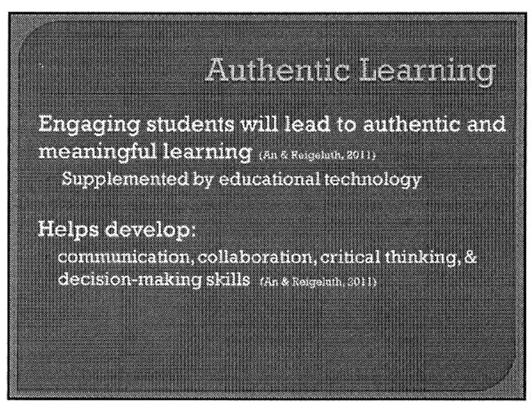
Authentic Learning Presentation

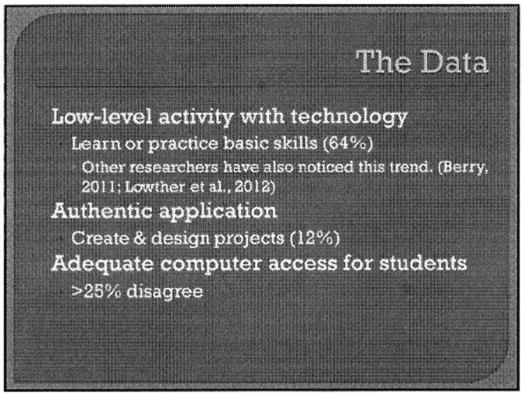


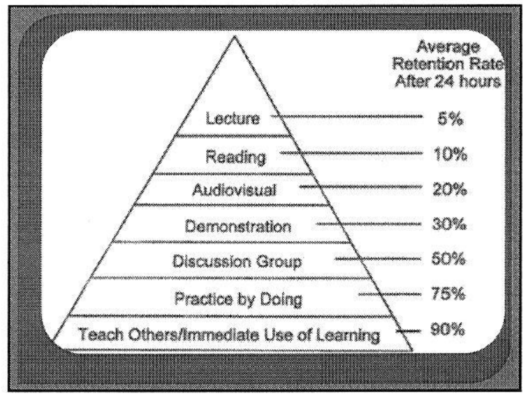


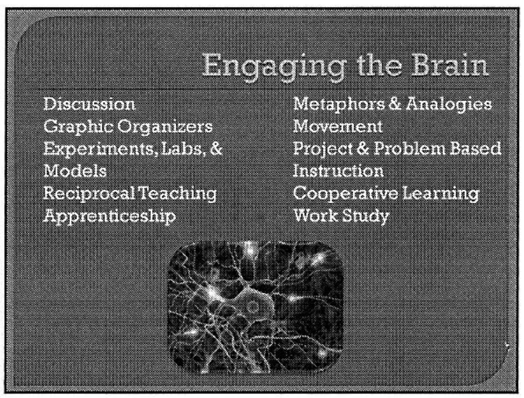


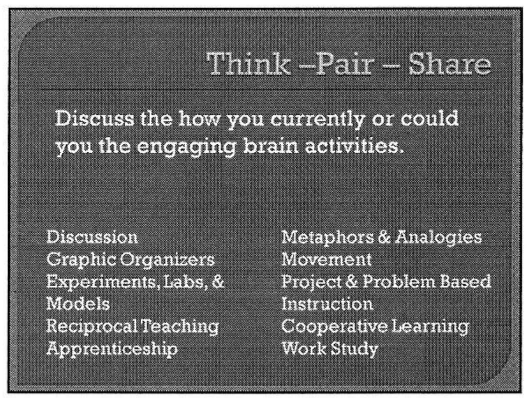


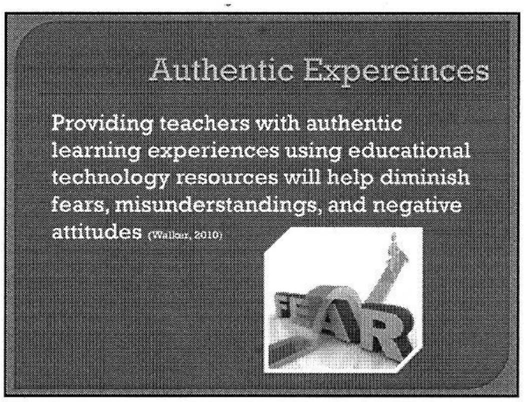


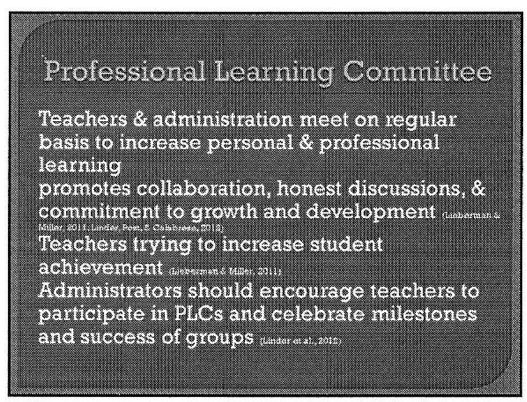

The Data
Low-level activity with technology
Learn or practice basic skills (64%)
Other researchers have also noticed this trend. (Berry, 2011; Lowther et al., 2012)
Authentic application
Create & design projects (12%)
Adequate computer access for students
>25% disagree

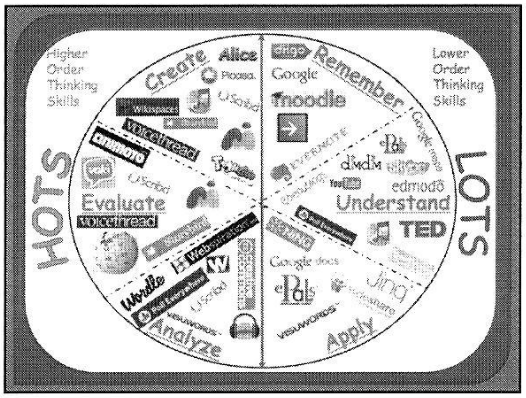

Average Retention Rate After 24 hours
Lecture 5%
Reading 10%
Audiovisual 20%
Demonstration 30%
Discussion Group 50%
Practice by Doing 75%
Teach Others/Immediate Use of Learning 90%

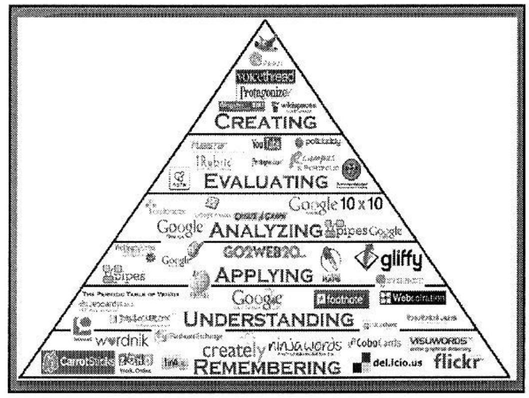

Engaging the Brain
Discussion
Graphic Organizers
Experiments, Labs, & Models
Reciprocal Teaching
Apprenticeship
Metaphors & Analogies
Movement
Project & Problem Based Instruction
Cooperative Learning
Work Study

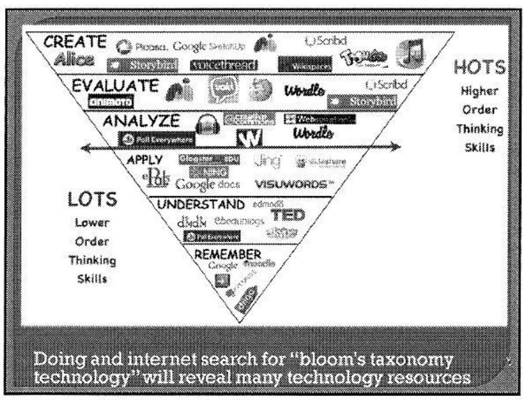

Think –Pair – Share
Discuss the how you currently or could you the engaging brain activities.
Discussion
Graphic Organizers
Experiments, Labs, & Models
Reciprocal Teaching
Apprenticeship
Metaphors & Analogies
Movement
Project & Problem Based Instruction
Cooperative Learning
Work Study

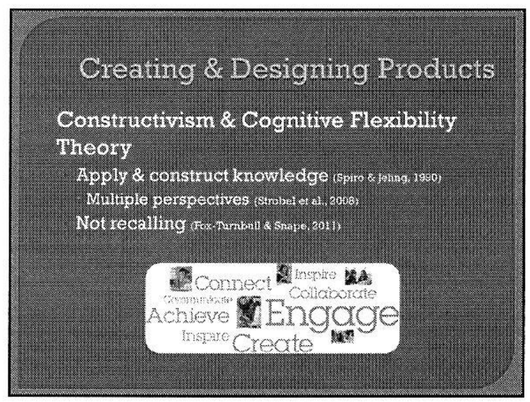

Authentic Expereinces
Providing teachers with authentic learning experiences using educational technology resources will help diminish fears, misunderstandings, and negative attitudes (Walker, 2010)
FEAR

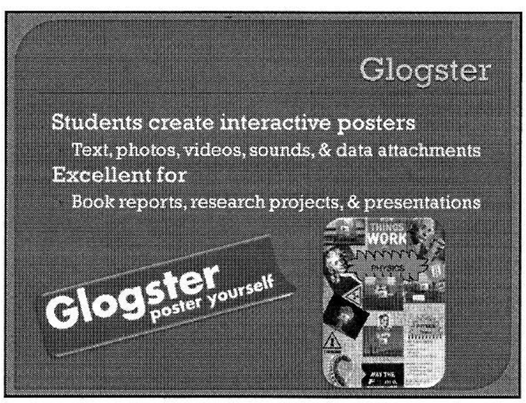

Professional Learning Committee
Teachers & administration meet on regular basis to increase personal & professional learning
promotes collaboration, honest discussions, & commitment to growth and development (Lieberman & Miller, 2011; Linder, Post, & Calabrese, 2012)
Teachers trying to increase student achievement (Lieberman & Miller, 2011)
Administrators should encourage teachers to participate in PLCs and celebrate milestones and success of groups (Linder et al., 2012)

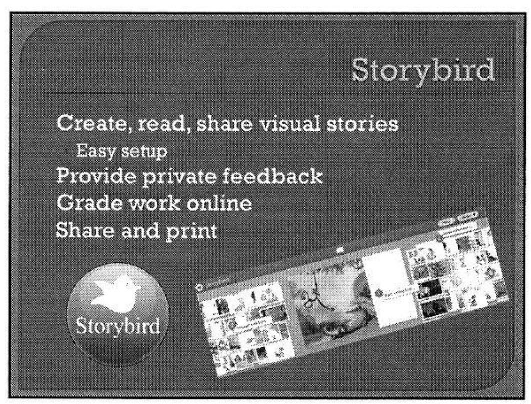

Higher Order Thinking Skills
Lower Order Thinking Skills
HOTS
LOTS
Create
Evaluate
Analyze
Remember
Understand
Apply


CREATING
EVALUATING
ANALYZING
APPLYING
UNDERSTANDING
REMEMBERING

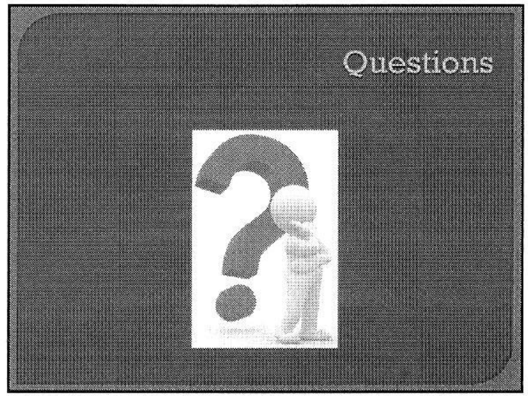

CREATE
EVALUATE
ANALYZE
APPLY
UNDERSTAND
REMEMBER
HOTS
Higher Order Thinking Skills
LOTS
Lower Order Thinking Skills
Doing and internet search for "bloom's taxonomy technology" will reveal many technology resources

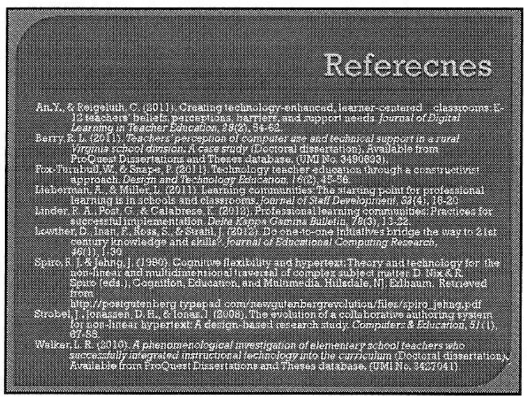

Creating & Designing Products
Constructivism & Cognitive Flexibility Theory
Apply & construct knowledge (Spiro & Jehng, 1990)
Multiple perspectives (Strobel et al., 2008)
Not recalling (Fox-Turnbull & Snape, 2011)
Connect
Inspire
Collaborate
Achieve
Engage
Create


Glogster
Students create interactive posters
Text, photos, videos, sounds, & data attachments
Excellent for
Book reports, research projects, & presentations
Glogster
poster yourself


Storybird
Create, read, share visual stories
Easy setup
Provide private feedback
Grade work online
Share and print
Storybird


Wikispaces Classroom
Social writing platform for education
Project-Based Learning
Students can work on projects alone or together
Manage activity, resources, conversations, & projects
See student progress in real time
Safe Social Networking
Remote Learning
FREE!!!
wikispaces
wikis for everyone


Questions


Referecnes
An,Y., & Reigeluth, C. (2011). Creating technology-enhanced, learner-centered classrooms: K-12 teachers' beliefs, perceptions, barriers, and support needs. Journal of Digital Learning in Teacher Education, 28(2), 54-62.
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Fox-Turnbull, W., & Snape, P. (2011). Technology teacher education through a constructivist approach. Design and Technology Education, 16(2), 45-56.
Lieberman, A., & Miller, L. (2011). Learning communities: The starting point for professional learning is in schools and classrooms. Journal of Staff Development, 32(4), 16-20
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Lowther, D., Inan, F., Ross, S., & Strahl, J. (2012). Do one-to-one initiatives bridge the way to 21st century knowledge and skills?. Journal of Educational Computing Research, 46(1), 1-30
Spiro, R. J., & Jehng, J. (1990). Cognitive flexibility and hypertext: Theory and technology for the non-linear and multidimensional traversal of complex subject matter. D. Nix & R. Spiro (eds.), Cognition, Education, and Multimedia. Hillsdale, NJ: Erlbaum. Retrieved from http://postgutenberg.typepad.com/newgutenbergrevolution/files/spiro_jehng.pdf
Strobel, J., Jonassen, D. H., & Ionas, I. (2008). The evolution of a collaborative authoring system for non-linear hypertext: A design-based research study. Computers & Education, 51(1), 67-85.
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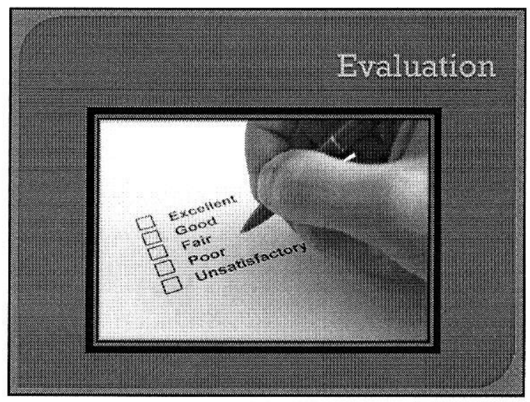
Evaluation
Excellent
Good
Fair
Poor
Unsatisfactory

Lesson Planning Guide

(From: Pitler and Mid-Continent Research for Education and Learning, 2005)

Name:

Subject Area:

Grade Level:

Lesson Title:

Brief Lesson Description:

District Content Standards:

NETS*S Technology Standard:

Assessment:

Reflective Dialog Protocol

(From: Pitler and Mid-Continent Research for Education and Learning, 2005)

Purpose:

1. experience another classroom environment

2. engage in reflective conversation about professional practice

3. observe students in another learning environment

4. contribute to professional growth

Method (do this twice a semester):

1. Pair with one or two other teacher leaders.

2. Select a good time to visit each other's classrooms for a minimum of 20 minutes. Pick a time when technology is being used.

3. Discuss what the lesson will be about ahead of time.

4. Spend a minimum of 20 minutes in each other's classroom using the *Look For* list below as a guide.

5. When both teachers' visits are completed, schedule an informal meeting to discuss the lessons and what each teacher saw. This meeting will probably take a minimum of 30 minutes. Use the *Guiding Questions* sheet as a guide for this meeting.

Look For:

To what extent are the following things happening during the lesson?

1. Students are engaged in discussions and debate that includes collaboration and commenting on and reviewing their own and other's work.

2. Students are encouraged to think independently.

3. Students design something that fosters critical thinking, judgment, and personal involvement.

4. Students are engaged in project-based learning that involves problem solving, making predictions, designing plans, collecting and analyzing data, drawing conclusions, and communicating findings.

5. Students are engaged in meaningful projects.

6. Students are using computers as tools (not as simply machines) to design and carry out projects.

Guiding Questions
Talk with your partner teacher about the lesson and what you saw students doing using the *Look For* list. Then use these questions to guide your discussion about technology integration:

- How did the use of technology change your teaching of this lesson?
- Has technology changed the way you manage your classroom?
- How will this lesson impact student achievement?
- Looking back, is there anything you would do differently next time?
- Where do you want to go from here?

Professional Development Session Survey

District: ______________________ Building: ___________________________

Date: _________________________ PD Session: _________________________

List two pieces of information that you learned from the session.

List two way you can utilize information you learned from this session.

List two pieces of information that you still have questions about after the session.

List two suggestions/comments about today's PD session.

Professional Development Project Survey

1. District:

2. Grade(s):

3. Subject(s):

4. Gender:

5. Age:

6. Years of Teaching Experience:

7. In general, how frequently do your **students** perform the following activities **using educational technology** during your class(es)? *Select "not applicable" for activities that do not apply to your students. (Circle one on each line.)*

	Not Applicable	**Never**	**Rarely**	**Sometimes**	**Often**
Prepare written text	1	2	3	4	5
Create or use graphics or visual displays	1	2	3	4	5
Learn or practice basic skills	1	2	3	4	5
Conduct research	1	2	3	4	5
Contribute to blogs or wikis	1	2	3	4	5
Use social networking websites	1	2	3	4	5
Solve problems, analyze data, or perform calculations	1	2	3	4	5
Conduct experiments or perform measurements	1	2	3	4	5
Develop and present multimedia presentations	1	2	3	4	5
Create art, music, movies, or webcasts	1	2	3	4	5
Develop or run demonstrations, models, or simulations	1	2	3	4	5
Design and produce a product	1	2	3	4	5

8. How often are student response systems available to you?
   Not Available As Needed In Classroom Every Day

9. How often do you utilize student response systems?
   Never Rarely Sometimes Often

10. Describe two applications of how you used student response systems to promote student learning.

    1.

    2.

11. How often is a document camera available to you?
    Not Available As Needed In Classroom Every Day

12. How often do you utilize a document camera?
    Never Rarely Sometimes Often

13. Describe two applications of how you used a document camera to promote student learning.

    1.

    2.

Question 7 from Pitler, H., & Mid-Continent Research for Education and Learning [McREL], (2005). McREL technology initiative: The development of a technology intervention program. Final report. *Mid-Continent Research for Education and Learning (McREL)*.

Anticipation Guide: Authentic Student Learning

Name: _______________________ **Date: ____________**

Before Reading: In the space to the left of each statement, place a check mark (√) if you agree or think the statement is true.

During or After Reading: Add new check marks or cross through those about which you have changed your mind. Keep in mind that this is not like the traditional "worksheet." You may have to put on your thinking caps and "read between the lines." Use the space under each statement to note the slide heading(s) where you have found information to support your thinking.

_____1. From the survey data, the most used student activity supplemented by technology was students learning or practicing basic skills.

_____2. Student using various technologies to learn and practice basic skills is considered a high-level authentic learning application/instructional practice.

_____3. Cognitive Flexibility Learning Theory is a high-level student application students construct their knowledge from a single perspective.

_____4. Today's students cannot be engaged in authentic applications without some type of educational technology.

_____5. Teachers are don't use or are intimidated by authentic student learning because there are limited available resources.

Appendix B: Survey Permission

Subject : **RE: Survey Permission**
Date : Thu, Apr 25, 2013 02:35 PM CDT
From : **"Bahr, Steven" <sbahr@air.org>**
To : kurt.schulze@waldenu.edu <kurt.schulze@waldenu.edu>
CC : Ralph, John (John.Ralph@ed.gov) <John.Ralph@ed.gov>

Hi Mr. Schulze,

Thank you for your interest in the National Center for Education Statistics (NCES).

Dr. Coopersmith no longer works for NCES. However, even though you wish to modify the survey his reply still holds. NCES surveys are public domain and can be reused for additional surveys. Just make sure to remove all references to NCES or OMB when conducting your research and cite NCES as the source for the items. Let me know if you have any further questions.

Regards,
Steve

Steven Bahr
Research Associate
American Institutes for Research
1000 Thomas Jefferson Street, NW
Washington, DC 20007
(202) 403-6937
sbahr@air.org

Subject : **RE: FW: Dissertation student wanting to Modify Questions on Teacher Technology Survey**
Date : Mon, Apr 29, 2013 05:42 PM CDT
From : **Matt Kuhn <mkuhn@mcrel.org>**
To : Kurt Schulze <kurt.schulze@waldenu.edu>

Hello Kurt, as long as you cite the survey properly, you have our permission to use it for your dissertation. If you choose to write a further publication after the publishing of your dissertation, we will need to be consulted again before granting further permission. Good luck and please send us a copy of the report when it is completed.

Sincerely,
Matt Kuhn, PhD
Curriculum & Instruction Technologist
Mid-continent Research for Education and Learning (McREL)
4601 DTC Blvd., Suite 500
Denver, CO 80237-2596
P: 303.632.5628
F: 303.337.3005
mkuhn@mcrel.org
Twitter@edtechmatt
Linkedin@matt-kuhn
http://www.mcrel.org/solutions/instruction/staff-development

Appendix C: Superintendent Permission

Below are e-mail screen shots from the county superintendents indicating approval for the survey to be conducted within their districts.

Subject : **Re: Survey Permission**
Date : Sat, Mar 09, 2013 06:22 PM CST
From : **Kevin Turner <kevin.turner@preblecountyesc.org>**
To : Kurt Schulze <schulzek@preble-shawnee.k12.oh.us>

Kurt:

Thank you. I have seen it because one of the local superintendents sent it on to me. I support your dissertation and the research you are conducting.

Best wishes,

Kevin

From: "Dr. Barbara Curry" <bcurry@eaton.k12.oh.us> Wednesday - July 10, 2013 1:48 PM
To: Kurt Schulze <schulzek@preble-shawnee.k12.oh.us>
Subject: RE: Survey Permission
Attachments: Mime.822 (2054 bytes) [View] [Save As]

Kurt,

It is fine to conduct the teacher survey, as long as they understand their participation is optional.

Good luck with your dissertation!

Dr. Barbara L. Curry
Superintendent

Eaton Community Schools
307 N. Cherry Street
Eaton, Ohio 45320
bcurry@eaton.k12.oh.us
937 456-1107 (office)
937 472-1057 (fax)

Subject : **Re: Survey Permission**
Date : Wed, Mar 06, 2013 11:38 AM CST
From : **Jeff Parker <jparker@nationaltrail.us>**
To : Kurt Schulze <schulzek@preble-shawnee.k12.oh.us>
CC : Brian Pool <bpool@nationaltrail.us>

Kurt,

This sounds good to me. When you plan to send the survey out, please let me know and I will send an e-mail to our faculty encouraging them to complete your survey. I believe the information received from your survey could also be used in the blended learning grant we received last spring. I have cc'd: Brian Pool (NT Technology Director and Teacher) so he is aware of this information. I will also forward him your original e-mail.

Thank-you,

Jeff Parker
National Trail Local Schools Superintendent

From: Dave Ulrich Wednesday - July 10, 2013 8:24 AM
To: Kurt Schulze
CC: Dave Ulrich; Greg Hamm; Mollie Hansel
Subject: Fwd: Re: Survey Permission
Attachments: Teacher Technology Integration & Perception Survey.pdf (1858386 bytes) [Open] [Save As]

Kurt,

You may proceed with the survey. I would also like a copy of the survey results.

David Ulrich

David Ulrich
Superintendent
Preble Shawnee Local Schools
124 Bloomfield St.
Camden, OH 45311
937-452-1283
ulrichd@preble-shawnee.k12.oh.us

Subject : **Re: Survey Permission**
Date : Tue, Mar 05, 2013 05:38 PM CST
From : **Clint Moore <cmoore@tvs.k12.oh.us>**
To : Kurt Schulze <schulzek@preble-shawnee.k12.oh.us>

You have my permission. I look forward to viewing your research data.

Clint

Sent from my iPhone

Subject : **RE: Survey Permission**
Date : Fri, Mar 15, 2013 12:42 PM CDT
From : **Noelle Murray <Noelle.Murray@tcnschools.com>**
To : Kurt Schulze <Schulzek@preble-shawnee.k12.oh.us>

Mr. Schulze:

Mr. Derringer talked to his building principals about your survey and they are on board for you to send it out to our teachers. We can't guarantee participation, but please feel free to send them the survey. If you have any other questions, please let me know.

Thank you,
Noelle

Noelle Murray
Administrative Secretary
Tri-County North Local Schools
436 N. Commerce Street
Lewisburg, OH 45338
P: 937-962-2671
F: 937-962-4731
noelle.murray@tcnschools.com

Appendix D: Research Questionnaire

Teacher Technology Integration and Perception Survey

The purpose of this survey is to gather information about the use and perceptions of technology in your school. In particular, the information you provide via this survey will help provide your school and district with valuable information that will support technology integration.

Please be assured that your responses to this survey will be kept completely confidential. Your candidness in responding to the questions is what will make the results from this survey useful. Therefore there are no right or wrong answers. Your participation in this survey is greatly appreciated.

Directions:
The survey should take about 30 minutes to complete. Please answer every question. Unless otherwise noted, please mark only one response per question.

Definitions:
Airliner: Allows users to wirelessly connect to and control their computer.

Blogs: Websites where an individual or group creates a running log of entries that can be read by other users, such as in a journal.

Classroom response system: Wireless system allowing a teacher to pose a question and students to respond using "clickers" or hand-held response pads, with responses compiled on a computer.

Document camera: Device that transmits images of 2- or 3-dimensional objects, text, or graphics to a computer monitor or LCD projector.

Social networking websites: Online social networks for communities of people who share interests and activities or who are interested in exploring the interests and activities of others (e.g., Facebook, MySpace).

Teacher in a self-contained classroom: Teaches all or most academic subjects to the same group of students all or most of the day.

Technology: Information technology such as computers, devices that can be attached to computers (e.g., LCD projector, interactive whiteboard, digital camera), networks (e.g., Internet, local networks), and computer software. We specifically are not including non-computer technologies such as overhead projectors and VCRs.

Wikis: Collaborative websites that allow users to freely create and edit web page content (e.g., Wikipedia).

Thank you for your time and effort!

References
Gray, L., Thomas, N., Lewis, L., & National Center for Education Statistics [NCES], (2010). Teachers' use of educational technology in U.S. public schools: 2009. First Look. NCES 2010-040. National Center for Education Statistics.

Pitler, H., & Mid-Continent Research for Education and Learning [McREL], (2005). McREL technology initiative: The development of a technology intervention program. Final report. Mid-Continent Research for Education and Learning (McREL).

Page 2 After page 1 Continue to next page

Teacher Demographics

1) Gender *

- Male
- Female

2) Age *

20

3) Highest completed level of education *

- Bachelor's degree
- Master's degree
- Professional degree
- Doctoral degree

4) I currently teach in the following district. *

- Eaton
- National Trail
- Preble Shawnee
- Tri-County North
- Twin Valley South

5) I currently teach the following subject(s): *
(Mark all that apply)

- All Subjects (elementary)
- Social Studies
- Language Arts
- Science
- Mathematics
- Foreign Language
- Visual/Performing Arts
- Special Education
- Vocational Education
- Technology
- Health/P.E.
- ESL
- Other

6) I currently teach the following grade level(s): *
(Mark all that apply)

- Pre - K
- Kindergarten
- First
- Second

- [ ] Third
- [ ] Fourth
- [ ] Fifth
- [ ] Sixth
- [ ] Seventh
- [ ] Eighth
- [ ] Ninth
- [ ] Tenth
- [ ] Eleventh
- [ ] Twelfth

7) I have been employed as an educator for ____ years. *
Include years spent teaching full and part time, in public and private schools, and the current school year

1

Page 3 After page 2 Continue to next page

Technology Usage

8) I have actively used technology in my classroom for ____ years. *

0

9) I have used technology at home or school for ____ years. *

0

10) In a typical 7-day week, I use the computer personally for ____ hours. *

0

11) In a typical 7-day week, I use the computer professionally for ____ hours. *

0

Page 4 After page 3 Continue to next page

12) Educational Technology Resources

For each of the devices below, indicate

1) its availability to you. Include only devices provided by the school or district.

2) how frequently they are used for instruction during your class(es)

LCD or DLP projector *

Not available

used *

- Never
- Rarely
- Sometimes
- Often

Videoconference unit *

Not available

used *

- Never
- Rarely
- Sometimes
- Often

Interactive whiteboard (e.g., SMART Board, Activboard) *

Not available

used *

- Never
- Rarely
- Sometimes
- Often

Classroom response system "clickers" *

Not available

used *

- Never

- Rarely
- Sometimes
- Often

Digital camera (still or video) *

Not available

used *

- Never
- Rarely
- Sometimes
- Often

iPod or MP3 player *

Not available

used *

- Never
- Rarely
- Sometimes
- Often

Document camera (definition on cover) *

Not available

used *

- Never
- Rarely
- Sometimes
- Often

Handheld device (e.g., Palm OS, Windows CE, Pocket PC, BlackBerry) *

Not available

used *

- Never
- Rarely
- Sometimes
- Often

Tablets (iPad/Kindle/Google Nexus/Samsung Galaxy) *

Not available

used *

- Never
- Rarely
- Sometimes
- Often

Scanner *

Not available

used *

- Never
- Rarely
- Sometimes
- Often

DVD / VCR *

Not available

used *

- Never
- Rarely
- Sometimes
- Often

Airliner *

Not available

used *

- Never
- Rarely
- Sometimes
- Often

Gaming device *

Not available

used *

- Never
- Rarely
- Sometimes
- Often

Page 5 After page 4 Continue to next page

13) Please indicate the degree to which you agree or disagree with each of the following statements:

Please rate *

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
The school administration encourages the use of technology.	○	○	○	○	○
My students have adequate access to computers.	○	○	○	○	○
My school administrator(s) understands how technology can be integrated into the classroom to improve student learning.	○	○	○	○	○
I am provided with adequate access to computers for myself.I know how other teachers in my school use technology in their classrooms.	○	○	○	○	○
I know how other teachers in my school use technology in their classrooms.	○	○	○	○	○
I have sufficient time to integrate technology into my classroom instruction.	○	○	○	○	○
Teachers in my school meet and share ideas about how to use technology in their classrooms.	○	○	○	○	○
I understand how I can use technology to help me attain school and district standards.	○	○	○	○	○
I believe that the use of computers in education almost always reduces the personal treatment of students.	○	○	○	○	○

Working with computers means working on your own, without contact with others.					
Sometimes I wish that technology would go away.					
Integration of technology into classrooms is a high priority for my school administrator(s).					
Integration of technology into classrooms is a high priority for me.					
I have sufficient training in how to integrate technology into my classroom instruction					
Technology has been helpful in meeting district and state standards.					
Technology makes my teaching more effective.					
I feel that computers are important for student use.					
I use technology in my classroom to enhance student understanding.					
I use technology in my classroom to improve student skills.					
Technology helps me to accommodate different learning styles.					
Computers can be useful instructional aids in almost all subject areas.					
Computers can stimulate creativity in students.					
Available technology resources are sufficient to support student learning.					
I am willing to learn or continue to learn about integrating technology into my classroom.					
Teachers in my school are involved in decision making related to implementation of technology.					
I would like more training in integrating technology.					

Page 6 After page 5 Continue to next page

14) Technology Use

Do you use technology in your teaching? *

- I do NOT use technology in my teaching
- I use technology in my teaching

Page 7 After page 6 Continue to next page

Note: "Go to page" selections will override this navigation. Learn more.

15) Please indicate the degree to which the addition of technology to your teaching has changed the learning environment.

My teaching style has changed in that I am more of a facilitator *

As a result of adding technology to my teaching.

	1	2	3	4	5	
Not at all	○	○	○	○	○	A lot

I have been able to present more complex materials to my class *

As a result of adding technology to my teaching.

	1	2	3	4	5	
Not at all	○	○	○	○	○	A lot

The arrangement of the room has been altered to accommodate technology *

As a result of adding technology to my teaching.

	1	2	3	4	5	
Not at all	○	○	○	○	○	A lot

I have used less class time for lecture. *

As a result of adding technology to my teaching.

	1	2	3	4	5	
Not at all	○	○	○	○	○	A lot

Students direct their own learning *
As a result of adding technology to my teaching.

	1	2	3	4	5	
Not at all	○	○	○	○	○	A lot

Students work together in collaborative groups *
As a result of adding technology to my teaching.

	1	2	3	4	5	
Not at all	○	○	○	○	○	A lot

Students teach each other *
As a result of adding technology to my teaching.

	1	2	3	4	5	
Not at all	○	○	○	○	○	A lot

Student projects include visuals *
As a result of adding technology to my teaching.

	1	2	3	4	5	
Not at all	○	○	○	○	○	A lot

Students engage in problem-solving activities *
As a result of adding technology to my teaching.

	1	2	3	4	5	
Not at all	○	○	○	○	○	A lot

Students use a variety of resources for their projects *
As a result of adding technology to my teaching.

	1	2	3	4	5	
Not at all	○	○	○	○	○	A lot

Student work is rigorous *
As a result of adding technology to my teaching.

	1	2	3	4	5	
Not at all	○	○	○	○	○	A lot

Student work is shared with a variety of audiences *
As a result of adding technology to my teaching.

	1	2	3	4	5	
Not at all	◯	◯	◯	◯	◯	A lot

Page 8 After page 7 Continue to next page

16) Please Inidicate

1) whether or not each of the following currently occurs in your classroom

2) the extent to which technology supports each.

I integrate standards into my curriculum *

Never

with ____ technology support *

- No
- Minor
- Moderate
- Major
- Complete

I work with other teachers in the development of lesson plans *

Never

with ____ technology support *

- No
- Minor
- Moderate
- Major
- Complete

I integrate a variety of subjects/content into each of my lessons *

Never

with ____ technology support *

- No
- Minor
- Moderate
- Major

Complete

I keep students informed of their progress in class *

Never

with ____ technology support *

- No
- Minor
- Moderate
- Major
- Complete

I evaluate electronic versions of student work *

Never

with ____ technology support *

- No
- Minor
- Moderate
- Major
- Complete

I spend my time coaching/advising students *

Never

with ____ technology support *

- No
- Minor
- Moderate
- Major
- Complete

Students spend time working in groups *

Never

with ____ technology support *

- No
- Minor
- Moderate
- Major

Complete

I use class time for students to work on projects *

Never

with ____ technology support *

No
Minor
Moderate
Major
Complete

I involve students in the development of learning activities. *

Never

with ____ technology support *

No
Minor
Moderate
Major
Complete

I use class time for whole group lecture *

Never

with ____ technology support *

No
Minor
Moderate
Major
Complete

I use class time for peer tutoring. *

Never

with ____ technology support *

No
Minor
Moderate
Major

- Complete

When I use technology in the classroom, it is *

(Mark the one response that typically characterizes your usage)

- Organized
- Chaotic but rewarding
- Chaotic and frustrating

17) I would classify myself as the following type of technology user. (Please choose the one response that most closely describes your skill level)

Entry: Teachers who are just starting to use technology for learning. They usually use technology for word processing and data bases. With their students, technology is used predominantly as a reward activity or specifically for technology training such as keyboarding.

Adoption: Teachers who have some comfort level with technology and are taking initial steps to use it in their curriculum. They use e-mail and Internet on a regular basis. Technology is employed in collaborative learning projects with their students. Technology is used in student-directed learning where the students design the projects and implement them.

Adaptation: Teachers who are shifting toward more student-based project learning and encourage the use of a variety of technology tools. They use a variety of multimedia tools and they distribute documents electronically. Student activities become more project-based and a wide variety of technology tools are used in those projects. More technology activities involve student-designed projects with the teacher serving as a facilitator.

Appropriation: Teachers who are so comfortable with technology that it is integrated throughout all learning activities. They use technology for multidisciplinary and problem-solving activities. They facilitate the use of multiple technologies and learner ownership increases as these teachers become a facilitator.

Transformation: Teachers who create new ways to use technology tools for real-world applications. They involve students in the development of authentic technology-rich activities. They guide others in applying information resources.

*

- Entry
- Adoption
- Adaptation
- Appropriation
- Transformation

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18) In general, how frequently do your students perform the following activities using educational technology during your class(es)?

Select "not applicable" for activities that do not apply to your students.

Please rate *

	Not Applicable	Never	Rarely	Sometimes	Often
Prepare written text. (e.g., word processing, desktop publishing)					
Create or use graphics or visual displays (e.g., graphs, diagrams, pictures, maps)					
Learn or practice basic skills (e.g., reading or math skills)					
Conduct research (e.g., Internet searching, using reference materials on CD-ROM)					
Correspond with others (e.g., students, teachers, experts) via email, network, or Internet					
Contribute to blogs or wikis					
Use social networking websites					
Solve problems, analyze data, or perform calculations					
Conduct experiments or perform measurements					
Develop and present multimedia presentations					
Create art, music, movies, or webcasts					
Develop or run demonstrations, models, or simulations					
Design and produce a product (e.g., computer-aided manufacturing					
Other					

Appendix E: Consent Form

CONSENT FORM

You are invited to take part in a research study of teachers' educational technology integration and perception. The focus of this research will be to investigate the relationship between various teacher characteristics such as gender, age, years of teaching experience, subject taught, grade level, and level of college education and teachers' perceptions and integration of educational technology. The researcher is inviting all teachers within the Eaton Community School District, Preble Shawnee Local School District, National Trail Local School District, Tri-County North School District, Twin Valley Community School District to be in the study. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

This study is being conducted by a researcher named Kurt Ronald Schulze who is a doctoral student at Walden University. You may already know the researcher as a mathematics teacher at Preble Shawnee Jr./Sr. High Building, but this study is separate from that role.

Background Information:
The purpose of this study is to explore the relationship between teacher characteristics and technology integration and perceptions within the classroom. The teacher characteristics that will be compared will be gender, age, years of teaching experience, subject taught, grade level, and level of college education. . The data will be used to help formulate decisions about future technology professional development sessions.

Procedures:
If you agree to be in this study, you will be asked to:

- Complete one survey
- The survey will take about 15 minutes to complete

Here are some sample questions:

- A LCD or DLP projector is available to you to use how often? How often to do you the projector for instructional use.
- School administrators encourages technology use
- Integration of technology is a high priority for me.
- I am willing to learn or continue about integrating technology into my classroom
- In what ways have technology changed your learning environment?
- I integrate standards into my curriculum with how much technology support?
- Please indicate your level of comfort using the following technology activities.
- What additional technology needs do you have?
- How frequently do your students perform the following educational technology tasks during class?

Voluntary Nature of the Study:
This study is voluntary. Everyone will respect your decision of whether or not you choose to be in the study. No one at Eaton Community School District, Preble Shawnee Local School District, National Trail Local School District, Tri-County North School District, or Twin Valley Community School District will treat you differently if you decide not to be in the study. Once a survey is submitted, it will not be possible to withdraw your data.

Risks and Benefits of Being in the Study:
Being in this type of study involves some risk of the minor discomforts that can be encountered in daily life, such as stress. Being in this study would not pose risk to your safety or wellbeing.

The results and findings of the study will be shared with county leaders, which they will hopefully use to make informed decisions about how to align professional development sessions to maximize results.

Payment:
No Payment/Reimbursement

Privacy:
Any information you provide will be kept confidential. The researcher will not use your personal information for any purposes outside of this research project. Also, the researcher will not include any information that could identify you in the study reports. Data will be kept secure by the data being stored in the researchers password protected Google Drive and SPSS account. The information will be also stored on the researchers' private password protected computer. The researcher is the only person who knows the information required to gain access to the accounts or computer. Data will be kept for a period of at least 5 years, as required by the university.

Contacts and Questions:
You may ask any questions you have now. Or if you have questions later, you may contact the researcher via kurt.schulze@waldenu.edu. If you want to talk privately about your rights as a participant, you can call Dr. Leilani Endicott. She is the Walden University representative who can discuss this with you. Her phone number is 1-800-925-3368, extension 3121210. Walden University's approval number for this study is 09-11-13-0240944 and it expires on September 10, 2014.

Please print or save this consent form for your records.

Statement of Consent:

I have read the above information and I feel I understand the study well enough to make a decision about my involvement. By clicking on the survey link and completing the survey, I understand that I am agreeing to the terms described above.

Curriculum Vitae

Kurt R. Schulze
kurtschulze82@gmail.com

Career Objective
Become a university professor where I can share my knowledge and passion for education, especially in the subjects of math, science, and technology. I also want to conduct STEM research to promote positive social change within the educational community.

Qualification Highlights
Educator with 6 years' experience in the design, development, implementation of innovative programs, curricula and instructional methodologies. Successful with a broad range of student populations: economically disadvantaged, students with learning disabilities, and high-achievers. Active member, leader, and contributor to the academic community. Additionally qualifications include:

- In-depth experience with math, science, and technology
- Team leadership skills and training
- Works collaboratively with other colleagues and administrators
- Adapts easily to new concepts and responsibilities
- Educational programming and design
- Knowledge in quantitative research
- Extensive knowledge of math, science, and educational technology

Education
Walden University, Minneapolis, MN
Riley College of Education and Leadership
Doctorate Degree in Educational Leadership, May, 2014 (Expected)
GPA 4.0/4.0

Wright State University, Dayton, OH
College of Education and Human Services
Masters of Science Degree, Education, June, 2008
GPA 4.0/4.0

Wright State University, Dayton, OH
College of Education and Human Services
Bachelors Degree in Middle Childhood Education, June, 2007
Concentration Areas: Mathematics and Science
GPA 3.59/4.0

Experience
Preble Shawnee Secondary, Camden, OH 8/2008 – Present
Teacher, Grades 7 – 9

- Utilize a variety of student assessments to drive instruction
- Adapted learning to meet all students' needs
- Co-taught for two years
- Utilize various educational technologies to assist in student learning and drive instruction; which include several cloud-based programs
- Tutored students after hours and worked closely with parents on the management of their child's homework assignments.
- Developed and implemented a peer-tutoring program for math department.
- Member of the school's building leadership team (2012 – present)
- Highly proficient with different operating systems and related programs
- Require students to reflect on the material and the class to help increase knowledge and make connection.
- Worked with book publisher and administrators to obtain and adopt CCSS aligned textbooks

Other Relevant Experience
Ohio certified mentor
Currently mentoring high school geometry teacher
One of the head chaperons for the 8th grade Washington DC trip for the last 4 years
Primary facilitator of the Thursday/Saturday School program (8/2008 – present)
Head varsity baseball coach for 2 years
Attended 2013 Ohio Technology Conference
Building representative for the school's association
Summer Work (5/2009 – present)

- Make minor repair to district schools
- Complete beatification projects

Research
Doctoral Study

- *Relationship between Teacher Characteristics and Educational Technology*
- Extensive research on educational technology resources, integration, and perceptions
- Extensive research on constructivism and cognitive flexibility theory, and andragogy
- Approved proposal and IRB application
- Currently obtaining final approvals
- Created technology professional development program based on data results
    - Technology Integration and Authentic Student Learning

Masters Study

- Intensive research project with a group of other students in my cohort
- Researched motivating the unmotivated math student
- Used three different instruction strategies: independent work, partners, and grouping

- Research revealed that the students were more motivated to complete math assignments when they were able to work with their peers as opposed to working alone.