The Relationships Between Teacher and Student Technology Use and Teacher Professional Development

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Abstract

The purpose of this non-experimental quantitative study was to determine to what extent relationships existed between the type of educational technology used in the classroom by teachers and students and the type of technology professional development received by the teacher. This study also examined to what extent relationships existed between the amount of professional development received by the teacher for a type of technology and the amount of technology used in turn used by teachers and students. The population for this study was certified elementary teachers assigned to teach students in grades kindergarten through six. The sample included 107 certified teachers responsible for the instruction of kindergarten through sixth grade at three elementary schools in a suburban school district in Missouri. Data regarding teacher and student technology use were gathered via eWalk observations. The professional development data utilized in this study was limited to technology professional development provided directly by Lee's Summit R-7 School District Instructional Technology Specialists. The results of the study indicated that there were not enough statistically significant results to define a relationship between professional development received by a teacher and the technology used by teachers and students. Additionally, the findings of the study revealed the average amount of professional development received by teachers for a type of technology was limited. Teachers' knowledge of technology integration and teacher competence related to various types of technology could be well served by increased professional development. This study could be used as a resource for planning technology professional development for teachers in order to affect student and teacher technology use. Implications for action included suggested training for administrators on

how to identify teacher-directed and student-centered technology use. Recommended, additionally, was a defined protocol for walkthrough expectations for administrators in order to gather data consistently across all elementary schools. Continued professional development is recommended with increased emphasis on content, technology, and pedagogy. Furthermore, the effectiveness of this professional development should be measured by evidence of changes in teacher practices. The LoTi survey is one measurement tool the Lee's Summit R-7 School District might select for utilization of this purpose. Finally, a Comprehensive School Improvement Plan should include a district defined vision for technology integration coupled with defined competencies for teachers and students. Suggestions for future research included replication of the study with an increased sample size, as this would create an accurate picture of district-wide technology integration at all school levels. The second recommendation was replication of the study including in the data collection process both teacher and student surveys and interviews regarding technology integration. Further, an expanded study was suggested to involve elementary, middle, and high school principal perceptions, district leader perceptions, and parent perceptions. A study designed to determine the extent of the relationship between the quality of professional development and technology integration was suggested. Finally, a similar study designed to determine the extent of the relationships between teacher and student technology use and student achievement as measured by state assessments was recommended.

Dedication

This study is dedicated to my mother, Rose Ellen Vergo. Your examples of strength and perseverance, particularly now and throughout your life, became my inspiration to achieve the goal of completion of this study.

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I wish to express my gratitude and heartfelt appreciation for those who journeyed with me to this place in my life where I might realize such an accomplishment.

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Chapter One

Introduction

Students no longer enter school fully dependent upon the instructor to impart the knowledge deemed by educators to be necessary for success in school. Rather, children enter schools with the ability to connect virtually and instantaneously to people and information, both past and present, from around the world (Prensky, 2001a). From pop culture to world events, they know what is "trending" on the internet at any moment. When children have curiosities about the world, answers from primary and secondary sources are at their fingertips.

The role of the classroom teacher has changed because of the massive invasion of technology in our lives, world, communities, and schools. Education can no longer be "business as usual" if the children of the United States are to compete in a global economy and remain a world leader for generations to come. With this objective in mind, Little (2000) addressed the relationship between teachers, teaching, and technology.

> For adults, learning something new is hard work and their established thinking must be changed to accommodate the new technology. It is this change in established thinking that we have overlooked for too often. For teachers to use technology effectively in their teaching they have to change the way they think about teaching, about themselves. (p. 161)

Considering what Prensky (2001a) purported about the type of learners in classrooms and what Little (2000) suggested is a required paradigm shift for teachers, schools should consider the work of Lieberman and Grolnick (1997) if they aim to be effective during this age of technology. Lieberman and Grolnick (1997) suggested a clear definition of what teachers should know and be able to do in order to create services that meet student needs. Additionally, clear student outcomes should be well of which teacher learning is paralleled (Lieberman & Grolnick, 1997). This suggestion echoes what educators have often thought, teacher learning impacts student learning.

Background

The Partnership for 21st Century Skills (2012) described education as surrounded in a structure of defined standards emphasizing critical thinking skills. They further purported that students must be able to compete in a global society and experience intensive use of technology. Where resources have been dedicated to support technology integration with the intent of improving the learning process, close examination must be paid to teacher professional development along with teacher and student use of that technology.

This study was conducted in the Lee’s Summit R-7 School District, a suburban school district southeast of Kansas City, Missouri. In 2012, the school district was responsible for the education of over 17,000 students (Lee’s Summit R-7 School District, 2012a). More specifically, there were 1,227 total teaching staff with 646 teachers at the elementary (K-6) level (Lee’s Summit R-7 School District, 2012c).

The Director of Instructional Technology of the Lee’s Summit R-7 School District provided leadership direction for instructional technology. In addition, responsibilities of the Instructional Technology Specialist (ITS) included training teachers on a variety of software applications, hardware operations, and/or technological equipment. Additionally, the ITS were responsible for providing ongoing support and maximizing the capabilities of teachers. Professional development provided by the ITS focused on the integration of technology into the curriculum for the purpose of enhancing instructional practices (Education Management Solutions, 2010).

Technology professional development in the Lee’s Summit R-7 School District begins with a teacher’s first contract. Year one of certified teacher employment requires ITS to meet quarterly on an individual basis with new teachers. The goal is to acclimate each of the teachers to the variety of software and hardware resources that are available in specific buildings, departments, and grade levels (K. R. Whaley, personal communication, January 15, 2012).

In year two, after new teachers have familiarity with technology tools and curriculum, the goal is to merge the two to impact instruction. In 2012, teachers were asked to choose a technology task, use the knowledge to create a technology-enhanced lesson, and then report to the year two teacher group via Blackboard (K. R. Whaley, personal communication, January 15, 2012).

The following subsections describe the type of technology professional development provided to Lee’s Summit R-7 School District teachers. The descriptions only relate to professional development made available to teachers by ITS. In some instances the type of technology professional development is linked to a particular technology initiative in the Lee’s Summit R-7 School District and that, too, is described where applicable.

Blackboard. Blackboard originates from Blackboard, Inc. It was originally designed for online learning purposes, but more recently included course management capabilities, content authoring options, an environment for collaborative discussions, a structure for virtual classrooms, as well as components for student work submission, testing, and grading (Bradford, Porciello, Balkon, & Backus, 2007). Lee's Summit R-7 School District ITS provided Blackboard professional development specifically in areas defined as District Staff Development, Online Teacher, and Blended Teacher as they relate to Blackboard use. District Staff Development refers to professional development that is consistent in language and approach across all employee groups in an effort to develop a baseline of common Blackboard knowledge. Primarily this training addresses basic Blackboard functionalities (K. R. Whaley, personal communication, January 15, 2012). Online Teacher BlackBoard professional development is provided to Lee's Summit R-7 School District teachers who teach on-line courses outside of the traditional instructional day. Professional development in this area focuses on the concepts and qualities of impactful online instruction. National Online Teaching Standards are the objectives for online teachers participating in these sessions (K.R. Whaley, personal communication, January 15, 2012). Conversely, Blended Teacher is a type of Blackboard professional development intended for middle school and high school teachers who utilize Blackboard as a tool to compliment the teaching process. This professional development provides teachers exposure to basic components of Blackboard with additional emphasis paid to features that increase instructional variability (K. R. Whaley, personal communication, January 15, 2012).

Classroom Performance Systems. Classroom Performance Systems (CPS) are student response systems with wireless connectivity that allow students and teachers immediate feedback. CPS uses radio technology to send information to a portable station to receive students' responses to questions. A computer connected to this station allows a teacher to keep track of individual and group answers. The answers can then be aggregated and displayed for a class to see, which aids in student regulation of their own learning (Zucker, 2010). Teachers may administer quizzes, test preparation reviews, lectures, formative assessments or summative assessments all with immediate grading capabilities afforded by CPS (Bruff, 2007). Students and teachers often refer to CPS as "clickers."

Identified elementary teachers from each school in the Lee's Summit R-7 School District participated in a program called Click-it To Learn and hence, received the corresponding CPS professional development. This program was instituted to achieve a goal defined in the Lee's Summit R-7 School District Comprehensive School Improvement Plan (Lee's Summit R-7 School District, 2009), which was to expand curriculum, assessment, and instructional programs to address the diverse educational needs of students. CPS Click-it To Learn provided two classroom teachers per elementary school to be equipped with a Generation 3 Classroom Performance System. This system of clickers had capabilities that allowed for short answer responses, along with numbers, symbols, and multiple choice response options. This system would provide teachers immediate feedback, which had the potential to help instantaneously guide instruction. The intent for teachers participating in the CPS Click-it To Learn program was to develop model classrooms that other teachers could visit to see the benefits of using CPS with students to impact learning (Gates, 2009).

Additionally, under the umbrella of CPS, teachers received professional development on Real-time Evaluation of Academic Progress (REAP). According to a district Elementary Math Curriculum Specialist, the original intended use of the REAP system was to be able to disseminate district summative assessments to elementary grade level teachers in an electronic format in order to gather district wide data about student mastery of the curriculum (J. Kubiak, personal communication, January 18, 2012). Teachers were required to receive professional development on the use of CPS clickers in order to know how to download assessments, administer assessments to their students electronically, and then upload the data to the REAP system. The analysis of the data allowed teachers and district curriculum specialists to discern the effectiveness of the curriculum. Additionally, district curriculum specialists could analyze district data, by specific objectives, for each grade level for each administered district summative assessment. Curriculum specialists were able to determine district trends and consequently design instructional strategies professional development for targeted areas (J. Kubiak, personal communication, January 18, 2012).

Multi-Media. Multi-media educational technology can be described as software and hardware that has the ability to amplify or integrate audio, text, animation, and video (Mayer, 2005). To achieve competency in multimedia, ITS provided professional development or training on a variety of equipment which included audio enhancement equipment, digital cameras, document cameras, iPods, projectors, video cameras, and web cams (K. R. Whaley, personal communication, January 15, 2012).

SMART Board. SMART Boards are interactive projection displays. This allows children to be engaged in video, sound clips, internet activities, and other options, which enhance the learning experience. Research has shown a benefit to student learning at the primary grade level when SMART Boards are used as a part of instruction (Preston & Mowbray, 2008).

To achieve competency of the use of SMART Boards, ITS provided professional development specifically on ways to integrate the SMART Board within the context of the classroom. Training was also provided so teachers could understand and proficiently use the corresponding SMART Board software (K. R. Whaley, personal communication, January 15, 2012).

Web Design. Web design refers to an educator's online presence as an instructor. It creates an information portal and facilitates communication and presentation. When web design professional development was provided, the focus was on web page development, website development, and blog creations and uses (K. R. Whaley, personal communication, January 15, 2012).

Software/Web Resources. Professional development provided on software or web resources helps teachers identify quality online tools and software to use as part of instruction. The Lee's Summit R-7 School District defines an example of this as District Image. When ITS provide training to teachers in this area, it is only related to resources approved and previously installed on district-issued teacher laptops. Examples of this include professional development on PDF writers, Microsoft Office Suite, Lotus Notes, or Google Chrome (K. R. Whaley, personal communication, January 15, 2012).

In addition to technology professional development data, this study utilized district walkthrough data documented via McRel's Power Walkthrough software (eWalk). This data collection tool, used by Lee's Summit R-7 School District administrators, recorded the name of the elementary school, the grade and corresponding teacher for whom the walkthrough was conducted, the teacher-directed technology being used during the walkthrough, and the student-centered technology being used during the walkthrough.

A walkthrough, or learning walk, is described as a brief classroom observation that is non-evaluative and conducted by a school or district administrator (Protheroe, 2009). This process is utilized to gather teaching and learning information (Learning Point Associates, 2007). Targeted walkthroughs are data-driven and observers know what to look for beyond traditional observation of school structure and student behavior (Cudeiro & Nelsen, 2008). Frequency of principal visits to classrooms may depend upon daily demands placed upon a principal, the size of the school, the size of the administrative team conducting the walkthroughs, or other factors.

Classroom walkthroughs vary from longer traditional structured observations in the brevity, focus, and dialogue associated with them (Protheroe, 2009). Walkthroughs allow school and district leadership to gather snapshots of instruction throughout the school on a consistent basis. Whereas a structured observation of instruction as part of a teacher's evaluation may be lengthy, a walkthrough or learning walk is brief in duration, usually not exceeding ten minutes (Learning Point Associates, 2007). The summary of these visits, over time, can paint a picture of the status of teaching and learning in a school community.

Administrators, theoretically, are not the director of the walkthrough. Instead, teachers and administrators collectively determine the focus, or look-fors, of walkthroughs (Hopkins, 2005). A shared and agreed-upon purpose of the walkthrough diminishes the fear of evaluation and creates a focus on data collection for overall school improvement efforts (Hopkins, 2005). Schools and districts that engage in walkthroughs have shown improvement in their culture of trust, openness, and collaboration because of the feedback and dialogue process that is built-in at the conclusion of the walkthrough process following data accumulation and sharing (Cudeiro & Nelson, 2008). Moreover, administrators can pose reflective questions to teachers about the data collected regarding instruction and learning. A pattern of feedback leading to reflection and dialogue about instructional practices creates a climate for increasing student achievement (Learning Point Associates, 2007).

The Lee's Summit R-7 School District formed a formal district team, The District Walkthrough Team, in spring of 2008 for the purpose of formalizing the walkthrough process across all district elementary, middle, and high schools. The team reviewed common areas of focus as identified by building walkthrough forms. From this, they determined McRel's Power Walkthrough software (eWalk) could serve as a consistent data collection and reporting tool about classroom instructional practices across all K-12 district schools (Lee's Summit R-7 School District, 2010a). The data from the walkthroughs were compiled into building reports and could be shared with staff. In turn, collaborative reflective sessions can occur where questions are asked and decisions made for the collective best interest of student learning in the Lee's Summit R-7 School District.

Administrators use a standard district template to record their observations. This template contains six research-based categories, which originated in Marzano, Pickering, and Pollock's (2001) work outlined in *Classroom Instruction that Works*: *Research-Based Strategies for Increasing Student Achievement.* These categories include instructional strategies, context, technology, depth of knowledge, evidence of learning, and student interview. The eWalk template is available electronically via administrators' i-Phones.

The District Walkthrough Team helped define district protocol for the eWalks. Each school conducted walkthroughs that were regular, routine, distributed throughout the day, and unobtrusive. The duration for each walkthrough was three to five minutes, which met recommended criteria that a walkthrough not exceed ten minutes (Learning Point Associates, 2007). The goal for each school was to complete, minimally, one observation per classroom per month. Five categories of the possible six were targeted for recording prioritized strategies, teacher-directed technology, student-centered technology, evidence of learning, and student interview.

Statement of the Problem

The Lee's Summit R-7 School District has made a commitment related to the purchase of instructional technology in the form of Smart Boards, software/web resources, multimedia equipment, interactive response systems (CPS), laptops, iPads, and Chromebooks for use by teachers and students to enhance teaching and learning. Additionally, the district pays salaries for instructional technology specialists exceeding $275,000 during a given school year (Lee's Summit R-7 School District, 2012a) to support the implementation and use of these devices within the instructional program. Time has also been substantially allocated to teacher training related to these technologies. Furthermore, as part of the district's Comprehensive School Improvement Plan, goals related to technology use have been identified (Lee's Summit R-7 School District, 2012b).

In spite of the fact that the Lee's Summit R-7 School District has identified technology goals and committed resources in the form of budget, staff, and professional development, the district has not conducted a study to measure instructional technology use by teachers or students. In other words, there is no known return on the district's investment in instructional technology.

Purpose Statement

The purpose of this study was to determine the extent of the relationship between the type of instructional technology used by the teacher and the technology professional development the teacher received. Likewise, this study sought to ascertain the extent of the relationship between the type of student-centered technology used by the students and the technology professional development the teacher received. Another purpose of the study was to reveal the extent of the relationship between the amount of technology professional development received by the teacher and the amount of teacher-directed technology used. The final, the purpose of the study was to determine the extent of the relationship between the amount of technology professional development received by the teacher and the amount of student-centered technology used.

Significance of the Study

Research has been conducted on integration of instructional technology (Cuban, 2001; Earle, 2002; Gary, Thomas, & Lewis, 2010; Howley, Wood, & Hough, 2011; Lawless & Pellegrino, 2007; Mitchem, Wells, & Wells, 2003; Papert, 1980; Schacter, 1999; Selwyn, 2006; Suppes & Morningstar, 1969). The findings of these studies are mixed. A research study has not been conducted in the Lee's Summit R-7 School District regarding professional development and teacher and student use of instructional technology.

The Lee’s Summit R-7 School District has a proud history of recognition as a distinguished school district. It has prided itself on a high quality teaching force, innovation in the classroom, and notable student achievements. The inception of an instructional technology department came in 2001 (Lee’s Summit R-7 School District, 2012a). Findings from examining technology use by teachers and students will inform the district as to whether the physical computer resources are being maximized as intended when purchased to enhance learning and teaching. Furthermore, the findings could provide evidence that facilitates informed decision making regarding utilization of instructional technology specialists and professional development to impact technology integration. Likewise, conclusions of the study may prompt the district to embrace professional development models that could further ignite student and teacher use of technology. Finally, the study adds to the body of research surrounding technology integration and the professional development that fosters technology’s use by teachers and students.

Delimitations

“Delimitations are self-imposed boundaries set by the researcher on the purpose and scope of the study” (Lunenburg & Irby, 2008, p.134). The study was limited to three elementary schools in one Missouri suburban district, Lee’s Summit R-7 School District. The only technology usage data considered in this study was usage documented via McRel’s Power Walkthrough software (eWalk). The professional development data utilized in this study was limited to technology professional development provided directly by Lee's Summit R-7 School District's Instructional Technology Specialists. Finally, all data collected occurred from August 2009 through October 2012. These delimitations may affect the ability to generalize the findings beyond the Lee's Summit R-7 School District.

Assumptions

"Assumptions are postulates, premises, and propositions that are accepted as operational for the purposes of the research" (Lunenburg & Irby, 2008, p.135). The study was based on the following assumptions:

1. All district data retrieved for this study were accurate.
2. All data were accurately entered into Excel and the IBM® SPSS® Statistics Faculty Pack 21 for Windows.
3. All Instructional Technology Specialists were trained in the type of professional development they provided.
4. All classroom walkthroughs were documented using McRel's Power Walkthrough software.
5. All classroom walkthroughs were documented with consistent administrator practice across schools.

Research Questions

Creswell (2009) stated that quantitative research questions inquire about the relationships among variables. The following research questions guided this study:

RQ1. To what extent is there a relationship between the type of instructional technology used by the teacher and the type of professional development received by the teacher?

RQ2. To what extent is there a relationship between the type of instructional technology used by the student and the type of professional development received by the teacher?

RQ3. To what extent is there a relationship between the amount of professional development received by the teacher for a type of technology and the amount of teacher-directed technology use of that technology?

RQ4. To what extent is there a relationship between the amount of professional development received by the teacher for a type of technology and the amount of student-centered technology use of that technology?

Definition of Terms

This section of the study lists terms where there is likelihood that readers outside the field of study will likely not know their meaning (Creswell, 2009). Included here are terms referenced in this study.

Design-based approach. A design-based approach to professional development allows teachers to learn technologies within the context of their curricular needs (Lawless & Pellegrino, 2007).

eWalk. Electronic evaluation technologies and tools can be defined as an eWalk, which is an electronic means of collecting, disaggregating, and aggregating data (Johnson, 2011). An example is McRel's Power Walkthrough used by the Lee's Summit R-7 School District. This can be further defined as informal classroom observations where data points on instructional practices are collected and recorded on specifically designed web-based software (Granada & Vriesenga, 2008).

Instructional technology. Instructional technology is technology used to enhance teaching and learning. This study recognized educational technology as hardware, software, the Internet, and multi-media digital technologies (Earle, 2002).

Instructional Technology Specialist. An Instructional Technology Specialist is a certified teacher whose work is orchestrated from the district's central office. This teacher provides direct professional development to other certified teachers in the area of technology for student and teacher purposes (Education Management Solutions, 2010).

National Educational Technology Standards for Students (NETS). NETS are standards developed to evaluate the skills and knowledge educators need to teach, work, and learn in an increasingly connected global and digital society (International Society for Technology in Education, 2008b).

Student-centered technology. Student-centered technology is technology used by students. Student-centered technology can be described when students utilize technology independently to enhance their learning (Krajcik & Varelas, 2007).

Teacher-centered technology. Teacher-centered technology or teacher directed technology is technology used by teachers. Teacher-centered technology allows control of technology to be guided by the teacher. Often the purpose of technology use is for demonstration, lecture, or administrative tasks of a classroom teacher (Krajcik & Varelas, 2007).

Technology integration. Technology integration is the incorporation of computer technology and other media to improve pedagogy (Wager, 1992, p. 454). When technology is integrated into the instructional process, it can be used to assess, extend, and remediate learning (Hamilton, 2007).

Technology literacy. Technology literacy is defined as what students should know and be able to do in order to be technology literate (International Technology Education Association, 2007, p. 9).

Walkthrough. Walkthrough refers to an informal observation completed during the instructional day by a school principal or district administrator of the teaching and learning environment during the instructional day (Cudeiro & Nelsen, 2009).

Overview of the Methodology

This non-experimental quantitative study involved three elementary schools (grades K–6) in the Lee's Summit R-7 School District. Correlation and chi-square analyses were used to examine the relationships between technology use by teachers and students in the classroom and the type and amount of technology professional development received by teachers from August 2009 through October 2012. Data was collected from eWalks conducted from August 2009 – October 2012 using the MxWeb Media software application and professional development data that was documented by instructional technology specialists using Excel and Google Documents. The data were compiled and entered into Excel spreadsheets. The eWalk data and professional development data were coded to protect the anonymity of buildings, principals, students, and teachers. Teachers were collapsed into groups according to professional development received or not received for each type of technology and technology use or non-use, in order to examine the relationship between technology use and professional development. The researcher exported the data into the IBM® SPSS® Statistics Faculty Pack 21 for Windows for analyses.

Organization of the Study

This chapter included an introduction to the study, the problem statement, and background information of the Lee's Summit R-7 School District as it related to technology use in classrooms and eWalks. The purpose and significance of the study were provided. Likewise, the delimitations, assumptions, research questions, and definition of terms were identified. The final portion of the chapter included an overview of the methodology of the study.

Chapter two provides a review of literature that addresses the history of educational technology, and an examination of the rationale for technology use by teachers and students in U.S. public schools. Furthermore, professional development as it relates to technology integration is reviewed. Chapter three identifies the research design, population and sample, sampling procedures, instrumentation, measurement, validity and reliability, data collection procedures, data analysis, hypotheses testing, and limitations of this study. Chapter four presents the results of the hypothesis testing. Chapter five includes a study summary, findings related to the literature, and conclusions including implications for action and recommendations for future research.

Chapter Two

Review of Literature

The purpose of this study was to examine the extent to which relationships exist between technology professional development provided to teachers and the use of technology by teachers and students in the classroom. This chapter provides an overview of the literature related to the history of educational technology, programs and policies intended to increase technology use in schools, technology integration, technology use by teachers and students, and professional development related to technology integration.

The History of Educational Technology

In 1913, Edison predicted that books would become obsolete in classrooms (as cited in Cuban, 1986). In classrooms across America students still utilize textbooks while the presence of educational technology has increased, thus Edison's predication has not yet been realized. Though textbooks are still in student hands, the Internet, for example, provides information to teachers and students in a way that is not possible via textbooks. Defining the role of emerging technologies in the classroom, while complimenting that with corresponding instructional approaches, has become a goal to be achieved by teachers.

Technology's entrance into classrooms has a long lineage. The history begins with textbooks and chalk (Cuban, 1986). In the early 1900s, audio and visual technologies were evolving for classrooms. These technologies included radio, sound recordings, slides, and even motion pictures (Lever-Duffy, McDonald, & Mizell, 2003). The increasing appearance of television across the country led to its use in classrooms described as the birth of instructional television (ITV) (Henry, 2001). The Federal

Communications Commission (FCC), as evidenced by the Public Broadcasting Service and National Educational Radio dedicated television channels and airwaves to instruction (Lever-Duffy et al., 2003). ITV aired on stations at night.

The 1960s saw an increase in audiovisual instruction accented by the use of videotape because the programs would be recorded by school librarians and then made available throughout the school year to teachers. In this way, hundreds of millions of students had access to ITV programming. Videotapes quickly became a teacher resource in school libraries across the country (Lever-Duffy et al., 2003). An initial drawback of ITV was that shows were 30 to 60 minutes in length, mimicking consumer television versus being tailored to instructional blocks of time (Henry, 2001).

Computer-assisted technologies were birthed and utilized in classrooms during the 1960s and 1970s resulting in the evaluation of such programs. The Congressional Commission on Instructional Technology (1970) concluded that technology was more than equipment and involved a systematic way of designing instruction. Suppes and Morningstar (1969) studied drill and practice programs and concluded these could be used in the absence of quality teaching and time. They referred to computer assisted programs emphasizing the area of mathematics used in schools in California and Mississippi from 1966–1968 as enrichment programs (Suppes & Morningstar, 1969). A meta-analysis on such programmed instruction yielded results indicating it was hard to show that this computer-aided instruction affected student learning in schools (Kulik, Schwalb, & Kulik, 1982).

Another example of the growth of computer-assisted instruction heralded from the University of Illinois during the 1960s. Programmed Logic for Automatic Teaching

Operations (PLATO) was designed using hardware and software that allowed instruction to be delivered via educational technology in many subjects. Kovalchick and Dawson (2004) reported that the hallmarks of this project were that it was the first to introduce color graphics, touch-sensitive screens, and programs that created more interaction between students and the computer.

In the late 1970s, the popularity of computers was beginning to take hold. Apple Computer launched its first microcomputer, Apple I, which had the ability to house computer-assisted instruction. These computers became known as personal computers. In 1977, the Apple II model was introduced. This was perhaps the start of the personal computer (PC) revolution because it was the first of the successful home computer systems in the United States (The People History, 2012). This computer could allow adults and children to play games on the computer, use office applications to improve efficiency of work, and store data of all kinds. The computer was no longer viewed as a luxury, but as a necessity in schools (Molnar, 1997). Today's classroom teachers likely recall their own experiences when the first computer arrived in their schools and the excitement that was generated for the children. The teachers and administrators of the late 1970s were likely propelled into imagining the ways the Apple computer could assist them with their responsibilities to students.

While computer assisted instruction relied on reaction from the learner, new educational technology focused on interaction. Papert was a professor at the Massachusetts Institute of Technology in Cambridge, and he is known as the inventor of LOGO. LOGO was a computer language created for children to help them write computer programs (Papert, 1980). These programs also focused on mathematical skills.

Papert believed that children do math when they create a computer program. In an interview recorded in *The Christian Science Monitor*, Papert (as cited in Pommereau, 1997) reported that he believed students demanded a more interesting way to do things and children saw that the outside world did not look like school. Pommereau suggested that Papert felt that computers could revolutionize learning. Children could construct meaning and new knowledge by interacting with and building computer programs. Papert argued teachers should strive to help children achieve higher order thinking, exemplified through synthesis and application of new knowledge. Whether or not Papert's philosophy could transcend traditional structures of instruction would have to be seen over time.

Following in the 1980s and 1990s, computer-based technologies offered instructional options in the classroom. Examples of computer-based technologies included CD-ROMs, digital presentations, the Internet, and discs (Lever-Duffy et al., 2003). Beginning in 1989, cable companies began offering schools free cable service, which was meant to expand educational television by making cable programming available to schools. The 1990s first saw the inception of varying search engines for the World Wide Web, such as Yahoo and Google.

The 1990s also saw an increasing presence of computers in schools and with it the birth of computer laboratories. While the rationale for computer laboratories in schools was understandable, it could be argued that computer labs actually made integration of computers into instruction more difficult (Becker, 1998). Teachers had to plan in advance for student computer use in the laboratories because it was shared by all classes in the school. According to the Teaching, Learning, and Computing survey of 1998, 43%

of computers were assigned to computer labs in schools across the nation (Anderson & Ronnkvist, 1999). There were varied reasons for placing computer technology in a shared location in schools. These included providing equipment security in a locked location; controlling laboratory climate to preserve equipment by controlling heating, dust, and cooling; creating dual access for children during the day and community members after the instructional day; and finally, computer laboratories were created out of basic electrical infrastructure demands created by their increasing presence (EduTech, 2013).

Beginning in the 2000s, a phenomenon referred to as gaming began sweeping the nation and entered schools. According to a report from the New Product Development Group (2012), there was an 11.1 billion dollar increase in video game sales from 2000 to 2011. Some authors refer to this movement, and its impact on schools, as the gamification of education (Shein, 2013). Educators have worked to capitalize on this popular medium. Many different types and styles of educational games to assist with counting to spelling to advanced algorithms entered classrooms and still remain. Simple drill and practice games to help children learn basic skills have been most popular. Shein (2013) explained that naysayers of educational games to aid learning argue that games only allow for surface level learning and teachers must be aware of the depth of knowledge they hope children achieve before adopting or purchasing educational games to implement the curriculum. Such contemplation reflects sound professional judgment in planning. Additionally, Shein (2013) wrote that proponents of educational games harken to the fact that these tools provide students immediate feedback and increase motivation and attention to tasks. Teachers can make children a part of technology when they ask them to develop programming for games. An example of this is Scratch created by the Lifelong Kindergarten group at MIT Media Lab (Shein, 2013), which is a programming language that gives children the ability to create their own stories, games, music, and animations. Use of games and technology in this way is an example of what Papert was espousing related to children's interaction with computers for the sake of deeper learning.

During the 2000s, the one-to-one laptop initiative began in Maine and Henrico County, Virginia, which sparked interest across the country (Zucker, 2010). During 2001 in Maine, over 34,000 middle school students and teachers were given laptops and in Henrico County, VA, over 25,000 students in grades 6-12 were provided laptops. The budgetary advantage to using laptops is that textbooks become outdated where information via the Internet is the most current knowledge available to teachers and students. Children were provided authentic project-based learning tasks that without the one-to-one initiative they could not easily have accomplished. An example of the authenticity of learning that can be created came from Henrico County where teachers described an assignment where high school students were asked to do online research about infectious diseases and then create a pamphlet about these diseases using word processing skills (Swanson, 2006). An assumption can be made that federal technology goals for schools and the decreasing cost of laptops has spurred the expansion of one-to-one in U.S. schools. Improving the student-to-computer ratio along with hopes of positive increases in student learning outcomes are goals of the popular one-to-one initiative where technology is increasingly embedded in classrooms across America (Mouza, 2008).

The term computer has multiple descriptors now. Handheld devices, tablets, laptops, desktops, and mainframes all describe and define the term computer in today's classrooms (Hattie, 2009). Classrooms no longer have dry erase boards but SmartBoards. Missouri reported the use of SmartBoards in 70% of its schools according to Market Data Retrieval (as cited in Education Week, 2007). A backpack may no longer possess paperback books or a heavy textbook, but instead an e-reader. Thomas Edison predicted textbooks would become obsolete, but the wait for that reality lingers. The State Educational Technology Directors Association (SETDA) set a goal that by 2017 all schools would switch from textbooks to digital resources (Reiss, 2013). The rate of technology innovation is happening at light speed around the world in all competitive economic markets and those advances continue to make their presence known in classrooms.

Programs and Policies to Include Technology in Schools

The Elementary and Secondary Act (ESEA) of 1965 introduced under President Johnson's administration was the first federal commitment to help schools where there were high concentrations of children from poverty (Goldmann, 2011). U.S. programs and policies geared toward technology and schools appear to have a direct relationship to this legislation because of their similar intent to support schools, student learning, and student populations they serve. Johnson's administration and Congress clearly recognized the federal government should provide response to the needs of students and schools. Almost 30 years later, related to the needs of these children, came an uproar from teachers and librarians about the critical need for access to technology and information via the Internet. A financial hurdle existed, making said access difficult. In response, as part of the Telecommunications Act of 1996 under the FCC, the E-Rate program was created (Federal Communications Commission, 1996). The E-Rate program grants discounts to schools and libraries for Internet access, telecommunications services, and internal networking systems. Because of this legislation, this program has resulted in approximately $2.25 billion in discounts provided annually to schools and libraries (Goldmann, 2011).

The first mention of technology and a connection to curriculum came in a report generated during President Reagan’s tenure when the National Commission on Excellence in Education (1983) published *A Nation at Risk: The Imperative for Educational Reform*. The report detailed recommendations in five categories: content, standards, and expectations; time; teaching; and leadership and fiscal support. Under content, computer science was listed as a curriculum requirement for students prior to graduation. With computer skills now appearing as a graduation requirement, teachers would need to have technology training to teach the new content.

In 1998, during President Clinton’s administration, the Higher Education Act was reauthorized and became known as Preparing Tomorrow’s Teachers to Use Technology (PT3). This created a federal grant program to fund training of prospective teachers so they were prepared to use technology to help children achieve state and local goals (Preparing tomorrow’s teachers to use technology: Final rule, 1999). The value can be seen in such a program because it focused on pre-service teachers, which potentially allowed for a trained workforce prepared to instruct using technology as a natural component of teaching and learning versus technology as a foreign tool. Unfortunately, funding for the program did not continue to receive emphasis from Congress, thus PT3 ultimately vanished.

In 2001, further articulating the requirement of high levels of learning for all children, President Bush's administration successfully introduced legislation known as the No Child Left Behind Act (NCLB) (U.S Department of Education, 2001). This quickly became one of the United States' most expansive pieces of federal legislation because of its intense focus on accountability and improving student learning in schools (Zucker, 2010). A reader of that legislation would find that it emphasized the power of technology as a tool for improving achievement (U.S. Department of Education, 2001).

The point of use of educational technologies by students and teachers is to help children think critically and deeply while taking initiative for their own learning (Healy, 1998). In 2002, education policy makers, business leaders, and community members from across the country formed a coalition to define skills needed for students in the 21st century in order to compete in a global market place. Comprehension of global interconnectedness, the ability to not only gather but also use information for problem solving, and an understanding of civic literacy defined areas of focus that the Partnership for 21st Century Skills (2003) attributed as necessary learning targets for students in U.S. schools. Furthermore, learning skills that also emphasized creativity, critical thinking, communication, and collaboration were defined as imperative for students (Partnership for 21st Century Skills, 2003). For the first time, national attention was brought to skills tied to information, media, and technology skills.

As a result of programs and policies setting into motion demonstrative efforts by school districts to infuse technology into the learning process, access to educational technology began expanding in schools across the country. According Gary, Thomas, and Lewis (2010), the ratio of students in the classroom to computers was 1:7 nationally. In contrast, the state of Missouri reported 2.55 students per instructional computer that same year as reported in the K-12 Missouri Schools Census of Technology (Missouri Department of Elementary and Secondary Education, 2011). Howley, Wood, and Hough (2011) noted that U.S. schools had adequate numbers of software and hardware along with appropriate Internet connectivity.

Education policy makers addressed the reality of technology in U.S. classrooms as compared to international competitors by defining expectations for impact on learning. President Obama's administration defined two educational goals to increase graduation rates to an all-time high by 2020 and close the achievement gap between student groups resulting in more students graduating from high school prepared for careers or college (U.S. Department of Education, 2010). Hence, the Office of Educational Technology emphasized a U.S. educational structure that would be fueled and supported by technology. These areas included learning, assessment, teaching, infrastructure, and productivity (U.S. Department of Education, 2010). The Office of Educational Technology of the U.S. Department of Education (2010) further outlined national technology goals that included but were not limited to: a) connectedness of effective teaching, b) accessibility of computing devices in the hands of every student, and c) availability of broadband to serve learners inside and outside of school.

The School – Student Technology Disconnect

Outside of the school day, students have access to the Internet via multiple types of technologies twenty-four hours a day, seven days a week. The Kaiser Family

Foundation conducted a national survey and found that 8 to 18 year olds spent an average of seven and a half hours a day using entertainment media more than any other activity because of their access to technology bringing information and entertainment to them instantaneously (Rideout, Foehr, & Roberts, 2010). Via this technology they collaborate, socialize, contribute, create, and learn independent of any school requirements. Learning in the 21st Century must reflect these capabilities within the structured school day (U.S. Department of Education, 2010).

Prensky (2001a) argued that the United States educational system and all reform efforts failed to identify a single factor that affects the success of educational initiatives. This factor, Prensky (2001a) argued, was that the educational system is no longer designed to meet the needs of the type of learner that enters schools today. He claimed this change in the type of students in classrooms is directly related to the explosion of digital technologies. He coined the phrase ‘digital natives’ because the current generation of student learners was the first to grow up from infancy with the Internet, digital tools, and complex video gaming. Digital immigrant was a phrase created to describe those educators that did not grow up in a digital world but instead have adapted to its birth and presence in their everyday lives. Further discourse on this topic led Prensky (2001b) to examine neurobiology and studies on the effect of digitized experiences on the student brain. Prensky (2001b) reiterated the research of neurobiologists when he proclaimed that children think differently because of the physical biological effects on their brain from interaction with varying technologies. Neuroscience research in later years confirmed Prensky’s argument (2001b) by reporting that exposure to technology stimulates brain cell changes and neurotransmitter release and thus creates new neural pathways (Small & Vorgan, 2009). The distinctions between teachers and students are noteworthy because Prensky (2001a) argued the natives and the immigrants speak two entirely different languages and therein lay the divide that will bring any educational instructional reform effort to its demise if this is not recognized and addressed in teacher learning and teacher practices.

Because little was known about student use of the Internet or about student attitudes towards the broader learning that can take place online, Levin and Arafeh (2002) conducted a qualitative study for the American Institutes for Research on the attitudes and behaviors of internet savvy middle and high school students. This work further enunciated the notion of 'digital natives'. In the survey, students articulated what they would like to see in school regarding technology use. The results indicated that the students desired increased quality of Internet access with fewer restrictions, and increased teacher use of technology that yielded educational challenge. Students also reported they wanted to see development of programs that specifically teach computer, keyboarding, and internet literacy skills because they and their peers lack skills and have misperceptions related to these areas. The students also noted there was a growing population of what can now be considered technologically disadvantaged students. Students communicated that they did not feel their schools recognized the way students access information and communicate via the internet, which influences their school engagement (Levin & Arafeh, 2002).

Still, in the field of educational research, there is limited empirical evidence of the impact to learning occurring as a result of "net-savvy" students and the "digital disconnect" that may be occurring between them, their instructors, and their schools

(Selwyn, 2006). Selwyn (2006) illustrated evidence that students are in what can be described as an i-mode or possessing immediate access to information via the internet on a personal electronic devise while schools restrict and limit such use and experiences in school. Selwyn's work actually suggested that students have adapted to school limitations of technology use and accepted the fact of loss of control and choice in this matter.

Technology Integration

Before discussing technology use by teachers and students, it is important to define what is meant by technology integration and instructional technology. According to Jonassen (1995a), technology integration occurs when the classroom is learner-centered and the teacher conducts oneself not as a sage on a stage but rather a facilitator of learning. Jonassen (1995b) further suggested that technology use in classrooms should be need-driven, initiated by the learner, and conceptually and intellectually engaging. Jonassen (1995a) wrote that computers in classrooms should be viewed as cognitive tools that allow students to access information, analyze their thinking, organize new knowledge, and assist them in presentation to others about what they have learned. Integrating technology is not about random use of technology by students as a reward (Dias, 1999). Instead, Dias (1999) defines technology as integrated when it is used "in a seamless manner to support and extend curriculum objectives and to engage students in meaningful learning" (p.10).

There are contradictory definitions of instructional technology and educational technology in the literature. According to Earle (2002), these two terms can be used interchangeably. According to the Association for Educational Communications and

Technology (AECT), educational technology is the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning (Seels & Richey, 1994, p. 1). Instructional technology is a support for the teaching and learning process (Hamilton, 2007).

Literature on teacher technology use seeks to articulate factors that impact such use. Honey and Moeller (1990) conducted interviews with twenty teachers who either used or did not use technology in the classroom. The interviews were conducted in elementary, middle, and high schools in two districts in the state of New York. The study found that a student-centered versus a teacher-centered philosophy was a contributing factor affecting technology integration.

The National Center for Education Statistics (NCES) conducts surveys on public school teacher access to and use of computers and the Internet. NCES (2000) reported that 53% of public school teachers who have a computer do use it during the school day for instruction. The NCES (2000) report also showed that there was no noticeable variance of teacher use of technology as compared to years of service in the profession. One-third of teachers surveyed reported being prepared or well prepared to use computers and the Internet in their classrooms. Additionally, the report noted that 93% of these same teachers reported that independent learning was what helped prepare them for using technology in their classrooms where 87% of teachers attributed professional development to their sense of preparedness. The teachers that did report feeling more prepared also reported they were more likely to use educational technologies as compared to their less prepared colleagues. Cuban (2001) articulated that teachers generally use technology on a frequent basis for personal use, planning, and administrative teacher tasks versus use of computers as a learning tool.

Regarding teacher use of instructional technology, the Levels of Implementation (LoTi) framework was developed in order to define levels of use of which teachers sequentially progress through as they increase their use of technology (Moersch, 1995). These levels of use are defined as zero to six with categories titled *Nonuse, Awareness, Exploration, Infusion, Integration, Expansion,* and *Refinement,* respectively (Moersch, 1995). Each of the categories are identified by how teachers use technology, the tools that are used, the connection to curriculum, and the responsibilities associated with student use of the tools. The LoTi survey categories are reflective of the Levels of Use that describe a professional's behavior as they progress toward implementation of an initiative or innovation (Hall, Dirksen, & George, 2006).

A study at the University of North Texas was conducted using the LoTi survey. The purpose of the study was to describe technology learning methods that teachers attended and those they perceived as effective. Results of the study showed that teachers with different technology levels of use also differed on their perceptions and utilization of technology training methods. The study showed that educators tended to use the technology training method that they perceived as most effective (Griffin, 2003).

The Teacher Attribute Survey (TAS) was used in a study in six northwest Ohio schools of which two were high schools and four were elementary schools (Vannatta & Fordham, 2004). The researchers were hopeful that where there was opportunity for technology training a normal distribution of technology integration would occur. Vannatta and Fordham (2004), though, were more interested in determining if teacher commitment to improvement predicted technology use by teachers. Descriptive statistics from the study indicated that teacher use of technology was higher than student use. Teachers reported use of word processing, e-mail, and the Internet all for administrative tasks. For the purpose of instruction, teachers reported they used spreadsheets, digital cameras, and presentation software only once or twice a semester. The results, based on survey responses, indicated that the number of hours of technology training, the number of hours worked beyond contract time, and openness to change were found to be predictors of teacher technology use.

Though the statistics on teacher technology use are informative, Bebell, Russell, and O'Dwyer (2004) warned that one must be cautious when examining patterns of use or difference in use based on how a researcher defines and measures technology use. However, Bebell and Kay (2010) updated the original report and suggested that with the explosion of one-to-one initiatives teachers are vital to technology use in the classroom and could be viewed as the gatekeepers to such use. The matter of pedagogical skills is one that surfaces in the literature related to technology integration.

Bauer and Kenton (2005) from the University of Texas conducted a qualitative study in which the classroom practices of teachers considered "tech savvy" were examined. Volunteers for the study were from elementary, middle, and high schools. The researchers studied how much teachers used technology, the obstacles to that use, and general teacher thoughts regarding technology. They found two key issues. First, students did not have enough time with computers, and second, teachers needed more planning time for integration of technology into their lessons.

According to the U.S. Department of Education (2010), 44% of elementary teachers surveyed by the National Center for Education Statistics (NCES) reported they or their students often use computers during instructional time. Thirty-nine percent of surveyed elementary teachers with three or fewer years of teaching experience reported they or their students often use computers during instructional time. The Missouri Department of Elementary and Secondary Education (2011) reported, "In the typical building, 75 percent of teachers reported fully integrating technology into the curriculum" (p. 9). This was compared to 50% in 2006. This statistic should be interpreted with caution because the report did not define "typical building" in the state of Missouri. The determination of how this specific information from teacher was gathered is unclear. Nonetheless, the report did indicate an increase in technology skills and usage from 2001 through the 2010-2011 school year.

Technology integration in pre-kindergarten thru fifth grade classrooms was examined when Rollins (2011) conducted classroom observations in a district located in a metropolitan area in the south central region of the United States. Conclusions from his work determined that though accessibility to technology may be high for teachers and students, teachers use technology predominantly for presentation of material. Students were not engaged in higher-level thinking activities, but rather student use in Rollins' study was primarily for the purpose of basic skill acquisition. Rollins' findings of such low level teacher technology use was contrary to suggestions in the literature that technology use is highest when a technology plan exists with articulated goals for technology use in the classroom, of which was present in all schools studied.

A research study conducted at Collingswood Technical High School in a suburban school district in Pennsylvania during the spring of 2011 investigated secondary teacher opinions about professional development geared specifically toward use of interactive whiteboards (SMART Boards) (Brey, 2012). The researcher collected data using questionnaires, semi-structured interviews, and classroom observations. The researcher concluded that a teacher's satisfaction with professional development programs led to integration of interactive whiteboards. The researcher hoped this finding might lead administrators and trainers to provide meaningful professional development that might result in high levels of integration of interactive whiteboards.

Knight (2012) explored roadblocks to why teachers do not fully integrate technology into instruction when accessibility has increased over time. He surveyed over 105 teachers in three Philadelphia, Pennsylvania schools. By conducting the study, he hoped to reveal the relationship between technology integration and teacher's knowledge of technology, the role of curriculum, and the teacher's perspective on the benefits of using technology. What the findings demonstrated was a statistically significant relationship between the teacher's knowledge of technology and the teacher's use of technology in the classroom. This research gave credence to further emphasis on teacher professional development as it relates to technology.

Pedagogy and Teacher Technology Integration

The theory of constructivist pedagogical practice is presented in this literature review as an attempt to define for the reader that this approach is a vehicle by which teachers can integrate technology so that it becomes part of the learning process and not an additional component. Brooks and Brooks (1993) wrote about the purpose, design, and principles of constructivist classrooms. This text can be summarized by identifying a constructivist pedagogical approach in a classroom where curriculum is grouped around concepts, student's point of view and interest drives learning, problem-based learning allows learning to be relevant to the child's life, and ultimately children are actively engaged where the teacher is guide and facilitator of learning (Brooks & Brooks, 1993). Constructivism as a primary pedagogical instructional design practice appears repeatedly within technology integration research (Lunenburg, 1998).

Those who provide professional development have the power to influence the use of student-centered learning activities described by a constructivist approach that can and should be enhanced by use of educational technologies (Sprague & Dede, 1999). Traditional forms of professional development have been isolated from classroom realities leading to impactful training, which translates to classroom practice (Guskey, 2000). For this to occur, Snoeyink and Ertmer (2001) suggested professional developers should focus on technology integration within content, while also teaching technological skills, and instructional design.

The use of technology as it relates to higher order thinking was addressed in this literature review. Constructivism as an instructional design has a relationship to integration of technology and the aforementioned goal of higher order thinking. Constructivism encourages student initiative, makes use of primary sources, allows for interaction between students, allows student questions and responses to drive instruction, poses open-ended questions, works to have students create metaphors and analogies, and finally, fosters curiosity and creativity (Foote, Vermette, & Battaglia, 2001).

Repeatedly, meta-analyses of the research on technology use in schools by teachers and students has shown positive gains in student learning as a result computer-based instruction (CBI), or software programs written to or teach or facilitate development of academic skills or deeper thinking (Kulik, 1994). PLATO as referenced previously in this chapter was an early example of CBI.

Schacter (1999) attempted to summarize technology studies on the effect of technology on student achievement. His findings showed students with access to integrated learning systems technology, computer assisted instruction, software that teaches higher order thinking, networked technologies, or design and programming technologies showed positive gains in achievement as measured by standardized tests. Schacter also concluded that students learn more in less time when they use educational technology. Finally, student technology use was shown to increase student motivation towards learning.

Becker, Ravitz, and Wong (1999) conducted The Teaching, Learning, and Computing (TLC) study. The sample in this study included teachers, principals, and school technology coordinators from across the United States. Elementary schools (299), middle schools (253), high schools (346), and private and parochial schools (83) were included in this study. The data were collected through questionnaire responses from teachers, principals, and school technology coordinators from three samples of schools. In the subjects of math, foreign language, and socials studies, secondary students were less likely to use computers than elementary students. Elementary student use was in the area of practice, drill, and games. The researchers found that of all elementary and secondary teachers surveyed, only 27% reported giving students frequent opportunities to use or interact with educational technology.

Becker (2000) examined student access to computers at home and at school while he also studied trends that emerged regarding use of those computers. He accessed data from of a survey of more than 4,000 teachers as conducted by a 1998 national survey of schools and teachers regarding technology. Becker also used data from the U.S. Census Bureau's Current Population Survey of U.S. Households from 1997 and 1998 to learn about children's access to computers at home and at school. He concluded that a far from subtle difference existed between children of lower SES homes and children of higher SES homes as related to computer and internet access. Becker recommended that schools must pay close attention to creating equal access to technology and equal opportunities related to computer technology for children of lower SES designation.

Ringstaff and Kelley (2002) summarized education research on technology. They declared a positive effect on student learning when there were clearly identified and articulated learning goals related to technology's use. The results of the summary indicate intentionality of planning by schools and districts when it came to articulation of goals for technology integration, which, according to Ringstaff and Kelley (2002), translate to student technology use for purpose of improved student learning.

Hart, Allensworth, Lauen, and Gladden (2002) surveyed 87,732 students enrolled in grades six through ten and 11,214 teachers from all Chicago Public Schools in the spring of the 2000-2001 school year. The researchers sought to learn about student and teacher attitudes towards technology, resource availability, and frequency of teacher and student use as well as type of teacher and student technology use. The study concluded that 19% of students reported using computers intensely once per week. The activities they were engaged in included word processing, Internet use, writing and analysis, graphing, and presentation development. Twenty-five percent of students reported limited use of technology while 38% reported moderate use of technology. Fifty-seven percent of students reported use of technology was highest in the area of English/reading as compared to 38% of students reporting use of educational technology in mathematics (Hart, et al., 2002). The researchers concluded that availability (access), professional development, and technical support influenced both teacher and student use of technology during the instructional day.

Lim and Tay (2003) interviewed students and teachers at a Singapore elementary school. The students and teachers were chosen for the study because of their high degree of use of information and communication technologies in the classroom. The researchers gathered data via surveys and case studies. The researchers determined that student technology use enhanced higher-order thinking skills. They concluded that higher-order thinking was facilitated when children constructed their own knowledge by active engagement and use of computer tools linked to Internet resources. They further concluded that students' high frequency use of computer games for educational purposes fostered critical thinking and high levels of engagement.

Warschauer (2007) complimented Becker's (2000) work when he closely examined research studies of Becker (2000) and Schofield and Davidson (2004) on student technology use as related to socio-economic status (SES). He concluded that access to and use of technology should be expanded for students of lower SES. His findings indicated that students of a lower SES used computers for basic skill acquisition was parallel to the fact that students of a lower SES also demonstrate lower literacy and language skills, thus computer usage has predominantly been development of proficiency in these basic skill areas. Warschauer (2007) recommended that concentrated efforts should be made to connect low-income students to both school and community technology resources.

The Mid-continent Research for Education and Learning (McREL) conducted a meta-analysis of impacts on student achievement. The meta-analysis showed that some student groups perform better in technology-rich classrooms. An example of this impact on learning was found for students receiving special services in technology-rich classrooms. In addition, at-risk student populations also showed increased achievement. Achievement results were compared for these same student groups in traditional classrooms and achievement in the traditional setting for these defined groups was lower (Pitler, Hubbel, Kuhn, & Malenoski, 2007).

In a meta-analysis of research on technology use, Hattie (2009) found a myriad of research focused on teacher use of technology as compared to the amount of research conducted on student use of technology. Therefore, results of research on student technology use should be used with some caution before generalizing to the larger population depending upon the nature of the studies.

Bebell and Kay (2010) used a pre-and post-comparative design to study a large-scale one-to-one initiative. The study examined a $5.3 million three-year pilot across five western Massachusetts middle schools that began in 2005 and involved distribution of a laptop computer with Internet access to every student and teacher. Data collection for this study involved teacher and student surveys, student drawings, classroom observations, student achievement results, teacher interviews, administrator interviews, and a computer writing assessment for students. Results from the pilot indicated that both student and teacher use of technology dramatically increased across the curriculum. Student motivation and engagement increased while less clear was improvement in academic achievement across the pilot schools. Teacher strategies to deliver curriculum were reported drastically changed because of the one-to-one initiative. Student and teacher technology use was shown to increase dramatically across subjects and grade levels. Specifically, student use of technology occurred with greater frequency in the subjects of social studies and English language arts versus science and math. Ultimately, Bebell and Kay (2010) concluded that generalizations from researchers about the impact on learning as a result of technology integration should not be articulated until there is correct documentation of and then quantification of technology use by students in repeated studies.

In *The Right to Learn*, Dixon and Einhorn (2011) wrote that because of children's innate and natural curiosity to learn, technology as a natural function of learning empowers children to learn whatever they need to and whenever they need to learn it. Dixon and Einhorn went on to purport that for the aforementioned reason schools could begin to decrease divisions between subjects and grade levels. They suggested that to meet the needs of learners the change of the infrastructure of delivery of curriculum should be explored by educators.

Reinhart, Thomas, and Toriskie (2011) conducted an exploratory study using survey data from 94 K-12 Midwestern teachers. The researchers defined first-level and second-level digital divide. First-level digital divide referred to differences in technology access between different student populations. Second-level digital divide referred to how technology is actually used in the classroom. Reinhart et al. (2011) highlighted evidence that students in schools with higher free and reduced lunch populations used technology in ways that stimulated higher-order thinking less often that those students in schools with lower free and reduced lunch populations. The researchers recommended further analysis of this problem so that students of lower SES are not limited in their futures because of low SES and its connection to technology use and school achievement as compared to their peers of higher SES.

As pointed out by a report from the National Association of State Boards of Education (2012), increased access to technology for the first time allows instruction to be individualized for children on a greater scale thereby personalizing education to meet individual student needs. A group of members from state boards of education was formed in 2012 to study the role of technology in schools and communities. According to the National Association of State Boards of Education (2012), a juxtaposition exists between student technology use at school compared to technology use at home. Thirty percent of students in grades six through eight and 46% of students in grades nine through twelve used sites such as Facebook and YouTube to work together on school assignments. Conversely, 90% of 13-17 year-olds reported use of social media outside of school and 51% reported visiting such sites daily. Sixty-nine percent of surveyed teenagers reported they used social media to get to know other students in their schools. Sixty-five percent of students reported negative impacts on their learning where school rules prohibited them from being allowed to use their own mobile technology devices to help them learn. The recommendations from the study summary set forth goals for districts to focus on, which included addressing the needs of students, ensuring educators can use technology to meet student needs, and building an educational technology infrastructure. In summary, the researchers concluded use of instructional technology to connect students to high levels of learning must be utilized to connect to the students in schools to maximize their learning in a way that parallels the digital lives they lead outside of school.

Professional Development

According to Sheingold (1991), helping teachers use technology as a tool for learning defines technology integration. Barth (2000) defined an at-risk teacher or principal as an educator “who leaves school at the end of the day or year with little possibility of continuing learning” (p. 68). Educators must demonstrate competency as a by-product of continuous learning when it comes to the use of educational technology as a natural part of the teaching and learning phenomenon. Instructional practice in the classroom cannot continue as business as usual if the reality of the change in the type of learner they are serving is to be respected.

Teacher behavior following participation in professional development activities is evidence of the effectiveness of professional development. Hall and Hord (1987) conducted 15 years of research on the change process and captured their findings in *Change in Schools: Facilitating the Process.* Within this text, they describe the initial phases of concern teachers experience when they learn and implement something new (Hall & Hord, 1987). Additionally, they describe eight phases teachers move through during the adoption of an innovation. First, there is Non-Use, which is when a teacher has no information about the innovation. Next is Orientation in which a teacher begins to gain some knowledge and considers how it might be useful in the classroom. Preparation describes a teacher when enough new learning has occurred that preparation for use occurs. Mechanical use occurs when a teacher uses the new innovation (technology) but is mostly focusing on the skills necessary to use it. The Routine phase occurs when use has become a routine function in the classroom. Refinement occurs when the technology is used routinely to improve outcomes. Integration occurs when the technology is used and collaboration occurs to meet common outcomes. Finally, a teacher arrives at Renewal when new technologies are again explored in order meet objectives better.

The 1997 Panel on Educational Technology recommended that professional development focus not singularly on technology, but rather learning with technology; and not focus just on technological hardware components, but instead pedagogy and content. Schrum (1999) reviewed models of professional development and determined that technology staff development requires attention to different knowledge, skills, and adult learning activities as compared to traditional staff development models. She went on to suggest that technology professional development should be differentiated where the adult learner has the opportunity to identify their own needs and interests in order to achieved individual learning goals.

Guskey (2000) indicated that research thus far documented the inadequacies of professional development. Guskey (2000) further indicated this same research, though, falls short of definition of effective approaches to the topic. Guskey (2000) referenced this work when he outlined his approach to evaluating professional development. Of interest to Guskey was Hall and Hord’s (1987) definition of a participant’s levels of use of a new innovation after knowledge and skills had been acquired during professional development. Teacher behavioral changes in the classroom resulting from professional development are defined as renewal, integration, refinement, routine, and mechanical (Guskey, 2000). These levels of use are similar to those defined by the LoTi as explained previously in this chapter. It was Guskey's opinion that if teacher's behaviors are to reflect automaticity of technology use at the highest level as defined by LoTi, then professional development should be designed to help the educator move through these levels.

Putnam and Borko (2000) contend that such scenarios for adult learning are too removed from regular classroom practices to affect teacher behavior change. Therefore, professional development that does not model authentic use of technology will not yield high results in terms of technology integration. According to Putnam and Borko (2000), situative theory suggests that the context in which professional development or the adult learning takes place is integral to the learning that will actually occur. "How a person learns a particular set of knowledge and skills, and the situation in which a person learns, become a fundamental part of what is learned" (Putnam & Borko, 2000, p. 4). In a report to the National Staff Development Council, Sparks and Hirsh (2000) defined staff development as effective when it is job-embedded, linked to daily teacher responsibilities, focused on learner outcomes, focused on curriculum goals, and cumulative as well as sustained over time.

According to Pierson (2001), those responsible for providing professional development should do so with the knowledge that there is an interconnected relationship between content, pedagogical, and technological knowledge if instructional impact is to result from professional development. This same point was reflected in later work that recommends a framework linking these three. Hence, professional development must be considered as a factor in technology integration. Teachers will naturally resort to styles and methods of teaching with which they are most familiar when not provided with quality professional development and training (Sparks & Hirsh, 2000).

Garet, Porter, Desimone, Birman, and Yoon (2001) conducted a national survey to determine the effectiveness of professional development. The data provided empirical evidence to support key factors of professional development that ultimately make it impactful at the student level. Collaborative participation of teachers from similar schools, grades, or content areas relates to active learning, was found to result in improved teacher knowledge, skills, and classroom practices (Garet, et al., 2001).

Snoeyink and Ertmer (2001) conducted a two-year qualitative study using a case study framework to understand the challenges of experienced elementary teachers when learning new technology and integrating it into the classroom. The researchers determined that teachers preferred learning from their peers, less preferred working in teacher groups as their individual questions were not always answered, and finally had to understand the relevance of what they were learning. Ultimately, Snoeyink and Ertmer found in their research that technology professional development that focused on content and related pedagogical practices yielded greater use for instructional purposes than professional development that focused on technology skills unrelated to instruction.

Researchers at the University of Albany developed a metaphor for professional development and technology integration (Swan et al., 2002). Conceptually in the metaphor, technology integration is viewed as a tree. The roots of the tree are factors, which research has shown to influence technology integration: planning, equipment, attitudes, focus, situation, culture, and support. Situation, in particular, refers to the environment of teacher learning as it relates to technology integration such as summer institute learning, after school workshops, professional conferences, and the like. The research on various professional development programs has shown that when professional development is teacher-initiated, adult-learner specific, contextual in terms of classroom and curriculum, and supported via a mentor where planning is similar to a classroom teacher's day-to-day planning for instruction, technology integration is more likely to occur at high levels (Swanet et al., 2002).

Irrespective of increased computers in schools and private and public investments made to increase technology use in schools, Zhao and Frank (2003) purported that computers are underused in schools. They concluded that professional development has been identified as a factor impacting this use as the rate of changing technology has made it difficult for teachers to remain current with new developments. A study conducted at West Virginia University evaluated professional development and instructional change related to instructional technology integration (Mitchem, Wells, & Wells, 2003). The findings of this study suggested that teachers improve instructional design, increase technology use, and student engagement rises when teachers raise awareness and understanding of instructional technologies. Likewise, Matzen and Edmunds (2007) concluded that when professional development is about teaching skills the result is no technology use by teachers at all or merely use of technology consistent with traditional instructional approaches.

The literature indicated there is value in identifying the correct professional developers, which will help teachers further integrate technology. Plair (2008) referred to facilitators or specialists as knowledge brokers. The researcher coined the term as the concept of a broker implies that knowledge of technology integration is a commodity. Commodities are traditionally known to be sought, purchased, exchanged, and valued. Hence, a knowledge broker, technology integration specialist, or staff developer would have content, pedagogical, and technological knowledge and skills that would aid the learning of teachers to match educational technology tools to content and therefore increase innovation in classrooms (Plair, 2008).

Gorder (2008) conducted a study with approximately 300 K-12 teachers in South Dakota. The purpose of the study was to determine the degree to which teachers perceived technology integration occurred relative to technology training they had received. The results of the research showed that teachers used technology for professional productivity more than integrating it into teaching and learning. The study also found that professional development was important when it brought teachers together and allowed them to share ideas about technology integration. Finally, Gorder (2008) concluded that teachers should learn to integrate technology within the context the integration will occur and allow for teacher practice and reflection.

The International Society for Technology in Education (ISTE) (2008a) established the National Education Technology Standards for Teachers (NETS-T), Students (NETS-S), and Administrators (NETS-A). Standards were defined for each group as they hold a collective responsibility to meet demands to transform teaching and learning. These standards reflect best practice related to technology's use in education. ISTE (2008a) purports that the benefits of using the NETS include improvement of higher-order thinking skills, preparation for a global job market, facilitation of project-based and online learning environments, guidance for systemic school change, and modeling of digital collaboration and decision-making.

The NETS-T defines standards and performance indicators teachers should know and be able to demonstrate in order to provide instruction that parallels the digital age students live in. The following are defined performance indicators:

1. Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.
2. Teachers design, develop, and evaluate authentic learning experiences and assessment incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the NETS-S.
3. Teachers exhibit knowledge, skills, and work processes representative of an innovative profession in a global and digital society.
4. Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices.
5. Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources. (International Society for Technology in Education, 2008a, pp. 1-2)

Because the aforementioned NETS-T describe performance indicators for teachers, then it would follow that professional development is aimed at facilitating teacher's attainment of these competencies.

Professional development models need to be designed to help teachers acquire technology skills. Mishra and Koehler (2009) believe that the Technological Pedagogical Content Knowledge (TPACK) is one such model. "TPACK draws connections between technology, curriculum content, and pedagogy. The framework demonstrates how teachers' understandings of technology, pedagogy, and content can interact with one another to produce teaching with educational technologies" (Mishra & Koehler, 2009). This framework is based on ensuring teachers have a more than adequate content knowledge base. The pedagogical component relates to teacher knowledge of learning theories and the ability to apply those to instructional design. Finally, teacher technological knowledge relates to knowledge about use of technology for problem solving, communication, and information processing (Mishra & Koehler, 2009). Table 1 depicts an example of instruction planning because of teacher professional development as it relates to the TPACK model.

Table 1

Knowledge Building Activity Types

Activity	Description	Technology
Group Discussion	Students engage in dialogue with peers	Blogs, wikis, chatrooms, discussion forums
Simulation	Students engage in paper-based or digital experiences that mirror complex and open-ended nature of the real world	Web sites, simulation software, animations, virtual reality
Historical Weaving	Students explore print-based and digital documents to understand multiple perspectives on a topic	Web sites, primary sources (paper-based and online), online newspapers/journals

Note. Adapted from Technological pedagogical content knowledge and learning activity types: curriculum-based technology integration reframed," by P. Mishra and M. Koehler, 2009, *Journal of Research on Technology in Education*, *41*(4), p. 408.

Wei, Darling-Hammond, Andree, Richardson, and Orphanos (2009) recommended collaborative teacher learning through job-embedded professional development that complements the goal of situative professional development. They determined that teachers learn best and teacher instructional behavior changes when professional development is formatted to model desired outcomes, allows for teacher practice of defined skills, and allows teachers to reflect on new content knowledge, new skills, and new instructional practices.

Mouza (2009) conducted a qualitative multiple case study research to examine the long-term effects of research-based professional development related to teacher learning and technology practice. The findings of that study exposed three key factors that impacted teacher learning and subsequent practices: 1) access to resources, 2) student characteristics, and 3) collaboration with peers. The current study did examine technology professional development in terms of type and amount unlike Mouza who focused on factors that impacted teacher learning related to technology.

The facilitators of professional learning should know what excellent teaching with technology looks like (Croft, Coggshall, Dolan, Powers, & Killion, 2010). The quality of job-embedded situative professional development also improves based on facilitator skills. Effective facilitator skills include quality interpersonal skills, comprehension of dynamics of professional learning, ability to guide teachers in inquiry learning, ability to model application of skills, and ability to connect teacher learning to student learning (Croft et al., 2010). Technologists challenge that educational leaders and even educational policy makers do not possess the same knowledge and use of technology as do people that function within and direct other professions (U.S. Department of Education, 2010).

In the matter of one click on a mouse, a teacher can access endless digital resources that can impact the classroom. One can purport that this access creates personalized professional development for teachers that can occur at their convenience. Examples of these online resources may include, but not be limited to, webinars, blogs, podcasts, social networks, bookmarking sites, and email groups (Morphew, 2012). Formal collaboration should not be overlooked as another means by which teachers can receive professional development. Morphew (2012) recommends the practice of professional reflection. When paired with teacher collaboration personal reflection can be a powerful tool to drive professional development. A simple well-known elementary strategy would be for teachers to develop a K-W-L chart based on as learners what they know, want to know, and need to learn related to technology integration. Taking this a step further, Morphew (2012) suggested teacher reflection using digital-imaging technology. Digital images can capture changes over time in student learning while also providing an efficient way for collaborative teacher teams to review student work, discuss student assessments, or generate models of student work, which can be used with students later during instruction or activity time. A thoughtful professional development plan with curricular goal connections, a corresponding evaluation plan, and support by financial and human resources is essential if technology is to be used by teachers and students to promote learning (North Central Regional Educational Laboratory, 2012).

Teachers cannot be expected to teach what they do not know, nor to use yesterday's training to prepare today's students for tomorrow's future. It cannot be expected of teachers to share and learn from each other's knowledge and skill unless we provide them with the research, structures, time, and money with which to do it. Ultimately, quality professional development benefits students by channeling the talents and expertise of all the school's teachers in all the school's classrooms (Sparks & Hirsh, 2000).

Summary

The literature review included information related to the history of technology in classrooms, rationale for technology use in schools, and technology integration in United States' classrooms as defined by teacher and student use. Studies illustrated that though there is increasing access to technology in schools and supporting empirical evidence connected to student learning for technology use, there is not at the same time empirical evidence showing increased parallel technology use by teachers and students as an integral tool for learning. Literature addressing professional development as it relates to technology integration was also reviewed. The literature on this topic recommended movement from traditional professional development models to professional development designs which facilitate authentic adult learning related to enhancement of teacher skills and knowledge related to technology and associated pedagogical practices. Chapter three discusses the study's research design, sampling procedures, instrumentation, data collection procedures, data analysis, and limitations of the study.

Chapter Three

Methods

The purpose of this study was to determine to what extent relationships exist between the type of educational technology used in the classroom by teachers and students and the types and amounts of technology professional development received by the teacher. The methodology and procedures utilized to conduct this study are presented in this chapter. The chapter defines the population, sample, and sampling procedures. In addition, instrumentation, measurement, and the data collection procedures are explained. Finally, data analysis procedures and limitations are outlined.

Research Design

The design of this study was quantitative, non-experimental, and correlational. The variables in this study were the type of technology professional development received by teachers, the amount of technology professional development received by teachers, and the types of teacher-directed and student-centered technology used in the classroom. Pearson correlations and chi-square tests of independence were used to test relationships among the variables.

Population and Sample

The population for this study was elementary certified teachers assigned to teach students in grades kindergarten through six. The sample included 107 certified teachers responsible for instruction for kindergarten through sixth grade at three elementary schools from the Lee's Summit R-7 School District.

The sample included only teachers who taught in the respective schools from August 2009 through October 2012. For the purpose of this study, related instructional areas or “mixed” teachers included art, music, physical education, resource reading, counseling, instrumental music, and library media specialist.

Sampling Procedures

Purposive sampling is used when the sample is chosen “based on the researcher’s experience or knowledge of the group sampled” (Lunenburg & Irby, 2008, p. 175). The sample was selected because certified teachers provided for the instruction of kindergarten through six grade students in the Lee’s Summit R-7 School District. Teachers taught in one of three identified schools. Additionally, teachers had been informally observed using the eWalk process documented using McRel’s Power Walkthrough software.

Criteria for teacher selection for inclusion within the sample were twofold. One criterion required that a teacher had to teach in one of the elementary schools identified as having the highest recorded incidences of classroom walkthroughs as documented by McRel’s Power Walkthrough software. Another criterion was that a teacher had to have participated in technology professional development offered by a Lee’s Summit R-7 School District ITS.

Instrumentation

McREL’s Power Walkthrough template was the instrument used to measure the variables defined as the types of teacher-directed and student-centered technologies used. Figure 1 provides a view of the first page of the Lee’s Summit R-7 School District eWalk Template managed via McRel’s Power Walkthrough software used to document observations.

Lee's Summit R-7 District Template

Observer:	Person Observed:
Date- / /	Time- :

Grade		Content	
☐ *Pre-K*	☐ *Grade 7*	☐ *Language Arts*	☐ *Early Childhood*
☐ *Kindergarten*	☐ *Grade 8*	☐ *Math*	☐ *Elementary Specials*
☐ *Grade 1*	☐ *Grade 9*	☐ *Science*	☐ *Fine Arts*
☐ *Grade 2*	☐ *Grade 10*	☐ *Social Studies*	☐ *Health/PE*
☐ *Grade 3*	☐ *Grade 11*		☐ *Modern Language*
☐ *Grade 4*	☐ *Grade 12*		☐ *Practical Arts*
☐ *Grade 5*	☐ *Mixed*		☐ *Special Education*
☐ *Grade 6*			

Prioritized Strategies (ongoing and integrated with the primary strategy)

☐ *Setting Objectives*	☐ *Reinforcing Effort*
☐ *Providing Feedback*	☐ *Providing Recognition*

Primary Instructional Strategy (teacher-intended main strategy)

☐ *Advance Organizer*	☐ *ISD - Compare*	☐ *Note Taking*
☐ *Cues/Questions*	☐ *ISD - Classify*	☐ *Practice*
☐ *GTH - Decision Making*	☐ *ISD - Metaphor*	☐ *Providing Feedback*
☐ *GTH - Experimental Inquiry*	☐ *ISD - Analogy*	☐ *Providing Recognition*
☐ *GTH - Historical Investigation*	☐ *NLR - Graphic Organizer*	☐ *Reinforcing Effort*
☐ *GTH - Invention*	☐ *NLR - Kinesthetic*	☐ *Setting Objectives*
☐ *GTH - Problem Solving*	☐ *NLR - Mental Imagery/Senses*	☐ *Summarizing*
☐ *GTH - Systems Analysis*	☐ *NLR - Physical Model*	☐ *No research-based strategy*
	☐ *NLR - Pictograph*	

Secondary Instructional Strategy (in support of main strategy, optional)

☐ *None (only primary observed)*	☐ *ISD - Compare*	☐ *Note Taking*
☐ *Advance Organizer*	☐ *ISD - Classify*	☐ *Practice*
☐ *Cues/Questions*	☐ *ISD - Metaphor*	☐ *Providing Feedback*
☐ *GTH - Decision Making*	☐ *ISD - Analogy*	☐ *Providing Recognition*
☐ *GTH - Experimental Inquiry*	☐ *NLR - Graphic Organizer*	☐ *Reinforcing Effort*
☐ *GTH - Historical Investigation*	☐ *NLR - Kinesthetic*	☐ *Setting Objectives*
☐ *GTH - Invention*	☐ *NLR - Mental Imagery/Senses*	☐ *Summarizing*
☐ *GTH - Problem Solving*	☐ *NLR - Physical Model*	
☐ *GTH - Systems Analysis*	☐ *NLR - Pictograph*	

Depth of Knowledge

☐ *Recall*	☐ *Strategic Thinking*
☐ *Skill/Concept*	☐ *Extended Thinking*

Context

☐ *Cooperative Group*	☐ *Small Group*
☐ *Individual*	☐ *Whole Group*
☐ *Pair*	

Figure 1. *Lee's Summit R-7 District eWalk.* Adapted from "Lee's Summit R-7 District Template," Lee's Summit R-7 School District, 2010b. Retrieved from http://its.leesummit.k12.mo.us/District_eWalk_Template.pdf

While conducting eWalks, school principals and district administrators documented the following on the first page of the eWalk template: date, time of observation, name of the observer, teacher's name, grade level observed, and content area observed. Observers marked all descriptors that applied under the five research-based categories impacting student achievement defined as prioritized strategies, primary instructional strategy, secondary instructional strategy, depth of knowledge, and context. Data from these five categories were not used in this study. Figure 2 provides a view of the second page of the Lee's Summit R-7 School District eWalk Template managed via McRel's Power Walkthrough software used to document walkthrough observations.

Teacher Directed Technology		
☐ *Brainstorming/Idea Mapping Software* ☐ *Calculator* ☐ *Clickers* ☐ *Collaborative application* ☐ *Curricular games*	☐ *Data probes* ☐ *Intervention software* ☐ *Multimedia (creating)* ☐ *Multimedia (watching)* ☐ *SMART Board*	☐ *Spreadsheet* ☐ *Web resources* ☐ *Word processing* ☐ *None*
Student Centered Technology		
☐ *Brainstorming/Idea Mapping Software* ☐ *Calculators* ☐ *Clickers* ☐ *Collaborative application* ☐ *Curricular games*	☐ *Data probes* ☐ *Intervention software* ☐ *Multimedia (creating)* ☐ *Multimedia (watching)* ☐ *SMART Board*	☐ *Spreadsheet* ☐ *Web resources* ☐ *Word processing* ☐ *None*
Evidence of Learning		
☐ *Dramatization/simulation/ modeling* ☐ *Experiment* ☐ *Independent practice or worksheet* ☐ *Individual student interview/demonstration* ☐ *Learning game*	☐ *Peer teaching* ☐ *Student discussion* ☐ *Student drawing/graphic organizing* ☐ *Student performance/presentation* ☐ *Silent reading (little evidence)*	☐ *Student writing/journaling* ☐ *Teacher directed lecture (little evidence)* ☐ *Teacher directed question/answer* ☐ *Assessment* ☐ *No evidence*
Student Interview (what and why?) ☐ *Articulated learning objective(s)* ☐ *Partially articulated objective(s)* ☐ *Could not articulate objective(s)*		
Optional Observations		

Figure 2. Lee's Summit R-7 District eWalk. Adapted from "Lee's Summit R-7 District Template," Lee's Summit R-7 School District, 2010b. Retrieved from http://its.leesummit.k12.mo.us/District_eWalk_Template.pdf

While conducting eWalks, school principals and district administrators documented the following on the second page of the eWalk template: teacher-directed technology, student-centered technology, evidence of learning, and student interview.

For the purpose of this study, it is important to clarify that observers were trained to mark all teacher-directed technology descriptors and student-centered technology descriptors that applied during the observation.

Data was collected for the variable of professional development using an Excel spreadsheet. Each instance a district ITS provided professional development to a teacher from August 2009 through October 2012, they then were required to enter the type of technology professional development and the name of the teacher who received the professional development. The type of professional development was categorized as Blackboard, CPS, Multi-Media (equipment), SMART Board, Software/Web Resource, or Web Design. Table 2 displays how the components of the eWalk template categorized by the type of professional development. For each type of technology used, it is defined as either teacher-directed technology or student-centered technology.

Table 2

Type of Professional Development Compared to eWalk Template Components Defining Teacher-Directed Technology and Student-Centered Technology

Professional Development	Teacher-Directed Technology	Student-Centered Technology
Blackboard	Collaborative Application	Collaborative Application
CPS	Clickers Data Probes	Clickers Data Probes
Multimedia (equipment)	Calculators Collaborative Application Multimedia (watching)	Multimedia (creating) Calculators Collaborative Application Multimedia (watching)
SMART Board	SMART Board	SMART Board
Software/ Web Resource	Brainstorming/Idea Mapping Software Collaborative Application Curricular Games Intervention Software Web Resources Word Processing	Brainstorming/Idea Mapping Software Collaborative Application Curricular Games Intervention Software Web Resources Word Processing
Web Design	Collaborative Application	Collaborative Application

Note. Adapted from ITS Professional Development data Excel sheets, Lee's Summit R-7 School District (2013) and the "Lee's Summit R-7 District Template," Lee's Summit R-7 School District, 2010b.

Professional development was provided to teachers individually at the request of the teacher unless otherwise required as part of new teacher professional development. Group setting professional development could also be arranged by teachers, administrators, or ITS but was not taken into consideration for this study.

Measurement. The classroom walkthrough consists of a series of frequent three to five minute visits where the observer uses a defined template to record what they saw in the classroom at a specific moment in time. The data recorded within the walkthrough software are compiled into building reports and can be disaggregated by teacher, by school, and by instructional strategy used during the recorded walkthrough. The walkthrough, or eWalk, is a common data collection tool used in the Lee's Summit R-7 School District to record instructional strategies during a school day.

The data collected via use of the walkthrough template allowed the researcher to measure teacher-directed and student-centered technology use in the classroom. Additionally, the collection of this data by teacher and by school from August 2009 through October 2012 was compared to the types of professional development received by each teacher from August 2009 through October 2012. The professional development data that was recorded included the type of professional development received by a teacher and the amount of specific professional development that was received by the teacher. The amount of professional development received by teachers refers to professional development sessions received in one-on-one (teacher: ITS) sessions that occurred during the contract day. These sessions could have been in one hour segments, forty-minute segments, or thirty-minute segments depending upon how they were scheduled between the ITS and teacher.

Validity and reliability. Schools across the country are using eWalks. These serve as a tool for principals to gather an overall view of instructional issues and patterns and to evaluate the implementation of building or district goals (Learning Point Associates, 2007). Evidence published for the education profession is limited when it comes to the reliability and validity of this particular measurement of instruction (Milanowski, 2009).

Content validity is defined as an important research methodology that refers to how well a test measures the behavior for which it is intended and how well a test's scores adequately represent the content or conceptual domain that the test claimed to measure (Gall, Gall, & Borg, 2006). Lee's Summit R-7 School District administrators were required to participate in a two-day training on the purpose of eWalks and how to conduct a walkthrough using McRel's walkthrough template and software. Prior to using the template, administrators were afforded opportunities to observe in multiple classrooms together and then conduct dialogue to discuss how they marked the template based on what they observed. This practice period increased inter-rater reliability and therefore increased the content validity associated with use of this instrument. Administrators received training on and practiced the correct way to measure accurately the activity in classrooms related to teacher-directed and student-centered technology.

Despite the practice of walkthroughs by administrators across the country, there is little research on the validity and reliability of electronic documentation of look-fors in this process. According to Pitler and Goodwin (2008), aggregating walkthrough data over a period of time, across buildings, and across teachers creates a mosaic because a picture of instruction is unveiled. Ten observations of one teacher do not provide a sound instructional impression of a school. Ten observations of forty teachers in varying classrooms can depict an instructional view strengthening the reliability of the walkthrough data (Pitler & Goodwin, 2008).

Proponents of eWalks such as the Association of California School Administrators, argue that mobile data tools are collection terminals of data about classroom instruction and eliminate the ambiguity about classroom practices (Hollis, 2010). This type of data gathering creates a reliable longitudinal landscape of instructional practices (Hollis, 2010). Thus, it can be assumed that walkthrough data gathered using electronic evaluation technologies and tools does have corresponding reliability and validity where factors as defined previously are given systemic attention.

Data Collection Procedures

For this study, technology professional development data and walkthrough data from August 2009 through October 2012 were used. Only administrators who had received district walkthrough training completed the walkthrough eWalk template via their iPhones. The walkthrough data points collected by the trained administrators were uploaded to the secure server at the completion of each walkthrough session, which avoided duplication of data points within the server. Data were gathered in order to measure teacher-directed and student-centered technology use in the classroom. Data points were only collected for certified teachers employed full time by the district. The researcher was granted district level access to password protected eWalk reports.

Before data collection, approval for research was sought (see Appendix A) and received from the Lee’s Summit R-7 School District’s Instructional Operations Team (IOT) on January 28, 2013 (see Appendix B). Approval was granted to gather and utilize archived walkthrough data stored on a secure server operated by Mid-continent Research for Education and Learning. Additionally, IOT granted approval for the utilization of archived ITS professional development data housed on the district’s secure server. In addition, proposal for research was submitted to be approved by the Baker University Institutional Review Board (IRB) (see Appendix C). The Baker IRB committee granted approval on February 11, 2013 (see Appendix D).

Three sources of documentation were gathered: eWalk data, ITS Excel or Google Documents professional development, and ITS Lotus Notes Calendar data as it related to professional development appointments. A Lee's Summit R-7 School District ITS randomly assigned codes to teacher names and school buildings in the eWalk data and also assigned codes to teacher names and school buildings in the technology professional development data to protect the anonymity of buildings, principals, students, and teachers. All data were compiled and entered into commonly formatted Excel spreadsheets to allow for ease of review. Data were refined to include only certified teachers responsible for instruction of K-6 students from one of three elementary schools. The Excel spreadsheets included type and amount of professional development provided each teacher as well as type of teacher-directed or student-centered technology recorded during walkthroughs for each teacher. Teachers were collapsed into groups according to professional development received or not received for each type of technology and technology use or non-use, in order to examine the relationship between technology use and professional development. The data were exported into the IBM® SPSS® Statistics Faculty Pack 21 for Windows for analysis.

Data Analysis and Hypothesis Testing

This section reviews the research questions that guided the study along with corresponding hypotheses and data analysis. Four hypothesis tests were conducted to address the research questions. The following are the research questions (as listed in chapter one), hypotheses, and data analyses.

RQ1. To what extent is there a relationship between the type of instructional technology used by the teacher and the type of professional development received by the teacher?

H1. There is a relationship between the type of instructional technology used by the teacher and the type of professional development received by the teacher.

A chi-square test of independence was conducted to test the hypothesis. The variables included type of instructional technology and the type of professional development. The significance level was set at $\alpha = .05$.

RQ2. To what extent is there a relationship between the type of instructional technology used by the student and the type of professional development received by the teacher?

H2. There is a relationship between the type of instructional technology used by the student and the type of professional development received by the teacher.

A chi-square test of independence was conducted to test the hypothesis. The variables were type of instructional technology and the type of professional development. The significance level was set at $\alpha = .05$.

RQ3. To what extent is there a relationship between the amount of professional development received by a teacher for a type of technology and the amount of teacher-directed technology use of that technology?

H3. There is a positive relationship between the amount of professional development received by teacher and the amount of teacher-directed technology used.

A Pearson product moment correlation coefficient was calculated to measure the strength and direction of the relationship between the amount of professional development and the amount of technology used. The significance level was set at $\alpha = .05$.

RQ4. To what extent is there a relationship between the amount of professional development received by the teacher for a type of technology and the amount of student-centered use of that technology?

H4. There is a significant relationship between the amount of professional development received by the teacher and the amount of student-centered technology used by the students.

A Pearson product moment correlation coefficient was calculated to measure the strength and direction of the relationship between the amount of professional development and the amount of technology used. The significance level was set at $\alpha = .05$.

Limitations

Lunenburg and Irby (2008) described limitations as those things of which the researcher has no control. The study included the following limitations:

1. Implementation of the eWalk – Beginning in 2009 the district began electronically documenting walkthroughs. Administrators across elementary schools have varying practices related to the frequency at which they complete walkthroughs. This could affect the number of walkthroughs completed and hence the amount of documented technology used by teachers or students.

2. Timing of eWalks – Walkthroughs are informal observations, which would occur for three to five minutes at a time. The length of the observation and the time of day at which the observation occurred could affect the amount of documented technology used by teachers or students.
3. Professional Development – Only professional development a teacher received individually from an ITS was considered. Teachers could also receive professional development in group settings or outside of the district, but that data was not considered.

Summary

Chapter three presented information on this quantitative, non-experimental, and correlational study on the relationships of teacher and student technology use and technology professional development received by the teacher. The chapter included research design, instrumentation, data collection, data analysis and hypothesis testing, and limitations. Chapter four includes the results of hypothesis testing.

Chapter Four

Results

The purpose of this non-experimental quantitative study was to determine to what extent relationships existed between the type of educational technology used in the classroom by teachers and students and the type of technology professional development received by the teacher. This study also examined to what extent relationships existed between the amount of professional development received by the teacher for a type of technology and the amount of technology in turn used by the teachers and students. This chapter presents the results of the study from data collected about teacher and student technology use from August 2009 through October 2012 in the Lee's Summit R-7 School District. Descriptive statistics were used to describe the sample while chi-square tests of independence and Pearson correlations were used to test the hypotheses. The IBM® SPSS® Statistics Faculty Pack 21 for Windows was used for data analyses

Descriptive Statistics

The population for this study was elementary certified teachers assigned to teach students in grades kindergarten through six from three elementary schools in the Lee's Summit R-7 School District. The sample included 107 certified teachers responsible for instruction for kindergarten through sixth grade. Table 3 shows descriptive statistical information including the average amount of professional development sessions received by teachers in each grade level. The standard deviation for each grade level group is also presented. Related instructional areas or "mixed" teachers included art, music, physical education, resource reading, counseling, instrumental music, and library media specialist that were responsible for specialized instruction for students in these grade levels.

Table 3

Average Amount of Professional Development Received by Teachers by Grade Level

Grade	*M*	*N*	*SD*
K	4.38	13	3.429
1	3.39	18	3.165
2	3.25	12	3.696
3	2.29	17	2.972
4	4.86	14	4.944
5	3.83	12	4.174
6	6.73	11	5.274
Mixed	13.60	10	27.411
Total	4.86	107	9.292

Analysis of the data showed third grade teachers, on average, received the least amount of professional development. The mixed teacher group, on average, received the greatest amount of professional development. Overall, the average amount of professional development sessions received by teachers was 4.86 sessions.

Table 4 shows descriptive statistics for the average amount of sessions for the type of technology professional development received by the certified teachers. The values presented in the table represent the average number of professional development sessions received by teachers, disaggregated by grade level and type of technology. The grade levels presented are kindergarten through sixth grade and mixed. For example, the table shows kindergarten teachers received no Blackboard technology and an average of .31 professional development sessions of CPS.

Table 4

Average Amount of Professional Development Sessions Received by Teachers for Each Type of Technology

Grade	Blackboard	CPS	Multimedia	SMART Board	Software/Web Resources	Web Design
K	0	0.31	0.77	0.77	1.77	0.77
1	0.06	0.11	1.56	0.50	0.56	0.61
2	0.08	0.50	1.25	0.50	0.92	0
3	0	0.29	0.71	0.47	0.47	0.35
4	0	1.71	0.79	0.50	1.36	0.50
5	0.25	1.33	1.83	0.08	0	0.33
6	0.45	2.27	0.91	0.36	2.45	0.27
Mixed	0.90	0	1.50	1.70	8.70	0.80
Total	0.18	.077	1.15	0.58	1.73	0.46

Analysis of the data presented in Table 4 indicated mixed teachers received the most one-on-one professional development from ITS in the area of Software/Web Resources. Sixth grade teachers received the most professional development for CPS. Software/Web Resources was the most prominent type of technology professional development received by teachers. Multimedia (or equipment), on average, was the second most popular technology professional development received by teachers. Professional development received by teachers was done so at the discretion of the individual teacher(s), hence the variance in amounts of professional development received.

Hypothesis Testing

Chi-square tests of independence were conducted to test for statistically significant relationships between teacher and student technology use and professional development the teacher received for that technology for H1 and H2. Pearson Product Moment correlation coefficients were conducted to determine the extent of the relationships between the amount of teacher and student technology used and the amount of professional development the teacher received for that technology for H3 and H4. The significance level was set at $\alpha = .05$ for each hypothesis test.

RQ1. To what extent is there a relationship between the type of instructional technology used by the teacher and the type of professional development received by the teacher?

H1. There is a relationship between the type of instructional technology used by the teacher and the type of professional development received by the teacher.

Table 5 shows frequency results for teacher-directed technology use or non-use for each type of technology. For RQ1, teachers were collapsed into groups according to professional development received or not received for each type of technology and technology use or non-use, in order to examine the relationship between teacher-directed technology use and professional development. In Table 5, the values represent the number of teachers that were observed in each category: professional development received or not received, and technology used or not used. Additionally, the values in the parentheses in Table 5 represent the number of teachers expected to fall into each category based on the number of teachers observed and the chi-square analyses.

Table 5

Observed and Expected Frequencies of Professional Development Received by Teachers and Teacher-Directed Technology Use

Professional Development	Teacher-Directed Technology		Technology Not Used	Technology Used
Blackboard	Collaborative Application	PD Not Received	97 (97.1)	1 (.9)
		PD Received	9 (8.9)	0 (.1)
CPS	Clickers	PD Not Received	71 (69.7)	0 (1.3)
		PD Received	34 (35.3)	2 (.7)
	Data Probes[a]	PD Not Received	71 (-)	0 (-)
		PD Received	36 (-)	0 (-)
Multimedia (equipment)	Calculators	PD Not Received	63 (63.8)	2 (1.2)
		PD Received	42 (41.2)	0 (.8)
	Collaborative Application	PD Not Received	64 (64.4)	1 (.6)
		PD Received	42 (41.6)	0 (.4)
	Multimedia (watching)	PD Not Received	44 (46.8)	21 (18.2)
		PD Received	33 (30.2)	9 (11.8)
SMART Board	SMART Board	PD Not Received	28 (30.4)	46 (43.6)
		PD Received	16 (13.6)	17 (19.4)
Software/ Web Resources	Brainstorming/Idea Mapping Software	PD Not Received	63 (60.1)	2 (4.9)
		PD Received	36 (38.9)	6 (3.1)
	Collaborative Application	PD Not Received	64 (64.4)	1 (.6)
		PD Received	42 (41.6)	0 (.4)
	Curricular Games	PD Not Received	63 (63.2)	2 (1.8)
		PD Received	41 (40.8)	1 (1.2)
	Intervention Software	PD Not Received	65 (64.4)	0 (.6)
		PD Received	41 (41.6)	1 (.4)
	Web Resources	PD Not Received	59 (57.1)	6 (7.9)
		PD Received	35 (36.9)	7 (5.1)
	Word Processing	PD Not Received	63 (63.8)	2 (1.2)
		PD Received	42 (41.2)	0 (.8)
Web Design	Collaborative Application	PD Not Received	77 (77.3)	1 (.7)
		PD Received	29 (28.7)	0 (.3)

Note. [a]No statistic could be computed due to insufficient data.

Table 6 presents results of the chi-square tests of independence for RQ1. In Table 6, the chi-square (χ^2) represents the test between each type of professional development and teacher-directed technology use based on the observed and expected frequencies as presented in Table 5. The degrees of freedom (*df*) and levels of significance (*p)* value are also presented.

Table 6

Chi-Square Tests of Independence Results for Research Question 1

Professional Development	Teacher-Directed Technology	χ^2	*df*	*p*
Blackboard	Collaborative Application	.177	1	.674
CPS	Clickers	4.433	1	.035
	Data Probes[a]	-	-	-
Multimedia (equipment)	Calculators	2.018	1	.155
	Collaborative Application	1.003	1	.317
	Multimedia (watching)	1.531	1	.216
SMART Board	SMART Board	1.061	1	.303
Software/ Web Resources	Brainstorming/Idea Mapping Software	4.568	1	.033
	Collaborative Application	1.003	1	.317
	Curricular Games	.046	1	.830
	Intervention Software	1.885	1	.170
	Web Resources	1.290	1	.256
	Word Processing	2.018	1	.155
Web Design	Collaborative Application	.636	1	.425

Note. [a]No statistic could be computed due to insufficient data.

Results of the chi-square tests showed statistically significant relationships between CPS and Clickers, and Software/Web Resources and Brainstorming/Idea Mapping Software. The frequencies in Table 5 show that for CPS and Clickers, there were more teachers observed using Clickers in the classroom and receiving CPS professional development than were expected. Furthermore, there were more teachers observed who did not use Clickers and did not receive CPS professional development than were expected. There was not sufficient evidence to support the hypothesis.

RQ2. To what extent is there a relationship between the type of instructional technology used by the student and the type of professional development received by the teacher?

H2. There is a relationship between the type of instructional technology used by the student and the type of professional development received by the teacher.

Table 7 shows frequency results for RQ2 regarding student-centered technology use or non-use for each type of technology. For RQ2, teachers were collapsed into groups according to professional development received or not received for each type of technology. Students in the corresponding teachers' classrooms were also collapsed into groups according to use and non-use of technology in order to examine the relationship between student-centered technology use and teachers' technology professional development. The values presented in Table 7 represent the number of teachers that were observed in each category and professional development received or not received. The values also represent students being observed using or not using technology. Additionally, the values in the parentheses in Table 7 represent the number of teachers expected to fall into each category based on the number of teachers observed and the chi-square analyses.

Table 7

Observed and Expected Frequencies of Professional Development Received by Teachers and Student-Centered Technology Use

Professional Development	Student-Centered Technology		Technology Not Used	Technology Used
Blackboard	Collaborative Application	PD Not Received	98 (97.1)	0 (.9)
		PD Received	8 (8.9)	1 (.1)
CPS	Clickers	PD Not Received	71 (67.7)	0 (3.3)
		PD Received	31 (34.3)	5 (1.7)
	Data Probes	PD Not Received	71 (70.3)	0 (.7)
		PD Received	35 (35.7)	1 (.3)
Multimedia (equipment)	Multimedia (creating)	PD Not Received	62 (62.6)	3 (2.4)
		PD Received	41 (40.4)	1 (1.6)
	Calculators	PD Not Received	64 (64.4)	1 (.6)
		PD Received	42 (41.6)	0 (.4)
	Collaborative Application	PD Not Received	64 (64.4)	1 (.6)
		PD Received	42 (41.6)	0 (.4)
	Multimedia (watching)	PD Not Received	59 (58.9)	6 (6.1)
		PD Received	38 (38.1)	4 (3.9)
SMART Board	SMART Board	PD Not Received	62 (62.2)	12 (11.8)
		PD Received	28 (27.8)	5 (5.2)
Software/ Web Resources	Brainstorming/Idea Mapping Software[a]	PD Not Received	65 (-)	-
		PD Received	42 (-)	-
	Collaborative Application	PD Not Received	65 (64.4)	0 (.6)
		PD Received	41 (41.6)	1 (.4)
	Curricular Games	PD Not Received	62 (60.1)	3 (4.9)
		PD Received	37 (38.9)	5 (3.1)
	Intervention Software	PD Not Received	63 (62)	2 (3)
		PD Received	39 (40)	3 (2)
	Web Resources	PD Not Received	61 (60.1)	4 (4.9)
		PD Received	38 (38.9)	4 (3.1)
	Word Processing	PD Not Received	60 (60.7)	5 (4.3)
		PD Received	40 (39.3)	2 (2.7)
Web Design	Collaborative Application	PD Not Received	77 (77.3)	1 (.7)
		PD Received	29 (28.7)	0 (.3)

Note. [a]No statistic could be computed due to insufficient data.

The analyses of the data included in Table 8 shows results of the chi-square tests of independence for RQ2. In Table 8, the chi-square (χ^2) represents the test between each type of professional development and student-centered technology use based on the observed and expected values as presented in Table 7. The degrees of freedom (*df*) and levels of significance (*p*) are also presented.

Table 8

Chi-Square Tests of Independence Results for Research Question 2

Professional Development	Student-Centered Technology	χ^2	*df*	*p*
Blackboard	Collaborative Application	5.057	1	.025
CPS	Clickers	11.385	1	.001
	Data Probes	2.197	1	.138
Multimedia(equipment)	Multimedia (creating)	0.375	1	.540
	Calculators	1.003	1	.317
	Collaborative Application	1.003	1	.317
	Multimedia (watching)	0.003	1	.959
SMART Board	SMART Board	0.019	1	.889
Software/Web Resources	Brainstorming/Idea Mapping Software[a]	-	-	-
	Collaborative Application	1.885	1	.170
	Curricular Games	1.905	1	.168
	Intervention Software	0.919	1	.338
	Web Resources	0.410	1	.522
	Word Processing	.373	1	.542
Web Design	Collaborative Application	.636	1	.425

Note. [a]No statistic could be computed due to insufficient data.

Results of the chi-square tests showed statistically significant results for the relationships between Blackboard and Collaborative Application and CPS and Clickers. There were more students than expected observed using Collaborative Application in the classroom as compared to the expected based on the number of teachers receiving professional development for Blackboard. Further, the frequencies in Table 7 show that for CPS and Clickers, there were more students observed using Clickers in the classroom and teachers receiving CPS professional development than were expected. There was not sufficient evidence to support H2.

RQ3. To what extent is there a relationship between the amount of professional development received by a teacher for a type of technology and the amount of teacher-directed technology use of that technology?

H3. There is a positive relationship between the amount of professional development received and the amount of teacher-directed technology use.

Table 9 presents the results of Pearson correlation analysis for H3, which shows the relationship between professional development and the amount of teacher-directed technology use. The correlation (*r)* represents the relationship between professional development and teacher-directed technology use. The level of significance (*p*) is represented in the table as well.

Table 9

Correlation Results for the Amount of Teacher-Directed Technology Used and the Amount of Professional Development Received

Professional Development	Teacher-Directed Technology	*r*	*p*
Blackboard	Collaborative Application	-.021	.829
CPS	Clickers	.406	.000
	Data Probes[a]	-	-
Multimedia(equipment)	Calculators	-.075	.440
	Collaborative Application	-.053	.587
	Multimedia (watching)	-.119	.223
SMART Board	SMART Board	-.046	.637
Software/ Web Resource	Brainstorming/Idea Mapping Software	.501	.000
	Collaborative Application	-.028	.774
	Curricular Games	-.021	.832
	Intervention Software	-.012	.904
	Web Resources	-.039	.690
	Word Processing	-.040	.683
Web Design	Collaborative Application	-.049	.613

Note. [a]No statistic could be computed due to insufficient data.

Analysis of the data indicated two statistically significant positive relationships between the amount of teacher-directed technology used and the professional development received by teachers. These significant relationships existed between CPS and Clickers and between Software/Web Resources and Brainstorming. The more CPS professional development a teacher received, the more teachers' use of Clickers in the classroom was observed. The more Software/Web Resources professional development a teacher received, the more teacher use of Brainstorming/Idea Mapping software in the classroom was observed. However, there were not enough statistically significant results to support H3.

RQ4. To what extent is there a relationship between the amount of professional development received by the teacher for a type of technology and the amount of student-centered technology used?

H4. There is a positive relationship between the amount of professional development received and the amount of student-centered technology used.

Table 10 presents the results of Pearson correlation analyses for H4. The correlation *(r)* represents the relationship between professional development received by the teacher and student-centered technology use. The level of significance (*p*) is represented in the table as well.

Table 10

Correlation Results of the Amount of Professional Development Received by the Teacher and the Amount of Student-Centered Technology Used

Professional Development	Student-Centered Technology	*r*	*p*
Blackboard	Collaborative Application	.098	.317
CPS	Clickers	.489	.000
	Data Probes	.151	.121
Multimedia (equipment)	Multimedia (creating)	-.084	.388
	Calculators	-.053	.587
	Collaborative Application	-.053	.587
	Multimedia (watching)	-.069	.479
SMART Board	SMART Board	-.010	.922
Software/Web Resource	Brainstorming/Idea Mapping Software[a]	-	-
	Collaborative Application	.053	.587
	Curricular Games	-.003	.977
	Intervention Software	.032	.742
	Web Resources	-.037	.705
	Word Processing	-.062	.524
Web Design	Collaborative Application	-.049	.613

Note. [a]No statistic could be calculated due to insufficient data.

Analysis of the data presented in Table 10 indicated there was one positive statistically significant relationship between the amount of student-centered technology used and the amount of professional development received by the teacher. This significant relationship was between the amount of CPS professional development received by teachers and students' use of Clickers. The more professional development a teacher received in CPS the more student-centered use of Clickers was observed. However, there were not enough statistically significant results to support H4.

Summary

The results of the study were presented in chapter four. Chi-square tests of independence and Pearson correlations were used to determine the extent of the relationships between teacher technology professional development and teacher and student use of technology. Results of the chi-square tests of independence and correlations were mixed. Few chi-square tests showed an impact between professional development received by teachers on the use of technology by teachers or students. The correlations showed few positive relationships between the amount of professional development received by the teacher and the amount of technology used in the classroom by teachers and students. Overall, the hypotheses were not supported.

Chapter five provides a summary of the study including an overview of the problem, the purpose of the study, research questions, review of methodology, and major findings. Additionally, findings related to the literature, conclusions, implications for action, recommendations for future research, and concluding remarks reside in this chapter.

Chapter Five

Interpretation and Recommendations

Teacher technology training, teacher and student access to technology, and integration of that technology as an organic component of the teaching and learning cycle is a goal of school districts across the United States. Though computer technology has evolved since the early 1900s, there continues to be little technology application in classrooms notwithstanding the amount of technology available in students' lives outside of school (Wager, 1992). Results from a review of current professional development practices and technology use in schools can serve as a vehicle to making informed decisions related to technology goals, technology use by teachers and students, and professional development for certified teaching staff. This chapter provides a summary of the study including an overview of the problem, the purpose, research questions, review of methodology, and major findings of the study. Also included in this chapter are findings from the study related to the literature. Finally, implications for action and recommendations for future research are reported.

Study Summary

This study examined the extent of the relationships between technology professional development received by teachers and teacher and student technology use. This section includes an overview of the problem, purpose of the study, the research questions, and an overview of the methodology.

Overview of the problem. The Office of Educational Technology of the U.S. Department of Education (2010) outlined national technology goals that included, but were not limited to: a) making connectedness the hallmark of effective teaching, b) putting computing devices in the hands of every student, and c) providing broadband to serve learners inside and outside of school. Since the establishment of these targets and other governmental programs and policies set in motion since 1965, school districts began increasing technology access with Internet capabilities with the intent of increasing technology integration in schools. It was the intent of the Lee's Summit R-7 School District to achieve the aforementioned targets as evidenced in the organization's commitment of professional development time, fiscal resources, human resources, and articulation of technology goals in the Comprehensive School Improvement Plan (Lee's Summit R-7 School District, 2012b). No previous research has been conducted in the Lee's Summit R-7 School District regarding teacher and student technology use and teacher technology professional development provided by district ITS.

Purpose statement and research questions. The purpose of this study was to explore technology use by teachers and students compared to technology professional development received by teachers. Four research questions guided this study. First, the study sought to examine the relationship between the type of technology used in the classroom by a teacher and whether or not the teacher received professional development for that type of technology. Secondly, the researcher sought to examine the relationship between the type of technology used in the classroom by the students and whether or not the teacher received professional development for that type of technology. Additionally, the researcher sought to determine the relationship between the amount of professional development a teacher received for a type of technology and the amount of teacher use of that technology. Finally, the researcher examined the relationship between the amount of professional development a teacher received for a type of technology and the amount of student use of that technology for which professional development was received.

Review of the methodology. This non-experimental quantitative study involved certified teachers from the Lee's Summit R-7 School District who were responsible for instruction of kindergarten through sixth grade students. Teachers were observed by principals who used the district eWalk observation tool and recorded those results. The sample included 107 certified teachers who taught in one of three elementary schools from August 2009 through October 2012. Chi-square tests of independence and Pearson Product Moment correlations were used to determine the extent of the relationships between teacher technology professional development and teacher and student use of technology.

Major findings. The first hypothesis of this study stated that there was a relationship between the type of instructional technology used by the teacher and whether professional development was received by the teacher. Statistical analysis of data was conducted by completing chi-square tests of independence. Based on the data there is evidence to suggest of all the professional development types studied and all the types of technology use studied, a relationship exists between CPS and Clickers and between Software/Web Resources and Brainstorming/Idea Mapping software. No other relationships were found.

The second hypothesis of the study stated there was a relationship between the type of instructional technology used by the student and whether professional development was received by the teacher. Relationships existed between teacher professional development and student-centered technology use in the classroom. These relationships were between Blackboard professional development and Collaborative Application use as well as CPS professional development and Clickers use. More teachers who received professional development on Blackboard that expected were found to have students who used collaborative applications in the classroom. Likewise, more teachers who received professional development on CPS were found to have students who used Clickers in the classroom. However, based on the data, there is little evidence to suggest that technology use by students for a specific type of technology related to whether professional development was received by a teacher.

The third hypothesis stated there was a positive relationship between the amount of professional development received by the teacher and the amount of teacher-directed technology used in the classroom. The result for the correlation between the amount of professional development for a teacher and the amount of teacher use of technology was statistically significant for CPS professional development and Clickers use. In addition, the relationship was statistically significant for Software/Web Resources professional development and Brainstorming/Idea Mapping use. However, there were not enough statistically significant results to support the hypothesis.

The fourth hypothesis stated there was a positive relationship between the amount of professional development received by the teacher and student use of that technology. One positive statistically significant relationship existed between the amount of CPS professional development received by teachers and student use of Clickers. The more professional development a teacher received in CPS the more student-centered use of clickers was observed. However, there were not enough statistically significant results to support the hypothesis.

Findings Related to the Literature

A review of literature was conducted related to student and teacher technology use and professional development. Literature regarding teacher technology use was more abundant than literature for student technology use. The literature on teacher technology use seeks to articulate factors that impact such use. Honey and Moeller (1990), for example, found that a student-centered versus a teacher-directed philosophy was a contributing factor affecting technology integration versus professional development as a prevailing factor to integration. The current study found a relationship between professional development and teacher technology use only as it related to professional development for CPS and Clickers use and Software/Web Resources professional development and Brainstorming/Idea Mapping Software use. Cuban (2001) found teachers generally use technology on a frequent basis for personal use, planning, and administrative teacher tasks versus use of computers as a learning tool. Likewise, Vannatta and Fordham (2004) found teacher technology use was higher than student technology use while this use was predominantly for administrative teacher tasks. Teacher surveys from research conducted by Vannatta and Fordham (2004) indicated that the number of hours of technology training was a predictor of teacher technology use. The results of the current study, in contrast, did not show a significant relationship between the amount of professional development received and teacher technology use for all types of technology studied. In addition, Rollins (2011) conducted observations in classrooms to study teacher technology use and found that teachers primarily used technology for presentation of materials. The current study examined types of teacher-directed technology used as observed during eWalk observations but the study did not define purpose of use for each teacher-directed technology type.

The literature review indicated various instructional reasons supporting student technology use. Hart et al. (2002) surveyed over 87,000 students and found that only 19% of students in Chicago Public Schools used technology intensely once per week. Student activities included use of word processing, use of the Internet, writing, graphing, analysis, and presentation development. The current study showed the average student use of technology was in the areas of Clickers and Brainstorming Software. The former of the two uses indicates that students were using this technology predominantly as an assessment response input tool given the capabilities of the CPS/Clicker system. Hart, et al (2002) also concluded that professional development influenced teacher use of technology during the instructional day. The current study did not conclude a statistically significant relationship between the amount of professional development for all types of technology studied and teacher use of that technology. Bebell and Kay (2010) cautioned about conclusions made about the impact of technology integration on student learning until correct documentation could be achieved to quantify technology use by students. The current study quantified student technology use from data gathered during eWalk observations. Technology integration in pre-kindergarten thru fifth grade classrooms was examined when Rollins (2011) conducted classroom observations. Student use in Rollins' study was primarily for the purpose of basic skill acquisition. The aforementioned student use of clickers in the Lee's Summit R-7 School District indicated a parallel finding though purpose of student technology use was not examined in the current study.

Hurdles to technology integration were discovered as a result of a survey conducted in Philadelphia, Pennsylvania schools. One of these hurdles was teacher training. Schrum (1999) suggested that professional development should be differentiated for each teacher. This design was found to be present in the Lee's Summit R-7 School District as data from professional development sessions was from one-on-one teacher and ITS sessions. Though the sample in the current study had access to one on one professional development, adequacy of that professional development was not studied thus the results of the Philadelphia research were not supported by the current study.

Mitchem et al. (2003) found teacher instructional design, technology use, and student engagement improved when teachers raised awareness and understanding of instructional technologies. A professional development framework referred to as TPACK emerged in the literature as a result of the connections between content, technology and pedagogy as related to teacher learning (Mishra, & Koehler, 2006). Knight (2012) also emphasized professional development as it relates to technology integration and found a significant relationship between teachers' knowledge of technology and teachers' use of technology during instruction. The findings of the current study supported Knight's work only to the extent that a significant relationship was found for some types of technology professional development and teacher use of that technology as exemplified in CPS professional development and use of Clickers. The results of the current study did not support the theories related to professional development as reported in the research because little was known about the specificity of the professional development in this study other than the type of technology professional development provided, which was professional development provided one-on-one between a teacher and an ITS for a specific type of technology. Although there were moderately statistically significant relationships identified between the amount of and type of professional development received by teachers and teacher and student technology use, the findings of this study were inconclusive as compared to those findings presented in the literature.

Conclusions

This section includes implications for school districts when seeking to increase teacher and student technology use as a result of professional development that teachers receive. Likewise, recommendations for further research are presented as a result of the findings of this study while closing with concluding remarks.

Implications for action. The findings of this study have implications for students and teachers. The results of this study should assist the Lee's Summit R-7 School District in making informed decisions about the future direction of teacher technology professional development and outcomes associated with teacher and student technology use.

The findings show few relationships between professional development and teacher and student technology use. Data about teacher-directed and student-centered technology use was gathered via walkthroughs. Walkthrough data provides only a snapshot of the types of technology used in the classroom on a given day at a given time. It could be argued that such a method of gathering this data is incomplete unless the format and frequency of the walkthrough protocol is revised. Principals should conduct walkthroughs in such a way that a large portrait is created about technology integration versus a narrowly focused picture. The researcher suggests that administrators receive training on how to identify teacher-directed and student-centered technology use to ensure that these observations are correctly documented across all classrooms and buildings using the walkthrough form. Additionally, defining for principals expectations related to the conducting of walkthroughs such as frequency by teacher and grade level may provide the district data that is gathered on a consistent basis.

The findings also revealed the average amount of professional development received by teachers for a type of technology was limited. Teachers' knowledge of technology integration and teacher competence related to various types of technology could be well served by increased professional development. This might be achieved via utilization of a situative professional development framework that includes time for direct instruction, practice, and reflection as suggested in the literature. Additionally, as recommended by the TPACK research, the professional development plan considered for implementation might include what teachers need to know and be able to do related to content, technology, and pedagogy. Guskey (2000) suggested that professional development should help educators move through levels of implementation of new initiatives. Hence, the researcher recommends that Lee's Summit R-7 School District ITS receive training on the levels of technology use as defined by LoTi. As the ITS provide on-going professional development to teachers, progress towards proficiency of use and high levels of integration could be monitored, thereby increasing technology integration throughout the school district.

The current study collected data on professional development provided directly by an ITS to individual teachers. However, the Lee's Summit R-7 School District ITS do provide technology professional development to small and large groups of certified teachers. This is important to note as Garet et al. (2001) found improved teacher knowledge, skills, and classroom practices when teachers actively learned in similar grades, schools, or content areas. The researcher recommends continued professional development in teacher groups with accentuated monitoring and measurement of improved teacher knowledge, skills, and practice whereby simultaneously the effectiveness of the professional development could be measured.

The researcher further suggests the design of a district vision related to technology integration. The Comprehensive School Improvement Plan should be updated to include goals defining teacher and student technology use. In addition, strategies to achieve such goals might include definition of expectations for teacher competencies and student competencies as defined by the NETS for students and teachers. Expectations could be outlined by teacher performance evaluations and on student report cards for accountability purposes.

Recommendations for future research. The study allowed the researcher to explore teacher professional development and technology use by teachers and students in classrooms. The following recommendations are made for other researchers interested in conducting a study involving teacher technology professional development, teacher-directed technology use, and student-centered technology use.

The first recommendation is replication of this study with increased walkthrough data. Walkthrough data gathered at the elementary, middle, and high school levels would facilitate analyses of that data and results that could potentially be generalized to the larger district staff and student populations. An increased sample would create an accurate picture of district-wide technology integration at all grade levels.

The second recommendation is to add both teacher and student surveys to the data collection process. The teacher survey would help the researcher study teacher efficacy as it relates to technology integration following professional development. The student survey would help the researcher understand the student perceptions related to both their use of technology and teacher use of technology. Both surveys would help answer what actions should be taken related to perceptions of both groups in order to further increase technology integration and improve professional development to achieve increased technology integration.

The third recommendation is to design a mixed-methods research study. An expanded mixed-methods study would involve collection of eWalk data as well as the inclusion of interviews with elementary, middle, and high school principals, district leaders, and parents in order to add their perceptions into the data collection process. Additionally, a teacher survey could be utilized to collect perceptions about teacher technology professional development and teacher and student technology use in grades kindergarten through twelfth grade.

The fourth recommendation would be development of a study designed to determine the extent of the relationship between the quality of professional development and technology integration. The fifth and final recommendation would be to design a similar study to determine the extent of the relationships between teacher and student technology use and student achievement as measured by state assessments.

Concluding remarks. Technology integration will continue to be an emphasis for school districts across the United States because of the ever-changing digital environment. In the same regard, programs and policies will continue to drive advances in this area of education if the national interest is to remain not only competitive but a leader in the global economy. Likewise, as expectations of students continue to increase, so too should the expectations rise concerning their educational experiences in the classroom. The teacher as learner must be a central focus of any educational change movement and consistency of that attention cannot wane as, indeed, the teachers are the most powerful factor that decides the fate of technology's impact on the traditional face of education.

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Appendices

Appendix A: IOT Application

Document Provided to Intended Researcher by:

Signature_____________________________________ Date:___________
(Building Principal for District Employee
or SLC Staff for Out-of-district Researchers)

INSTRUCTIONAL OPERATIONS TEAM
Lee's Summit R-7 School District
301 NE Tudor Rd.
Lee's Summit, Missouri 64086

REQUEST FOR PERMISSION TO CONDUCT RESEARCH/GATHER DATA
IN THE LEE'S SUMMIT R-7 SCHOOLS
TO MEET A COURSE REQUIREMENT

DIRECTIONS: The applicant should complete this form, obtain the necessary approval and signatures, and return to:

Associate Superintendent of Instruction & School Leadership
Lee's Summit R-7 School District
301 NE Tudor Rd.
Lee's Summit, Missouri 64086

It may take up to three weeks for requests to be processed; please plan accordingly in order to meet course deadlines.

1. Please describe concisely the basic concepts and goals of your proposed project, and include an explanation of how the project meets a course requirement within the field of education.

Q1 To what extent is there a relationship between the type of instructional technology used by the teacher and whether the teacher received professional development on that type of technology?

Q2 To what extent is there a relationship between the type of instructional technology used by the student and whetherthe teacher received professional development on that type of technology?

Q3 To what extent is there a relationship between the amount of professional development provided for a type of technology and the amount of teacher-directed technology use of that technology?

Q4 To what extent is there was a relationship between the amount of professional development provided to the teacher for a type of technology and the amount of student-centered technology used?

2. List the names of all data collection instruments you intend to use and enclose a copy of each with this application. Also, enclose a copy of each

parent/studentconsent form. Please describe in detail the distribution, implementation, and collection methods you intend to use in your data collection.

A data collection instrument specific alone to this study will not be used. Instead, archived walkthrough data stored on the secure server operated by Mid-continent Research for Education and Learning (McREL) will be utilized. Additionally, archived technology professional development as documented via Excel spreadsheets and Google documents as recorded by ITS from August 2009 – October 2013 will be used.

3. Give the names of the Lee's Summit R-7 School District public school(s), you intend to involve to meet the project requirements. Are there certain demographics required for the project (ie: grade level, gender, etc.)

The study will be conducted using walkthrough data and technology professional development data for teachers from three elementary schools in the Lee's Summit School District (SPE, LFE, and TRE). Criteria for teacher selection for inclusion within the sample are twofold. One criteria required is that a teacher had to teach in one of the elementary schools identified as having the highest recorded incidences of classroom walkthroughs as documented by McRel's Power Walkthrough software. Another criteria was that a teacher had to have participated in technology professional development offered by a Lee's Summit R-7 ITS.

Teacher names and schools will be used to set up the initial statistical database, but will be coded once the database is established to protect the anonymity of staff and schools. School names or teacher names will be not be used in the written summary of this study. A comparison will not be made between the three elementary schools.

4. What amount of time would be required of staff or students in the R-7 schools in order to meet project requirements?

The data collection process would require minimal amount of time or participation from R-7 staff. Primarily, assistance would be sought from the Executive Director of Technology and the Director of Instructional Technology.

5. Are there any other school records you would require (for example, achievement test scores or attendance?). If so, please provide a detailed explanation of your process to code such records to ensure confidentiality.

There are no other school records that would be required. As part of the study specific records from Human Resources will accessed related to: staffing information at elementary schools from 2009 – 2013, the EMS job description for an Instructional Technology Specialist, and salary information.

CRITERIA FOR APPROVAL OR DISAPPROVAL

The approval or disapproval of requests will be made within the following general guidelines.

1. The only projects which will generally be approved are those which:

a) contribute to the improvement of education in the Lee's Summit R-7 Schools;
b) contribute to the improvement of education in general.

2. Even within the above categories, studies will generally be disapproved if they:
    a) appear to infringe on the privacy of pupils, parents, or staff members;
    b) present a burden to pupils or staff members;
    c) threaten school-community relations in any way.

3. Research solely for a course requirement will be considered only for Lee's Summit R-7 School District staff.

4. At any point in the research process, R-7 staff can terminate the study if determined necessary for any reason.

5. The R-7 School District reserves the right to access any results or product created as a result of projects conducted using R-7 students, staff, or facilities.

PARTICIPATION OF THE SCHOOLS

Generally, participation in any research study conducted by an outside agency or individual will be completely voluntary on the part of the principals, teachers, pupils and any other personnel involved.

6. Give the name of each person who will enter the schools. For nondistrict employees, please provide existing background checks for individuals or a plan to ensure background checks are in place prior to entry in schools.

    There will not be a need to enter the schools. The researcher has current access, if necessary, to all elementary schools and other R-7 facilities.

7. What is the date you wish to begin? February 2013.

8. By what date do you anticipate being finished? May 2013.

9. Please obtain the signature of your instructor responsible for this assignment and attach a copy of the assignment guidelines.

Signature: Susan K Rogers

Position: Associate Professor

University/College/School/Department/Division: Baker University, School of Education

10. Name of applicant (please print)

Kathleen M. Collier

Signature

Address 808 SW 33rd St. Lee's Summit, MO 64082

Assistant Superintendent Elementary Instruction

Position/Status

1/28/13

Date

Phone Number 816-986-1025 wk.

DISSERTATION REQUIREMENTS

The doctoral dissertation research is conducted in accordance with guidelines established for doctoral candidates of Baker University. The doctoral study follows recommendations found in "The Role and Nature of the Doctoral Dissertation: A Policy Statement," Council of Graduate Schools.

Purpose

The doctoral dissertation is a clinical research study that

1. Reveals the candidate's ability to analyze, interpret, and synthesize information;
2. Demonstrates the candidate's knowledge of the literature relating to the research project and acknowledges prior scholarship on which the study is built;
3. Describes the methods and procedures used;
4. Presents results in a sequential and logical manner;
5. Displays the candidate's ability to discuss fully and coherently the meaning of the results; and
6. Informs the field and improves practice.

The dissertation is the beginning of the candidate's scholarly work, not the culmination. Clinical research is expected to provide the candidate with hands-on, directed experience in the primary research methods of the discipline and should provide for the type of research that is expected after the Doctor of Education degree is awarded.

Dissertation Process Guidelines

Once a candidate has entered the program, he or she receives a full description of the process for completing the study, including the following:

- Clinical research proposal development and approval.
- Clinical research style guide.
- Dissertation Resources Moodle site.
- Statement on originality.
- Format and publication of the research document.
- Adviser-Advisee relationship.
- Administrative and faculty support.
- Study presentation process.
- Deadline to complete the research project.

General Content

Following approval of the study proposal by the candidate's major advisor and committee, the candidate submits the study to include the following:

- Chapter 1: Introduction and Rationale – A description the study including the purpose and research questions.
- Chapter 2: Review of the literature – A logical link of data to the proposition.
- Chapter 3: Methodology – The hypothesis(es) and a description of the unit or units of analysis to be used.
- Chapter 4: Results – A description of the findings.
- Chapter 5: Discussion – A description of the interpretations made from the results, including the criteria for interpreting the findings and the applications to future studies.

Appendix B: IOT Approval

From: Ann Starlin-Horner/Administration/LSSD
To: katie.collier@leesummit.k12.mo.us
Date: 02/05/2013 04:34 PM
Subject: Research Request

Katie,

I am pleased to report that the Instructional Operations Team approved your research request. We look forward to you sharing the results with us.

Sincerely,
Ann

Ann Starlin-Horner, Ph.D.
Assistant Superintendent
Instruction and Leadership
(816) 986-1027

Appendix C: Baker University IRB

BAKER UNIVERSITY

SCHOOL OF EDUCATION
GRADUATE DEPARTMENT

Date:
IRB PROTOCOL NUMBER ____________
(IRB USE ONLY)

IRB REQUEST
Proposal for Research
Submitted to the Baker University Institutional Review Board

I. Research Investigator(s) (Students must list faculty sponsor first)

Department(s) **School of Education Graduate Department**

Name	Signature	
1. Dr. Susan Rogers	Susan Rogers	Major Advisor
2. Katie Hole	Katie Hole	Research Analyst
3. Dr. Verneda Edwards		University Committee Member
4. Dr. Amy Gates		External Committee Member

Principal Investigator: Mrs. Katie Collier, Mrs. Katie Collier
Phone: 816-537-4138
Email: KathleenMCollier@stu.bakeru.edu
Mailing address: 808 SW 33rd St. Lee's Summit, MO 64082

Faculty sponsor: Susan Rogers
Phone: 913 344 1226
Email: srogers@bakeru.edu

Expected Category of Review: X Exempt ___ Expedited ___ Full

II: Protocol: (Type the title of your study)

The Relationship Between Technology Professional Development and Teacher and Student Use of that Technology

Summary

In a sentence or two, please describe the background and purpose of the research.

Background: Expectations of education at the national level define education with robust standards for students and teachers. These high standards are defined to help America keep its edge in a global economy. Technology must be a common tool in all aspects of education in order to meet this challenge of global competitiveness and to meet the needs of the learners that enter our schools. Professional development, then, is the key to helping educators meet this era of change.

Purpose: The purpose of this study is to determine to what extent there is a relationship between the type of instructional technology used by the teacher and whether the teacher received professional development on that type of technology. The second purpose of this study is to determine to what extent there is a relationship between the type of instructional technology used by the student and whether the teacher received professional development on that type of technology. The third purpose of this study is to determine to what extent there is a relationship between the amount of professional development provided for a type of technology and the amount of teacher directed technology used. The fourth purpose of this study is to determine to what extent there is a relationship between the amount of professional development provided to the teacher for a type of technology and the amount of student-centered technology used.

Classroom walkthrough data will be used to measure technology use by teachers and students. It is important to articulate both the definition of a walkthrough and its purpose. Classroom walkthroughs vary from longer traditional structured observations in the brevity, focus, and dialogue associated with them (Protheroe, 2009). Walkthroughs allow school and district leadership to gather snapshots of instruction throughout the school on a consistent basis. Whereas a structured observation of instruction as part of a teacher's evaluation may be lengthy, a walkthrough or learning walk is brief in duration, usually not exceeding ten minutes (Learning Point Associates, 2007). The summary of these visits, over time, can paint a picture of the status of teaching and learning in the school community.

Briefly describe each condition or manipulation to be included within the study.

Archived data will be used. Conditions will include whether a teacher did or did not participate in professional development. Other conditions include use of teacher-directed or student -centered technology during walkthroughs.

What measures or observations will be taken in the study? If any questionnaire or other instruments are used, provide a brief description and attach a copy. Will the subjects encounter the risk of psychological, social, physical, or legal risk? If so, please describe the nature of the risk and any measures designed to mitigate that risk.

Walkthrough data will be utilized as documented via McREL's e-walk, that has been archived on a secure data server from August 2009 through October 2013.

Technology professional development data will be utilized as documented via Lee's Summit R-7's Instructional Technology Specialist professional development logs via Excel and Google Documents, which have been archived on a secure server.

Will any stress to subjects be involved? If so, please describe.

No stress to subjects will be involved.

Will the subjects be deceived or misled in any way? If so, include an outline or script of the debriefing.

The subjects will not be deceived or misled in any way.

Will there be a request for information which subjects might consider to be personal or sensitive? If so, please include a description.

There will be no request made for information that subjects might consider to be personal or sensitive.

Will the subjects be presented with materials which might be considered to be offensive, threatening, or degrading? If so, please describe.

The subjects will not be presented with materials that might be considered to be offensive, threatening, or degrading.

Approximately how much time will be demanded of each subject?

No time will be demanded from each subject. All data is archival.

Who will be the subjects in this study? How will they be solicited or contacted? Provide an outline or script of the information which will be provided to subjects prior to their volunteering to participate. Include a copy of any written solicitation as well as an outline of any oral solicitation.

Criteria for teacher selection for inclusion within the sample were twofold. One criterion required that a teacher had to teach in one of the elementary schools identified as having the highest recorded incidences of classroom walkthroughs as documented by McRel's Power Walkthrough software. Another criterion required that a teacher had to have participated in technology professional development offered by a Lee's Summit R-7 Instructional Technology Specialist (ITS).

What steps will be taken to insure that each subject's participation is voluntary? What if any inducements will be offered to the subjects for their participation?

No solicitation for participation will take place.

How will you insure that the subjects give their consent prior to participating? Will a written consent form be used? If so, include the form. If not, explain why not.

No consent is required. All data is archival.

Will any aspect of the data be made a part of any permanent record that can be identified with the subject? If so, please explain the necessity.

There will be no permanent record created or made available to a supervisor, teacher, or employer to indicate participation in this study, which will use archived data only.

Will the fact that a subject did or did not participate in a specific experiment or study be made part of any permanent record available to a supervisor, teacher or employer? If so, explain.

There will be no permanent record created or made available to a supervisor, teacher, or employer to indicate participation in this study, which will use archived data only.

What steps will be taken to insure the confidentiality of the data? Where will it be stored? How long will it be stored? What will be done with it after the study is completed?

The researcher will randomly code the e-walk data and technology professional development data to protect the anonymity of buildings, principals, students, and teachers. All data will be compiled and entered into commonly formatted Excel spreadsheets to allow for ease of review.

Data will be stored on a secure drive, of which only the researcher has access. This data will be stored and destroyed by the researcher after a period of three years. The data stored will have no identifiable information of participating schools, teachers, principals, or students involved.

If there are any risks involved in the study, are there any offsetting benefits that might accrue to either the subjects or society?

No risks are involved in this study.

Will any data from files or archival data be used? If so, please describe.

Walkthrough data will be utilized as documented via McREL's e-walk that has been archived on a secure data from August 2009 through October 2013.

Technology professional development data will be utilized as documented via Lee's Summit R-7's Instructional Technology Specialist professional development logs via Excel and Google Documents, which have been archived on a secure server.

Appendix D: Baker IRB Approval

BAKER UNIVERSITY
Own Confidence

February 11, 2013

Katie Collier
808 SW 33rd St.
Lee's Summit, MO 64082

Dear Ms. Collier:

The Baker University IRB has reviewed your research project application (M-0159-0206-0211-G) and approved this project under Exempt Review. As described, the project complies with all the requirements and policies established by the University for protection of human subjects in research. Unless renewed, approval lapses one year after approval date.

The Baker University IRB requires that your consent form must include the date of approval and expiration date (one year from today). Please be aware of the following:

1. At designated intervals (usually annually) until the project is completed, a Project Status Report must be returned to the IRB.
2. Any significant change in the research protocol as described should be reviewed by this Committee prior to altering the project.
3. Notify the OIR about any new investigators not named in original application.
4. Any injury to a subject because of the research procedure must be reported to the IRB Chair or representative immediately.
5. When signed consent documents are required, the primary investigator must retain the signed consent documents for at least three years past completion of the research activity. If you use a signed consent form, provide a copy of the consent form to subjects at the time of consent.
6. If this is a funded project, keep a copy of this approval letter with your proposal/grant file.

Please inform Office of Institutional Research (OIR) or myself when this project is terminated. As noted above, you must also provide OIR with an annual status report and receive approval for maintaining your status. If your project receives funding which requests an annual update approval, you must request this from the IRB one month prior to the annual update. Thanks for your cooperation. If you have any questions, please contact me.

Sincerely,

Carolyn Doolittle, EdD
Chair, Baker University IRB