The Effects of Peer Coaching for Technology Integration on Teachers’ Comfort, Practice, and Student Technology Literacy

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THE EFFECTS OF PEER COACHING FOR TECHNOLOGY INTEGRATION ON
TEACHERS’ COMFORT, PRACTICE, AND STUDENT TECHNOLOGY LITERACY

by

Tricia Cauffiel Frazier

Kennesaw State University

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ABSTRACT

The purpose of this eight week mixed methods study was to understand the effects of peer coaching on teacher’s comfort, instructional practices, and the culminating impact on student achievement. Through collaborative lesson planning, teachers learned how to improve student learning with technology. The data revealed that though change in comfort was only approaching significance, teachers’ personal statements demonstrated improved comfort. Similarly, change in practices with technology was found to be non-significant; however, observations and interviews indicated that teachers did indeed initiate changes in their instructional practices with technology. Student technology literacy scores also improved significantly from pre- to post-assessment. The researcher concluded that this model of peer coaching may offer educators a cost-effective, sustainable approach to improving technology integration practices.

Keywords: communities of practice; collaboration; peer coaching; student technology literacy; technology integration
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CHAPTER ONE
INTRODUCTION

Statement of the Problem

Students must have access to teachers who are able to provide for their technology literacy needs. One of the objectives of the Title II, Part D of No Child Left Behind Act is to provide funding to states and districts to ensure implementation of technology in all levels of schooling in effort to improve student achievement (Enhancing Education through Technology, 2007). Although the primary goal of this provision is to improve student achievement, a secondary outcome is the implementation of programs and initiatives that increase the availability and use of technology through classroom instruction. It also seeks to ensure students are technologically literate by the time they finish the 8th grade regardless of their socioeconomic status, race, geographic location, or disability (Enhancing Education through Technology, 2007).

It is imperative that educators provide students with technology literacy skills that will aid them outside of the classroom as well. A poll conducted by the Partnership for 21st Century Skills in 2008 found that 88% of voters felt that 21st century skills should be addressed through the curriculum in schools and an astounding 99% of voters felt that technology literacy skills were crucial to the success of the future economy (Partnership for 21st Century Skills, 2008). These skills, highlighted by the Partnership, include computer and technology as well as communication, problem solving, and critical thinking skills (2007). The International Society for Technology in Education (ISTE) also determined that technology literacy skills were critical in preparing students for their future in the work force (ISTE Website, 2011). They defined these skills further by developing the National Educational Technology Standards (NETS) for Students and Teachers with the expectation that teachers make use of them to plan for integration of
technology within their curricular instruction (ISTE NETS Website, 2011). In fact, technology literacy skills are so vital that they will become a part of the nation’s report card when the National Assessment for Educational Progress (NAEP) begins assessing these skills on the 2012 assessment (Technology and engineering literacy: NAEP 2014 Website, 2008). While gaining these skills is vital, ensuring teachers are able to provide improved instruction through technology integration is the first priority. For this reason, it is essential to understand the variables impacting teacher and student use of technology within schools. This begins with teachers learning how to best integrate technology into their classroom instructional practices.

Technology integration that affords students relevant learning, engaging instruction, and technical skills that will assist them in their future is essential. Unfortunately, despite the immeasurable investment of time and funding to ensure technology was available and teachers trained to use it, many critics note less than stellar results in the way of technology integration over the past decade (Cuban, 2001; Cummins, Brown, & Sayers, 2007; Oppenheimer, 2003). Research suggests teachers still tend to teach as they were taught and/or make use of technology for administrative purposes rather than instructionally with students (Cuban 2001, Matzen & Edmunds, 2007; Palak & Walls, 2009). This neglect to meet students’ technology learning needs may be the result of professional learning which leaves teachers ill-equipped to integrate technology (Matzen & Edmunds, 2007). Technology professional development, which often focuses on technical skills, rather than instructionally sound techniques for making use of technology, may prevent teachers from obtaining the instructional skills they need to integrate technology properly (Cuban, 2001; Earle, 2002; Matzen & Edmunds, 2007; Staples, Pugach, & Himes, 2005). A survey sponsored by education technology provider Computer Discount Warehouse-Government (CDW-G) found 93% of teachers surveyed believed technology was
necessary for effective instruction. Unfortunately, only 22% felt they have had effective training in making use of technology for instruction (Ishizuka, 2004). It is well established that successful use of technology with students is dependent on how well trained teachers are in integrating it in a pedagogically sound manner (Brinkerhoff, 2006; Kanaya, Light, & Culp, 2005; Borthwick & Pierson, 2008). More importantly, teachers must understand how to utilize technology within their particular content area so students can learn practical application of these skills (Matzen & Edmunds, 2007; Borthwick & Pierson, 2008; Staples et al., 2005). In other words, student success in learning and achievement with technology can be largely impacted by teachers’ skills and training. For this reason, educators have to be provided better training and support that will assist them in integrating technology properly.

Importance of High Quality Professional Development

Technology integration is defined by some as creating an environment where technology is utilized as a learning tool to research, analyze, and assemble information into an appropriate form for presentation (Mills & Tincher, 2003; U.S. Department of Education, 2003). Because student achievement with technology is highly dependent on teacher skill, effective ongoing professional development that is supportive of technology integration is critical (Jacobsen, 2001). According to a 2003 survey completed by the United States Department of Education, 80% of teachers cited technology integration as the most desired type of professional development (U.S. Department of Education, 2003). This illustrates teachers’ desire to learn technology integration skills. Teachers, however, still may not be getting what they need in regards to learning how to teach with technology. As recent as 2008, a survey by the National Education Association found that current technology training focuses more on use of technology for non-instructional purposes rather than integration of technology for learning (NEA Survey,
Technology professional development must focus on the context of teaching and how to infuse it into the curriculum if we want to see improvements in instruction and student learning (Cradler, Freeman, Cradler, & McNabb, 2002; Staples et al., 2005; U.S. Department of Education, 2003).

There are several barriers that may be preventing teachers from integrating technology properly into their curricular practices. Teachers who are not comfortable using technology are less likely to explore ways to incorporate it into the curriculum (Baylor, 2002; Brinkerhoff, 2006). Comfort is crucial because teachers cannot make use of technology for learning using a student-centered approach, until they are comfortable with its basic application (Matzen & Edmunds, 2007). Teachers may require individual assistance with people they trust in order to build their comfort with technology (Holahan, Jurkat, & Friedman, 2008). This can be achieved this by allowing teachers to build relationships with people they trust who will assist them in their learning. It is also essential that teachers have instructional methods modeled for them in order to change their practices with technology effectively (Matzen & Edmunds, 2007; Zhao, Pugh, Sheldon & Byers, 2002). When teachers learn technology separate from instruction, they do not always make the connection with integrating it properly into student learning.

Finally, teachers’ attitudes toward the use of technology are a significant factor in whether it is used for instruction (Palak & Walls, 2009). In fact, Palak and Walls found that attitudes, positive or negative, were the most important reasons for teachers’ instructional technology decisions (2009). For this reason, teachers should be provided an understanding of the benefits of using technology for student learning (Brinkerhoff, 2006). These benefits include more engaged learning, exposure to technology skills, and improved student achievement (Brinkerhoff, 2006; Hew & Brush, 2007).
A common model of technology training typically allows a trainer to work with teachers for a specified time period to demonstrate the use of a technology tool, often independent of any instruction or curricular area (Borthwick & Pierson, 2008; Brinkerhoff, 2006; Earle, 2002). Teachers are then expected to incorporate the particular technology into their instructional practices. Unfortunately, this does not always happen because teachers are not able to make the connection to student learning, causing them to rely on traditional teaching methods that usually do not include the use of technology (Cuban, 2001; Matzen & Edmunds, 2007; Palak & Walls, 2009). It is vital for teachers to refine their teaching methods by incorporating the appropriate technology skills and tools, but educators must change the professional learning teachers are receiving in order to make this happen. Teachers need to learn how to use technology within the context of teaching so they are able to practice, reflect, and change their teaching practices accordingly (Glazer, Hannifin, & Song, 2002; Martin et al., 2010). They also must have time to work with and learn from their peers so that best practices with technology implementation will be used. Professional development, therefore, should be revised to focus on teacher needs and interests related to the curriculum so as to provide them the opportunity to learn new skills that will improve student outcomes (Kanaya et al., 2005; Martin et al., 2010; Sugar, 2005).

Need for Research

Teachers must be offered alternative forms of professional development because they are often unable to see the connection of technology with instruction (Cradler et al., 2002). Professional development models situated in sociocultural approaches to learning may give teachers a better opportunity to learn the skills they need. This is best done through collaboration with colleagues within their specific subject area and/or context of learning. Peer coaching that focuses on improving technology integration is one way to provide teachers with sociocultural
professional learning. It allows teacher leaders to serve in a mentor capacity to their colleagues by assisting them in learning new skills and planning instruction. Peer coaching also has the potential to further technology integration by breaking through the isolation of teaching by encouraging collegial interaction and reflection (Beavers, 2001; Doersch, 2002; Grove, Strudler, & Odell, 2004). Finally, it allows individual assistance and support from teachers working toward the same goal (Franklin, Turner, Mumbi, & Duran, 2001; Holahan et al., 2000).

The model used for this research promotes the collective work of several individuals by using existing staff to assist colleagues in developing contextual uses for technology. Research on this model is important, as most of the current research on PC has assessed use of coaches who are specifically hired to act as a technology coach. For this reason, it is a logical option for professional learning, as teachers tend to look to their colleagues initially when they need assistance in learning about technology (Zhao et al., 2002). Use of peers for coaching offers a cost-effective strategy for supporting and strengthening individuals while building sustainability within an organization. This is key because the change process is a time intensive one which necessitates continuous growth and improvement over time.

Peer coaching works best when used in the context of specific areas of learning, where teachers can collaborate with more knowledgeable peers. Some researchers recommend making use of “Communities of Practice” to organize and facilitate peer coaching. Communities of practice (CoPs) are defined as a group of people who collaborate toward a common goal, in this case the goal of integrating technology (Wenger, 2002). Placing teachers in a group with a coach, who guides them in learning processes, can help teachers build their comfort and confidence with integrating technology (Sugar, 2005). It can also provide continuity for teachers by creating an atmosphere of mutual learning (Borthwick & Pierson, 2008). Peer coaching can aid in
preventing an organization from becoming dependent on external resources, such as technology training faculty, which may not always be available or not economical (Glazer & Hannifin, 2006). For these reasons, it is essential to examine the effects of peer coaching and Communities of Practice working toward the goal of technology integration.

The purpose of this study was to investigate the effect of peer coaching on teachers’ comfort and instructional practices with technology. Additionally, the study sought to understand the overall impact on student technology literacy achievement when taught by those participating in peer coaching. The study utilized a mixed methodology to examine the effects of peer coaching on these areas of concern. A mixed methods design was used to provide a more complete picture of teachers’ experience with peer coaching and understand the reasons behind their successes and failures with the process.

Use of coaching for technology based professional learning has shown promise in a number of research studies (Barron, Dawson, & Yendol-Hoppy, 2009; Cole, Simkins, & Penuel, 2002; Grove et al., 2004). Coaching may be better than the traditional form of professional learning that tends to involve bringing an expert for one day to train teachers in effective instructional methods (Knight, 2007). It has the potential to provide teachers with the support they need to improve their comfort with technology and ultimately change their instructional practices over an extended time period. Knight (2007) suggests collaboration, as is the practice in peer coaching, has the best opportunity for changing practice because teachers can discuss and choose the best instructional intervention for their particular students. For this reason, understanding the effects of peer coaching on technology integration practices is crucial.

The significance of this study is established by the need to improve current technology related professional learning activities. Borthwick and Pierson assert that the factor that impacts
student achievement most is teacher education (2008). For this reason, research that details the factors that improve professional learning with technology is essential. Most of the current research on technology-based peer coaching is primarily qualitative in nature with a focus on attitudes and feelings or participants reflecting on their experiences with coaching (Grove et al., 2004; Sugar, 2005; Vannatta & Fordham, 2004). While it is beneficial to understand personal experiences of teachers participating in coaching, it is just as critical to assess teachers’ comfort and practices, using quantitative and qualitative data as it provides a more complete picture of the coaching process. Additionally, other studies neglect to provide a link between peer coaching and improvements in students’ technology literacy skills (Barron et al., 2009; Glazer et al., 2006; Grove et al., 2004; Sugar, 2005). This study makes use of both quantitative and qualitative data to understand the effect on teaching practices and then presents the overall impact on student technology literacy achievement. The effect on student achievement is of the utmost importance when assessing the effectiveness of professional learning activities. This is essential because if we expect changes in teachers’ practices, they must be convinced that technology will lead to improved student learning (Borthwick & Pierson, 2008). The current research seeks to measure change in practice, comfort, and learning so that educators will appreciate the importance of using technology with students. Finally, this study is crucial because it will contribute to the understanding of one model of technology-based professional learning. Ultimately, the objective is to understand whether peer coaching is an effective form of learning for educators seeking to improve their practices with technology.

Research Questions

This research focused on understanding four primary concepts in regards to peer coaching and technology integration: comfort with technology, change in practice, student
achievement with technology, and factors that helped and hindered teachers in the coaching and integration process. It was the intention of the researcher to understand whether the peer coaching process affected comfort level, instructional practices, and student achievement with technology and to determine some of the reasons why it did or did not work with the participants involved in the study.

The first two areas, comfort with technology and change in practice, were addressed both quantitatively and qualitatively. Teachers completed the Levels of Technology Innovations (LoTi) survey to reveal their personal computer usage, indicative of comfort with technology, and LoTi level to determine change in practice. Teachers took the survey prior to and at the completion of the study. Additionally, teachers were questioned prior to and at the end of the study, regarding their comfort level and practices. Teachers were asked initially to answer these questions in written form and then orally through interviews and focus groups at the completion of the study. In order to better understand change in practice, teachers were also observed prior to the study and during the coaching.

Student achievement was assessed using the Technology Literacy Assessment (TLA). Skills students were tested on included system fundamentals, social and ethical uses of technology, spreadsheets, word processing, multimedia presentations, database, and Internet. Teachers, therefore, focused on integrating technology that utilized many of these elements considered crucial for technology literacy. Finally, teachers were interviewed regarding questions about the process of coaching, specifically what helped and hindered them in the process and how the coaching process influenced them.

Conceptual Framework

Three sociocultural theories for learning were used to develop the conceptual framework
for this investigation, which include: Zone of Proximal Development, Cognitive Apprenticeship Model, and Communities of Practice. Using key proponents from each of these frameworks, this study was structured on teachers working collaboratively with their peers so as to address individual areas of concern in technology integration practices. A colleague assisted teachers in learning how to integrate technology through modeling, guidance, and planning instruction, which are tenets of the Cognitive Apprenticeship Model of learning. Additionally, teachers were offered assistance in the classroom when they did not feel comfortable integrating technology on their own. This was done to meet individual needs of each teacher and work within their Zone of Proximal Development. Finally, teachers were put into learning communities, otherwise known as Communities of Practice, and guided by a coach in the planning and integration process. The conceptual framework, therefore, was focused on improving comfort and practices through connecting teachers in a social context for learning.

Review of Relevant Terms

*Co-teaching:* A manner of providing special education students services within the general education classroom by distributing responsibilities to two teachers in the room, one special education and one general education (Cushman, 2004)

*Collaboration:* Teachers working together to plan unified or differentiated instruction in preparation for teaching students.

*Communities of Practice:* Groups formed by people who have a common interest or concern and work toward learning how to better that area by working together on a regular basis (Wenger, 2002).

*Curriculum:* Areas of study provided by a school, which are guided by a set of standards for instruction. Curriculum areas may include math, science, social studies, and language arts.
District Technology Literacy Coach (TLC): A federally funded position for Title I schools only. TLCs were hired to assist teachers, in these schools, with understanding the importance of technology literacy skills, integrating technology and working in the classroom to coach them in the process of integration. Each TLC was charged with two to three schools and approximately 300 teachers.

Inclusion: The practice of putting student with disabilities in a regular classroom, with general education students, rather than segregating them into a small group class of their own.

Peer Coaching: A form of professional development that involves using existing staff to act as leaders in assisting teachers with a skill or process. It involves using observation, modeling, reflection, feedback, and revision of current practices. In the case of this research, peer coaches were chosen from each subject area to act as leaders to their subject area peers in planning and preparing for the integration of technology.

Special Education Teacher: A teacher certified in teaching and assisting students with special needs or disabilities (Glossary of Educational Terms Website, 2008).

Inclusion Teacher: A special education certified teacher who works as a co-teacher in a general education classroom to work with students who have special needs.

Technology Coach: A teacher skilled in teaching pedagogy and technology who leads teachers in the process of integrating technology in instruction.

Technology integration: Making use of technology for learning within a curricular area of study.

Technology Literacy: Technology skills, which involve making use of computers and other forms of technology for learning and producing.

Title I: Distinction given to schools when a high percentage of the student population is
on free or reduced lunch due to income status.

Overview of the Methodology

As mentioned previously, this was a mixed methods study to determine the effect of peer coaching on comfort with technology, change in instructional practices, and student achievement with technology literacy skills. The researcher also assessed the factors that helped and hindered teachers in the peer coaching process. This eight week study was conducted in a Title I middle school in a large school district just outside of Atlanta. A total of thirteen 6th grade teachers participated in the study from beginning to end. The coaches, who acted as leaders in technology integration, were included in this total as they too were participants learning to integrate technology and, as teachers, responsible for improving students’ technology literacy skills as well. Teachers were expected to participate in planning sessions with their coaches twice a month and as needed to plan for instruction and learn how to use technology for student learning. Some teachers were also assisted during classroom instruction by the district technology coach. The district coach assisted on an as needed basis. At the conclusion of the study, the teachers’ students took part in the TLA to assess their technology literacy skills. There were a total of 174 students who attended the school for the full academic year. All 174 students were included in the final assessment of technology skills.

Quantitative data to determine teachers’ comfort and change in practices was collected using the Levels of Technology Innovation (LoTi) survey. Teachers Personal Computer Usage (PCU) scores were used to indicate their comfort with technology while their LoTi levels demonstrated their technology integration practices in the classroom. Students’ scores on the Technology Literacy Assessment (TLA) were used to better understand their level of technology literacy according the National Educational Technology Standards for students (NETS-S).
Qualitative data were used to corroborate the quantitative data as well as better understand what helped and hindered teachers in the peer coaching process. Teachers were asked to initially answer questions regarding comfort and practices in writing. Then, throughout the study and at the end, teachers participated in individual interviews and focus groups, which were audio recorded for subsequent analysis. Teachers’ practices were also assessed through pre- and post-observations, completed by the researcher, in order to gain an understanding of how instruction was impacted by the peer coaching process. The researcher focused specifically on understanding the process and influence of peer coaching on teachers’ comfort with integrating technology, change in instructional practices, and the impact of coaching on student achievement with technology. The researcher also collected data from the participants regarding what helped and hindered them in the process so as to plan for future research and improvements in the peer coaching process.

Limitations

Several limitations emerged as this study began. This study started with a comparison group, which was dropped early in the study due to lack of participation. For this reason, the researcher was not able to provide a direct connection between coaching and change in comfort and practice. Additionally, the study took place over a short period of eight weeks. A study longer in duration might have provided teachers more time to improve their comfort and skills with technology integration. Another limiting factor had to do with the number of participants. Though the study began with sixteen participants, a total of thirteen teachers, who participated in the study from beginning to end, were included in the results. Because of the small number of participates and lack of comparison group, qualitative data were added to allow for a more comprehensive understanding of the peer coaching process. It is necessary to note that though
the time was short, positive results were seen offering evidence that the process is likely to have helped improve teachers’ comfort level and practices. Student technology literacy may have also been influenced by the coaching process as students’ scores improved significantly from pre-assessment, in September 2009, to post-assessment in May 2010, although due to the lack of a comparison group and lack of data during the time prior to the coaching to post-assessment, a direct connection cannot be made.

Organization of the Study

The upcoming chapter will present the current literature on peer coaching as a method of professional learning. Subsequent chapters will outline the methodology used for this investigation as well as results and implications for the use of peer coaching on teacher learning and student achievement. Finally, suggestions for further research will be presented.
CHAPTER TWO

REVIEW OF THE LITERATURE

According to various theorists, people learn most effectively through experiences gained within a social group of people working toward a common goal (Fullan, 2001; Taylor, Marienau, & Fiddler, 2000; Vygotsky, 1978). Peer coaching models are grounded in sociocultural theories of learning and offer considerable potential in improving teachers’ technology integration skills in the classroom. This type of social learning is accomplished through collaborative efforts that allow teachers time to plan instruction, without the need for outside trainers. It may be the most effective, as well as most economical and timely way of providing teachers with the instructional skills to use technology properly with students.

The sociocultural approach to learning involves the relationship between social interaction and an individual’s cognitive modifications as a result of those interactions (Dillenbourg, Baker, Blaye, & O’Malley, 1996). Vygotsky (1978) popularized the concept of human development occurring as a result of socially based activities that aid in the internalization of learned processes (Steiner & Holbrook, 1996). Dewey (1938), Piaget (1965), Bandura (1977), and Wertsch (1985) all contributed to the literature on the various sociocultural approaches of learning. While these scholars have differing perspectives, they all suggest that knowledge and learning is best obtained through interaction in a social environment while learning in a practical context. This is commonly referred to as situated learning (Lave & Wenger, 1991; Taylor et al., 2000). Kolb (1984) contributed to this concept with a model for learning that includes these activities: experience, reflection, abstraction, and experimentation in order to improve learning. He specifically emphasized the idea that learning results from taking knowledge and transforming it into practical skills, the core purpose of this model of learning.
Additionally, Bruner (1992) asserted that teachers need pedagogical support through observation of technology based lessons and assistance and feedback from mentors experienced in technology integration. The work of these theorists emphasizes the necessity of offering teachers a sociocultural learning environment to meet their professional learning needs. The following three constructs central to sociocultural learning theories have heavily influenced peer coaching models: Zone of Proximal Development (ZPD), Cognitive Apprenticeship (CA), and Communities of Practice (CoPs).

*Zone of Proximal Development*

ZPD was developed by Vygotsky (1978) to define a level of learning, which distinguishes the difference between what a learner can do with or without assistance from more capable peers. Scaffolding, a process that allows for guidance while a learner is developing a skill, is a fundamental part of this concept. Guidance can be gradually removed as learners develop the ability to complete tasks on their own, which they may not have been able to do without prior assistance (Greenfield, 1984). In other words, as participants become more proficient with a skill, the learner can take over the task on their own and continue to develop expertise at their own pace. ZPD also views learning as a problem solving process achieved through guided practice (Driscoll, 2005). This idea typically refers to children and their ability to solve problems with or without the help of their teachers, but can also include those learning from someone more skilled in a specific area. Bandura (1977) stressed the role of social interaction in the development of skills. In the realm of coaching, this is predicated on educators learning from a peer who is more knowledgeable or experienced. He felt that learning would be less efficient if people were to rely on their own actions to learn. This is significant because, as Vygotsky (1978) argues, the range of expertise that can be developed with adult guidance or peer
collaboration exceeds what can be accomplished alone. Social interaction, therefore, is essential for effective learning to occur (Burvill-Shaw, 2008).

**Cognitive Apprenticeship**

Cognitive apprenticeship (CA) is grounded in Brown, Collins, & Duguid (1989), and Lave and Wenger’s (1991) approaches to learning as situated cognition. This emphasizes learning which results in a set of beliefs and actions based on the social context of learning (Driscoll, 2000). Learning in a social context can help individuals construct knowledge and skills more efficiently. Collins, Brown, and Newman (1989) defined CA as learning which results from guided experiences on cognitive and meta-cognitive skills and processes. It involves pairing a more experienced knowledgeable person with a less experienced person to develop expertise through guidance, modeling, and collaboration. Apprenticeship is used in teacher education programs in order to induct student teachers into the practice of teaching. It is essentially a manner of learning that involves observation, coaching, practice, and feedback from those more experienced in a specified skill, context, or practice (Stockhousen & Zimitat, 2002). CA has its roots in situated cognition, which involves learning that occurs socially in an authentic context (Brown, Collins, & Duguid, 1989). Lave (1988) is often credited with beginning the situated cognition movement, which is compatible with Dewey and Vygotsky’s theories on experiential learning and social constructivism (Oliver, 1999). Lave and Wenger (1991) have also been credited with developing situated learning theory. This holds that learning results from contextual and cultural aspects, which are fundamentally a function of social activity. They characterize learning as the process of becoming a practitioner rather than simply learning about certain ideas or practices (Brown, 1998). Practical learning is necessary because educators must be able to apply new skills directly, so as to incorporate them into their instructional practices.
For this reason, the CA Model is one that suits the field of professional learning for educators.

The CA Model includes several elements that made evident to learners during the learning process. The expert, who acts in a mentoring capacity, is responsible for providing skills and guidance to the learner to support their learning. These strategies should be utilized throughout the process of learning in order to provide an organized structure for the learners. They include the following as outlined by Dennen and Burner (2004, p. 427):

1. Modeling-Specific processes demonstrated for the learner so as to help them visualize the desired actions and then practice them.
2. Coaching-Feedback and supportive processes used to guide learners as they practice and may include adjusting activities for readiness through scaffolding.
3. Reflection-Participants reflect on their learning processes.
4. Articulation-Participants verbalize their reflections.
5. Exploration-This involves the participants developing and testing their own hypotheses as a result of what they have learned.

Scaffolding is an essential component of this model as it helps individualize learning for those at different levels. Teachers’ developmental progress can be addressed by their peers, charged with the same objective within an identical context of learning, or those who teach the same level and content area. This should help them to address the needs of the individual learner better. Mutual engagement and social interaction are obligatory components as learning is attained primarily through collaboration among its participants and emphasized through the situated nature of the CA model (Dennen & Burner, 2004). Additionally, this model fits naturally into the use of Communities of Practice (CoP) because it typically involves one leader with several learners who are seeking to improve their practices by working collaboratively.
Communities of Practice

Sociocognitive theorists describe communities of practice as a collection of people who unite with a common objective or problem such as improving instruction (Lave & Wenger, 1991; Wenger, McDermott, & Snyder, 2002). When colleagues come together to form CoPs, the learning that occurs is a result of participation in that social group through situated learning activities. In time, relationships develop as the CoP defines their purpose as a social group. The members also determine their own meaning, as Wenger (1999) states, because they develop around what matters most to them. These communities can develop naturally over time as the members build relationships based on trust and cooperation and unite together to reach common objectives. CoPs are beneficial to learners becoming proficient with using technology because participants must work toward the common objective of changing instruction with technology integration. CoPs are dependent on elements of working together toward a common purpose while establishing similar practices (Dennen & Burner, 2004). These qualities define the group’s identity, expectations and standards as a group, as well as a common vocabulary that differentiates them from other CoPs (Wenger, 1999). As a result, CA used in conjunction with CoPs is a practical strategy for moving teachers toward making changes in their instructional practices with technology.

In education, CoPs are often utilized to enhance professional learning activities. In view of this, the CA Model works best by pairing knowledgeable educators comfortable with a skill such as technology integration, to serve as coaches and assist with learning new skills. When placed within learning communities, coaches can work in partnerships with their peers as they share their expertise while planning for instructional uses of technology.

Researchers have found that professional development models influenced by CA and
CoPs have been successful. For example, de Jager, Reezigt, and Creemers (2002) compared the effects of teacher training using a CA environment, as opposed to traditional training, and found that the teachers making use of CA were successful in changing their teaching behavior and improved their instructional quality significantly (Darabi, 2005). Furthermore, Tilley and Callison (2007) described that adults often experience anxiety about forging new forms of learning with technology and how traditional faculty training sessions do not work. CA provides a means of learning in which mentors guide novices through real-world learning tasks with the objective of offering purposeful skills and strategies for teaching. Tilley and Callison also highlighted the idea that teachers can learn appropriately from apprenticing themselves to peers in order to gain expert skills and strategies in technology. Many technology researchers such as Ge and McAdoo (2004) and Glazer and Hannafin (2006) have offered models for professional learning based on the CA approach because current professional development models emphasize isolation in learning, which do not support teacher experience or expertise (Fullan, 2001). Key to this idea is building CoPs that work to support professional development in technology, which should ultimately lead to improvement in teaching and instruction.

Learning models, influenced by CA and CoPs, offer a viable solution to overcoming some of the existing obstacles to teachers integrating technology in instruction. It allows for collegial relations to emerge, provides teachers individual attention and time to collaborate, as well as an opportunity to learn from each other. This option offers the advantage of meeting individual needs and providing needed assistance with planning, implementation, and support with instruction in the classroom (Franklin et al., 2001). It ultimately places an emphasis on collaborative activities with a peer leader who promotes technology integration and learning amongst teachers in a naturalistic context. This may provide a window into collaborative
relationships, situated cognition, and learning within a teacher’s individual ZPD. Additionally, effective learning should be situated in activity, context, and culture, and fostered through membership in CoPs (Darabi, 2005). Use of the CA model and CoPs, has the potential to provide educators with the skills they need for integrating technology. These models unite by engaging teachers in a community of learners, led by a knowledgeable colleague to assist them in the learning process.

Peer Coaching

Peer coaching is often defined as a process by which two or more people connect to reflect on educational practices and work toward developing and refining new practices (Easton, 2008; Robbins, 1991). Joyce and Showers (1986) completed extensive research on peer coaching, beginning in 1980, to help establish it as an effective form of professional learning for teachers (1986). One study they completed indicated that less than 15% of teachers implemented the concepts they learned in traditional training, such as workshops (Joyce & Showers, 2002). Peer coaching emerged in response to the movement to improve teacher training in efforts to improve student achievement (Joyce & Showers, 1996). After years of study, these researchers found that when teachers had a coaching relationship which involved idea sharing, lesson planning, and reflecting on experiences, they were more likely to apply newly learned skills and strategies to their teaching and retain the knowledge they had gained through professional learning (Joyce & Showers, 1996, 2002). They also found that peer coaching fostered the development of collegial relationships when teachers were able to plan collaboratively, problem solve, or teach together (Joyce & Showers, 2002). When comparing teachers who participated in coaching and those who did not, Joyce and Showers found three factors stood out among those who worked with coaches. First, teachers practiced the new strategies more. In turn, this helped
them retain more information and improve their skills over time. Finally, in the end teachers expressed a better understanding of the purposes of the strategies they were using (Joyce & Showers, 2002). In order to be effective, it is essential for professional learning to be focused on teachers’ work with students, specific to content and grade, as well as create a sense of a collaborative community (Borthwick & Pierson, 2007; Garet et al., 2001; Russo, 2004).

Following Joyce and Showers' research, many other experts, such as McKenzie (1999), Fullan (2007), Barkely (2008), Knight (2007) and the National Council for Staff Development (NCSD, 2006) have endorsed the peer coaching model for professional learning. McKenzie (1999) suggested educators use peer coaching, characterizing it as possibly the most effective way to convert nonusers of technology into avid users of technology. Fullan (2001) and Knight (2007) emphasized the importance of relationships in establishing change in instruction and learning. Fullan (2001) actually proposed coaching as a useful method for sustaining learning across an organization. He also felt that learning in the context of teaching, within a specified culture, and through relationship building is what creates the greatest impact on changes in teaching (Fullan, 2007). Knight (2007) suggests that taking a partnership approach, which involves equality, dialogue from both parties, choice, and reflection are vital to making coaching a successful process. Making time for talking about teaching and learning is most important if we expect to see change, he asserts (Knight, 2007). Barkley (2008) has also encouraged the use of coaching by emphasizing the relationship as necessary for sharing skills and knowledge and supporting each other with feedback and celebration. He goes on to state that a culture of coaching in a school can improve teacher learning and thus student achievement (2008). Finally, the National Staff Development Council emphasized the importance of teachers learning and collaborating with their peers as a way to train and support teachers’ learning needs (Kanaya et
al., 2005; NSCD, 2001).

According to Joyce and Showers (1996), the term coaching has evolved over the years and can be executed in a variety of ways. Peer coaching, however, typically involves one person coaching one or more people, individually or in a group. (Joyce & Showers, 1996). The practice of peer coaching, Joyce and Showers note, focuses on making needed changes in curriculum and instruction. It involves teachers learning from one another as they plan and develop instruction while assessing the impact their instruction has on students (1996). It can also involve teachers observing one another in the practice of teaching. Teachers can support one another through this process using a mentor-type relationship and/or using peers to collaborate and learn from each other during the process of lesson development. The most indispensable feature is that teachers work together to establish learning objectives, instructional strategies, and curriculum-based activities that will improve student learning. Teachers, thus, have the opportunity to learn most from planning collaboratively within the specified context of their instructional field.

This model of PC makes use of existing staff members to help guide and educate their peers. While many organizations invest in the necessary equipment needed for technology integration, not all increase the time or funding for educating teachers in the practical uses of technology (Fullan, 2001). Planning collaboratively with the use of peer coaches may provide teachers with an opportunity to produce quality lessons without additional funding. Fullan (2001) asserts the importance of learning through a particular teaching context is vital, because it is adaptable to specific situations. For example, a teacher who learns how to integrate technology within the context of a mathematics class may be able to apply his or her learning more effectively than someone who learns only the procedure of using a particular technology program. PC used with CoPs based on subject areas, therefore, may have the most potential for
improving learning for educators and preparing them properly for technology integration practices (Fullan, 2001).

As a framework for professional learning, PC use, which follows the CA model, may be a viable solution to overcoming some of the existing barriers to teachers integrating technology into instruction. As previously mentioned, some of the barriers to learning that traditional technology training lacks include modeling of the technology integration process, assistance with ongoing practices, and time to reflect on instruction and student achievement with technology. Research shows that these are all crucial factors in ensuring development of technology integration skills in teachers, so it is essential to understand the impact this PC model has on these elements (Grove et al., 2004; Seels, Campbell, & Tasma, 2003; Vannatta & Fordham, 2004).

**Qualities of Effective Peer Coaching**

Researchers have identified various factors that lead to effective professional development for educators. Some of these elements include meeting teachers’ expressed needs, providing a strong curricular focus guided by research-based practices, allowing teachers to work together, and evaluating the effect of professional development on student learning (Corbeil and Valdes-Corbeil, 2007). Additionally, in terms of technology-focused professional learning, an understanding of the change process is necessary in order to support teachers properly. This involves providing plenty of time for training, showing teachers how technology supports their students’ curricular learning needs, and providing leadership and technical support needed for proper implementation (Earle, 2002).

The traditional professional learning model for technology has often focused on training teachers how to use technology rather than helping them integrate technology practices into their
instruction (Earle, 2002). Teachers must be able to make the connection between technology, pedagogy, and their curriculum. When schools focus primarily on computer skills in technology professional development, teachers may continue to teach using current practices because they have not been offered guidance in using technology for learning (Matzen & Edmunds, 2007). Additionally, integrating technology should not be about the technology, but instead should be the instructional practices that are improved with technology (Earle, 2002; Matzen & Edmunds, 2007). If the ultimate goal of professional development is improved instructional practices, then technology-based professional learning should be based on the pedagogical design for its use.

Barron et al. (2009) completed a study designed to identify key characteristics of peer coaching for technology integration. They collected data from coaches and facilitators of the coaching process to understand their attitudes toward technology and perceptions of their peer coaching professional development program. They highlighted several characteristics that make up an effective peer coaching program. They include trust and rapport built between coaches and teachers, shared goals, a deep understanding of instruction and pedagogy, and most importantly, time for teachers to practice their skills by implementing what they have learned immediately and the opportunity to reflect on their practices (Barron et al., 2009). Creating an atmosphere of community, with CoPs who meet and plan on a consistent basis can help improve these qualities. It also helps to have guidance from a more knowledgeable colleague who can assist teachers in the planning process. Also, selecting coaches who are well versed in content in pedagogy can make the process of integration more practical for teachers. Finally, having teachers participate in reflective practices and revising their instruction appropriately can give teachers a sense of control over their teaching and may help them improve their instruction.

_Modeling Technology Integration_
Often, technology professional learning lacks modeling with an instructional focus, which is needed to prepare teachers for classroom use of technology (Brinkerhoff, 2006, Matzen & Edmunds, 2007; Palak & Walls, 2009). This happens when outside trainers treat technology as a tool separate from curriculum; therefore proper modeling does not occur (Brinkerhoff, 2006). According to a survey completed by the National Education Agency (2008), most educators make use of technology for administrative tasks rather than instructional purposes. Many researchers believe this is because they do not feel comfortable with instructional uses of technology or have not learned ways to use technology for student learning (Palak & Walls, 2009; Sugar, 2005). For this reason, there needs to be a shift in professional learning practices so as to give teachers an opportunity to understand how to use technology for instructional purposes.

Teachers tend to teach and implement learning activities according to their beliefs and ways that have been modeled for them (Matzen & Edmunds, 2007; Pugach & Himes, 2005). Knight (2007) asserts that modeling can help teachers develop “a deeper understanding of the intervention in the context of where it matters most: their classroom” (p. 29). When teachers are taught to use technology based on technical skills only, they tend to fall back on their current practices (Matzen & Edmunds, 2007). Professional learning that emphasizes technical skills can end up, as Earle (2002) found, “placing undue emphasis on the technology for its own sake without connections to the learning and the curriculum” (p. 16). For this reason, the way teachers implement technology is highly dependent on the quality of their professional learning (Matzen & Edmunds, 2007).

Peer coaching may provide the modeling teachers need to assist them with technology integration. In a study completed by Matzen and Edmunds (2007), the researchers found that
teachers increased their use of technology in constructivist, student-centered ways because these ways were modeled for them. Glazer and Hannafin (2006) completed a study where they assigned peer teachers to serve as modelers of technology strategies useful for instruction. They found that modeling situated in classroom instruction was the most effective for teachers’ learning needs and, for this reason, encouraged the use of peer teachers to serve as the modelers for technology integration (Glazer & Hannafin, 2006).

Many teachers continue to teach students using traditional methods with paper and pencil activities instead of using technology devices for learning. This could be due to a multitude of reasons including lack of technological skills, fear of technology problems, or even the view that students need to develop basic content knowledge through traditional methods because technology is not efficient or reliable. Studies suggest that teachers lack the support needed to implement technology properly in their classroom instruction (Matzen & Edmunds, 2007; Palak & Walls, 2009). In order to change teachers’ comfort level and practices with technology integration, making use of modeling strategies is vital.

Franklin, Turner, Kariuki, and Duran (2001) studied the use of coaches to overcome the barriers of integrating technology in an elementary school. They had positive results asserting that the coaching gave teachers a vision for developing lessons around the vast technological resources they had, assisting with technical support, and making use of technology for teaching and learning (Franklin et al., 2001). The PC model provides teachers with the needed modeling for technology integration practices and, for this reason, may help improve their overall comfort with using technology for learning.

Comfort and Support in Integration Practices

Joyce and Showers (2002) found that less than 15% of teachers actually implement ideas
learned in traditional professional learning activities. In fact, research indicates that teachers need both inservice education on specific technology applications and long-term support through collaborative practices to assist them in integrating computers with the curriculum in meaningful ways (Hew & Brush, 2006). For this reason, learning that is sustainable and provides collegiality among peers are critical components of successful technology implementation practices in schools. It takes time to develop technology integration skills and teachers who are not already comfortable with technology may overlook the use of these tools when planning instruction. This issue is compounded by the increasingly complicated nature of time-consuming responsibilities that teachers have been given in recent years (Glazer et al., 2005). Additionally, teachers often have little time to troubleshoot technical difficulties that may occur during use and thus often avoid planning for the use of technology altogether (Grove et al., 2004). Time to prepare for teaching, therefore, must be incorporated into what teachers are already doing.

Several studies have demonstrated the value of cognitive apprenticeships, in the form of peer coaching, to maintain and enhance professional learning. Barron, Dawson, and Yendol-Hoppey (2009), who studied the key characteristics of coaching, found that peer coaching has become a more common and powerful tool for professional, job-embedded learning in recent years. Use of this model may potentially increase the frequency and improve the quality use of technology in the classroom (Glazer et al., 2005). The desire to utilize peer coaching for professional learning is founded on the idea that most teachers seek assistance and support from their colleagues first, rather than outside technology training personnel (Ishizuka, 2004). PC used as a part of CoPs offers a method that allows teachers to share their practices, repertoires, and become united in a joint effort at meeting their instructional objectives. This is notable because lack of collaborative culture is frequently cited as an obstacle to integrating technology in
classrooms (Glazer et al., 2005). Additionally, PC and study groups have also proven effective in promoting classroom technology integration (Beavers, 2001; Doersch, 2002; Poplin, 2003).

Coaching may also help teachers develop comfort as they become increasingly capable, skillful, and knowledgeable within the community in which they interact (Glazer et al., 2005). When teachers feel competent with the use of technology, they are more likely to use it for learning (Brinkerhoff, 2006). In other words, when comfort improves integration practices may actually increase. For this reason, it is pertinent that educators gain comfort with the use of technology. We know that traditional forms of technology training are not as effective because they fail to provide the individual attention many teachers may need to build their comfort with technology (Jones, 2001; Vanatta & Fordham, 2004). A study done by Holahan, Jurkat, and Friedman (2000) revealed that timely and individualized support is important in ensuring teachers’ comfort with using technology. They recommend using colleagues who are well respected as well as experts in instruction, rather than technology, to demonstrate effective technology skills for learning (Holahan et al., 2000). This can be accomplished by having those who are familiar with teacher’s practices and leading abilities select the coaches. When peers are used in a coaching capacity, they should also be capable of providing timely support, which is focused on instructional practice and scaffolded for the different levels of teacher learning (Holahan et al., 2000; Sugar, 2005). This is critical because when teachers’ level of comfort with technology improves, they can then concentrate on student-focused learning with technology.

In a study completed by Sugar (2005), the benefits of a technology-based coaching program in a middle school were investigated. He sought to understand whether the confidence and attitudes of teachers improved when they were assigned a coach outside of their school to assist with technology integration. He found that most of the teachers felt their coach was able to
devote time to their individual needs and offer the encouragement needed to build their confidence with technology integration (Sugar, 2005). More specifically, he found that successful technology training was focused on individual teacher's skills and situated in a classroom environment (Sugar, 2005). PC, therefore, may be the key to providing teachers with the one-to-one, timely support they need to improve their comfort and confidence with using technology for learning.

*Coaching and Reflective Practices*

Reflective practices bear a crucial role in the coaching process as well (Barron et al., 2009; Vannatta & Fordham, 2004; Zwart et al., 2007). Since it has been shown that ongoing support is necessary, coaching must involve time for collaboration with peers while they are developing lessons and implementing plans. Once implemented, teachers themselves need time to adequately reflect on the teaching and learning that occurred in the classroom. Reflection provides teachers the opportunity to share ideas and receive feedback and explore better ways of implementing technology on their own (Vannatta & Fordham, 2004). This may offer the proper short and long-term support that will help teachers to make it a consistent part of their instructional repertoire.

Teachers must also understand the full potential of the use of technology for instruction. For this reason, ongoing professional learning that requires reflecting on use of technology can help teachers because it gives them the opportunity to report their instructional practices regarding technology (Vannatta & Fordham, 2004). Teachers tend to use technology in a way that is consistent with their beliefs about instruction therefore; connecting the two is vital (Matzen & Edmunds, 2007). Research on one peer coaching program suggested that when coaches were able to gain a better understanding of the potential of technology, they could offer...
more examples of proper integration and improve the use of tools they already had available to them (Barron et al., 2009). Teachers need to reflect on their learning collaboratively in order to improve their teaching and learning processes, since guidance and input from peers may be the best source of learning (Cole et al., 2002; Grove et al., 2004). While learning to improve technology integration is the objective, it may also give teachers the opportunity to prepare for unexpected problems with technology as well. Reflection time also gives coaches the opportunity to offer the moral support teachers need to succeed with technology (Cole et al., 2002; Sugar, 2005). Coaching studies have shown that providing time for reflection is helpful with all of these aspects of the integration process because it allows teachers to have a say in what they are learning and supports them in the process of changing their instruction (Cole et al., 2002; Matzen & Edmunds, 2007; Seels et al., 2003).

*Student Achievement*

Part of the reflection process in coaching should also ensure teachers understand the impact of technology on student learning and achievement (Borthwick & Pearson, 2008). Kanaya, Light, and Culp (2005) found that one of the factors that influenced teachers in continuing their efforts with technology was the fact that they saw the relevance of using technology with students. It gave them a voice in the daily learning their students were acquiring, which helped motivate them to use more technology (Kanaya et al., 2005). Matzen and Edmunds (2007) found that changes in instruction were made primarily because of teacher reflection on instructional practices, with the goal of improving student learning. Given that student achievement is dependent upon effective professional learning, it is imperative that we plan technology-based professional learning with a focus on student learning. Student learning then must be assessed properly and provide relevant results that teachers can reflect upon. This gives
teachers concrete evidence of improved learning and they can plan more appropriately for their students’ needs. Discussing technology’s impact on student learning, therefore, can help teachers focus on using it for learning purposes, which may encourage them to use it more consistently (Barron et al., 2009). For this reason, reflection should always include assessing student achievement and improved learning.

Change in Practices

Teachers initially learn content-area teaching and pedagogical practices through their preservice teaching programs. Their first experience with actual teaching is to act as an apprentice to a practicing teacher culminating with student teaching as the final stage in teacher education programs. This provides them with practical learning experience in the work environment in which they will eventually instruct and manage themselves. This method is valuable because it takes into account the individual needs of the student teacher and gives them access to someone who is skilled and knowledgeable with curricular practices. Since this is the best method to prepare teachers for teaching students, coaching may also be a logical fit for providing professional learning for inservice educators who need to change their instructional practices by integrating technology in instruction.

Zhao and Bryant (2006) emphasized the necessity of mentors or coaches for teachers who are have had difficulty implementing technology in their classroom instruction. Teachers learn best from their peers and can gain insight from their colleagues through the experiences that have yielded them the most success. When coaching is used for professional development in technology, significant changes may occur in teacher learning and classroom instruction. The Enhancing Missouri’s Instructional Networked Teaching Strategies (eMINTS) program used technology specifically to improve student learning (Beglau, 2005). It included a plan to provide
teachers with professional development that includes in class coaching to make fundamental changes in instruction (Beglau, 2005). In a study that compared the performance of Black and White students in grades three through five with the Missouri Assessment Program (MAP), scoring data were collected after teachers completed two years of professional development which focused on inquiry-based teaching and use of multimedia technology. The MAP is used to assess students communication arts and mathematics skills. Results of the test were gathered within the eMINTS program, which indicated higher achievement in the students who were enrolled in eMINTS classes (Beglau, 2005). This demonstrates the impact a professional learning activity can have on student learning.

The National Staff Development Council (NSDC) has established standards that point out the importance of organizing educators into learning communities to improve instruction (2002). This is another form of support needed to help maximize the potential of PC in technology training. When teachers work collaboratively, as in CoPs, they learn to rely on each other rather than merely follow directions from a trainer (Borthwick & Pierson, 2008). Teachers also need a supportive, trusting environment of collaboration, which is concentrated on curriculum, in order to make changes in their practices (Cole et al., 2002; Glazer & Hannifin, 2006). Several studies have determined that as relationships and collegiality among teachers improved, improvements in technology integration and instruction followed. One study demonstrated that teachers working in collaboration, with one acting as a coach, were more likely to be users of technology (Seels et al., 2003) The teachers involved in the study were able to draw upon the expertise of others and found that collaboration was important to successful integration (Seels et al., 2003). While coaches can help address individual needs and provide guidance in the implementation, CoPs can provide support that will influence change throughout the community of learning.
Summary and Rationale

Isolation in teaching can make learning and growth challenging for educators (Cole et al., 2002; Glazer & Hannafin, 2006; Sugar, 2005). Teachers need support from knowledgeable colleagues through coaching and collaboration, preferably within learning communities (Glazer & Hannafin, 2006; Hughes & Ooms, 2004). While coaches help make the connection between technology skills and curricular practices, communities provide the extensive knowledge and support teachers need to improve comfort with integrating technology properly (Franklin et al., 2001). Coaching can also assist in giving teachers the personal attention they need to improve their practices, by providing one-on-one assistance to meet teachers’ specific needs (Franklin et al., 2001; Holahan et al., 2000). Relationships through coaching and collaborative support, therefore, may be one of the essential components to improving comfort and promoting improved technology integration. Relationships have the potential be built and strengthened by grouping individuals into CoPs and can allow them to grow relationally by working together to improve teaching practices with technology.

Recent research on peer coaching in technology has demonstrated some success, although many of the studies are strictly qualitatively based and/or focused on attitudes or perceptions of coaching. For example, Barron, Dawson, and Yendol-Hoppey’s study (2009) evaluated the design and implementation of the Microsoft peer coaching program in Florida and attitudes regarding technology. They interviewed teachers to understand the benefits and limitations to coaching. The researchers determined that their peer coaching model was indeed successful with changing teachers’ attitudes about technology use and offered four suggestions for improving the effectiveness of the coaching model:
1. Help coaches to better understand the potential of technology
2. Provide them with experiences that allow them to see effective integration of technology
3. Emphasize the effect on student achievement
4. Improve the technology resources available to teachers

Another study examined the effect of using mentor teachers to promote the use of computer technologies in math and assessed teachers’ attitudes, confidence, and skills toward technology when teachers were paired with a mentor teacher, similar to a coach (Holahan et al., 2000). Results showed that the mentor teachers’ attitudes improved over the course of the study and technology use increased. Additionally, the study revealed the importance of having mentors that are highly motivates and respected by their peers as they provide better influence on teachers. A study completed by Grove, Strudler, & Odell (2004) researched the effects of cooperating teachers helping student teachers with integrating technology through a mentoring process similar to coaching. The teachers utilized observations, modeling, and reflection to assist student teachers in the process. The researchers collected data, which included teachers reflecting on their experiences with the process. They found one-on-one modeling, discussion and reflection on content areas topics, and encouragement all supported teachers in their use of technology (Grove et al., 2004). Peer coaching within communities of practice has the potential to be successful with improving teachers’ integration practices. For this reason, it is crucial to understand the effect of using peer coaching for the purposes of professional learning.

**Rationale for study**

Although many studies have researched the use of peer coaching, there is little information that provides a link between peer coaching and the improvement of integration
practices in K-12 schools (Barron et al., 2009). This research set out to uncover whether teacher practices in technology integration improve using this collaborative approach and whether teachers’ practices affected student achievement. It also sought to assess teachers’ comfort levels with technology integration. Qualitative methods were used to ascertain how coaches influence their peer teacher’s practices and what practices help or hinder them in these processes. These methods were used to support the quantitative measures on comfort and change in practice.

Current professional learning models tend to emphasize isolated learning experiences which fail to support growth and expertise in teaching (Matzen & Edmunds, 2007). The current study utilized peer coaches, teachers highly experienced with curriculum and pedagogy, to educate the teachers they work alongside every day. Teachers coaching one another can be beneficial to both parties because it may help them provide meaningful uses of technology while assisting their peers in learning how to use technology more effectively with their students (Holahan et al., 2000).

Baylor and Richie (2002) found that 88% of teachers depend on professional learning to develop their technology integration skills. In fact, several factors that influence teacher learning include the need for planning to improve skills and confidence (Baylor & Richie, 2002), one-on-one assistance (Jones, 2001), and time to develop curriculum based lessons with the use of technology (Hannifin, 2005; Staples, Pugach, & Himes, 2005). Peer coaching provides all of these as the time is embedded in teachers’ collaborative planning. For this reason, research that contributes to understanding the effect of peer coaching can help educators to make decisions about what works best in improving technology integration in schools.

Many different models of peer coaching are available for use by educators and those outside of education. The model of peer coaching used for this study is particularly unique to the
current research on peer coaching studies. While several models of peer coaching make use of an outside expert to assist teachers with technology integration, the model used for this study used existing teachers as well as a technology expert. This study made use of a Technology Literacy Coach (TLC), who assisted teachers at several schools, as well as one 6th grade teacher from each subject area in the grade level who was designated as a peer coach to teachers on his or her team. The studies which have investigated peer coaching models with a person hired specifically to coach teachers in technology integration differ in that no extra personnel were assigned to assist the participants (Barron et al., 2009; Cole et al., 2002; Mills & Tincher, 2003; Sugar, 2005). Instead, teacher leaders at the school, not necessarily experts in technology, were used to coach their peers in technology integration. The technology expert or TLC merely assisted and guided the coaches in the process and helped teachers during instruction when needed. Using peers for technology coaching provides a cost-effective way of promoting leadership and learning in the area of technology integration. Understanding the effects of this type of peer coaching has benefits that may offer hope for sustainable improvement in schools, which is vital for continued success with technology integration.

The researcher has found that most of the current research in the use of peer coaching is qualitative in nature and has focused primarily on attitudes and beliefs about its use. More specifically, past research that has looked at comfort levels with technology was based mainly on teachers’ perception of comfort (Matzen & Edmunds, 2007; Mills, & Tincher, 2003). This study allowed teachers to discuss their perception of comfort as well as participate in a survey to assess their personal use of computing devices in order to establish their comfort level. Comfort is important because when teachers are comfortable with technology, oftentimes they are able to integrate technology more effectively with a focus on student-centered instruction (Matzen &
Edmunds, 2010). Understanding the effect of PC on comfort, therefore, can assist in understanding teachers’ practices and ultimate effect on student learning.

Because student learning hinges on how well teachers instruct, understanding change in practice is essential. Sawchuk (2010) observed that few professional learning activities are linked to measures that demonstrate that teachers have improved their instructional practices with students. It has been well established that change in practice requires time and support for teachers (Borthwick & Pierson, 2008; Bradshaw, 2002). Oftentimes it is difficult to measure change in practice, especially over a short time frame as is used for this research. For this reason, this study made use of observations as well as an assessment of teachers’ technology integration practices to measure change in practice. While several studies have made use of reflections and discussions with teachers to assess change in practice, the researcher opted to use observations and surveys, which are critical to understanding how teachers have modified their instruction with technology (Martin et. al, 2010; Glazera & Hannifin, 2006; Grove et al., 2004). Research has shown that teacher use of technology is low but student use is even lower (Vanatta & Fordham, 2004). For this reason, it is also necessary to measure and understand whether peer coaching affects changes in teachers’ integration practices with their students.

Additionally, this study sought to identify the effect on student achievement by measuring students’ skills with technology using the Technology Literacy Assessment (TLA). Few studies have demonstrated improved student technology skills in relation to teachers who have been trained using peer coaching for technology integration. Martin et al., (2010) affirmed that measuring the impact on student outcomes has been a challenge. One study by Baylor and Richie (2002) measured several factors related to technology use in schools. Student achievement, however, was only addressed by analyzing teachers’ perceptions of student
learning, rather than a skills assessment of students. While the eMints study made use of a standardized assessment on the Missouri Assessment Program (MAP) to determine whether a teacher technology professional learning program helped close the achievement gap between Black and White students, students’ technology skills were not assessed. While teachers oftentimes see the value in making use of technology for learning, they do not always understand how it can improve student achievement (Franklin et al., 2001). Educators must understand the positive impact technology can have on student learning in order to understand its true value (Bradshaw, 2002; Hughes & Ooms, 2004; Vanatta & Fordham, 2004). Consequently, it is vital to research overall effect on student achievement with technology. Often, teachers do not attribute success in content to what they are doing with technology, so a specific assessment for technology literacy can help teachers understand this connection. In the end, it can help to provide educators with incentive for improving their technology integration skills for improved instruction. Thus, this research is needed because it will help provide the link between professional learning and student achievement with technology.

The researcher examined the effects of peer coaching as a professional learning strategy used to assist teachers with technology integration. Teachers helping teachers may make learning more efficient by making use of knowledgeable peers during time already reserved for preparing instruction. It also requires little additional funding and makes use of staff members who are aware of their students’ needs, rather than outside personnel who may not understand those needs. This study is important because it may help uncover qualities of a cost and time effective way for improving teaching practices with technology. Ultimately, understanding the impact of peer coaching on comfort levels with technology, technology integration practices, and the culminating effect on student achievement with technology may help educators to determine the
true potential of coaching as an effective form of professional learning with technology. The following chapter will detail the methods used to complete this study.
CHAPTER THREE

METHODOLOGY

Research Design

The purpose of this mixed method study is to pursue research on the following four areas of peer coaching as they relate to technology integration:

1. The effect of peer coaching on teachers’ comfort level with technology integration by assessing teachers before and after the treatment;
2. The effect of peer coaching on how teachers use technology in the classroom before and after the treatment;
3. The effect of technology integration practice on student technology literacy achievement before and after the treatment;
4. The factors that helped and hindered teachers in the process of peer coaching for technology integration.

The researcher chose to utilize mixed methods, with quantitative and qualitative data, for a variety of reasons. As defined by Creswell and Clark (2007), mixed methods uses both types of inquiry, in conjunction, allowing for a better understanding of research problems than either type can individually. Scholars increasingly utilize this methodology as it provides a more comprehensive understanding of research problems; while one form may be sufficient, both can provide a complete picture (Creswell & Clark, 2007). Making use of both forms of data can afford the researcher more conclusive evidence and offset the limitations of one form of data alone (Creswell & Clark, 2007; Bryman, 2006). In the case of this study, there was a need to augment the quantitative data with qualitative data to help provide possible explanations for the results. As Bryman (2006) states, using both methods can help to uncover relationships between
variables and enhance the integrity of the findings by providing a comprehensive illustration and bridging quantitative findings with qualitative explanations. Palak and Walls (2009), who completed a study of teachers’ beliefs with regards to technology practices, recommended future technology research to be based on mixed methods if change in practice is the desired outcome. They argue it provides a more detailed, convincing picture of what is needed from teachers (Palak & Walls, 2009). In the case of the current study, using quantitative results with qualitative support through interviews and observations provided a more rich and intricate view of the various factors that affected the coaching process. It also provided further validity to the final results by supporting the quantitative data with qualitative results.

Participants and Setting

As stated earlier, the setting for this research is a middle school made up of three grade levels, 6th through 8th, in an urban area of Georgia. The school has approximately 887 students and 74 teachers, and a 12 to 1 student to teacher ratio (National Center for Educational Statistics, 2011). Built in 1996, the school has a diverse population demographically with the student body consisting of 8% Caucasian, 50% African American, 39% Hispanic, and 2% Asian students. Eighty percent of the student body qualifies for free or reduced lunch (National Center for Educational Statistics, 2011). Teacher experience varies as well, with the average years of expertise being 11.4 years, and 45% having less than 10 years, 45% with 10 to 20 years, and 10% of teachers with 21 or more years of service (Georgia Department of Education Website, 2010). The school is designated as a Title I school, due to the large number of students who qualify for free and reduced lunch. Being identified as Title I entitled the school to additional federal funding in order to assist students with meeting their educational goals. Funds can be used for professional learning for teachers, program improvement for students, and resources for
the school. There were originally sixteen 6th grade teachers with an average of 11 years of experience who participated in this study, although three teachers dropped out prior to the conclusion of the study leaving 13 remaining.

The 13 participants, including four males and nine females, were all 6th grade teachers who have worked in the school for at least three years. For this reason, they were familiar with the schools’ overall instructional objectives and procedures, which included bimonthly collaborative planning time. This was helpful because teachers were well versed in working together to plan for instruction. Coaches and teachers were included in the total number of teacher participants because coaches were responsible for the same outcome from students as their peer teachers. Additionally, both groups worked on improving comfort and integration practices throughout the study. Participation was voluntary, however, administration did mention that making use of technology was going to be part of their instructional evaluation the following year and it may prepare them for the expectation by participating in the study.

Site and Population Selection

Participants were selected as a sample of convenience as teacher and student participants attended the school where the researcher/district TLC was employed. As previously mentioned, all Title I middle schools in this particular district were provided with a TLC to ensure their teachers and students had assistance in making instructional use of technology. This group of teachers was selected because all 6th grade students at the district's Title I schools were required to complete the Technology Literacy Assessment at the beginning and end of the year, which provided the data needed to assess student progress with technology literacy skills. Participants who served as peer coaches, were invited based on administrative recommendations, and their willingness to assist. These teachers acted as coaches to teachers in their grade level/subject area
to assist in the process of technology integration. They were charged with helping teachers by modeling technology integration, planning lessons, and providing guidance and feedback to the teachers to guide and help them in the technology integration process.

Of the 13 teachers participating in the study, which lasted a total of eight weeks, four of those teachers were assigned to be coaches. Coaches were selected by the school’s administration according to their instructional skills and ability to lead, not necessarily their technology expertise. In fact, several of the coaches had LoTi scores that were equal to or lower than the teachers they coached. For this reason, as mentioned earlier, the coaches and teachers were assessed equally for change in comfort and instructional practices in the data collection process. The coaches were initially trained by the researcher, who was their district TLC, to use the strategies inspired by the Cognitive Apprenticeship Model articulated by Dennen and Burner to include (2004, p. 427) modeling, coaching, reflection, articulation, and exploration. Training also involved providing coaches with guidelines for coaching their peers and suggestions for types of technology to use with students according to the National Educational Technology Standards (NETS-S) for middle school students (Appendix A and B). In addition, the coaches were offered ideas for planning for technology integration with their teachers, including use of suggested technology tools that would assist 6th grade students with building technology literacy according to their progress on the TLA pre-assessment, taken in September 2009 (Appendix C). Finally, the coaches spent time discussing what types of projects would fit best into their subject area curriculum with guidance from the TLC. Coaches were then expected to support their team of teachers by modeling effective technology integration, assisting with lesson planning, and providing guidance and feedback in the integration process. They were expected to meet on a bi-weekly basis to complete the coaching activities with their teams or Communities of Practice.
They were also expected to reflect on practices, once the integration process started, and explore ways to make changes in their plans along the way. Though the expectation was to meet twice a month, all but the math group met much more than the requirement. Coaches were asked to offer teachers help from the district TLC if they felt uncomfortable with the actual integration process during instruction, since the coaches were teaching their own students and could not assist during the school day. Consequently, coaches requested the district TLC to continue the coaching process with teachers by working in the classroom as necessary, modeling integration, and assisting with technology integration.

*Position of the Researcher*

Because a portion of this study was qualitative in nature, it is necessary to understand the position of the researcher. The researcher played the role of guiding the coaches in the coaching process, assisting teachers with integrating technology during classroom lessons, and attending meetings with the teachers, as well as assisting with the collaborative learning process. The researcher essentially acted as the leader in the peer coaching process and assistant during classroom lessons as needed. She also collected data through observations of classroom instruction and during peer coaching sessions.

*Data Collection Process*

The four key areas assessed during the study: change in comfort level, change in instructional practices, student technology literacy achievement, and what helped and/or hindered teachers during the peer coaching process, were assessed quantitatively with a pre-/post-assessment and qualitatively throughout the study. Change in comfort level and instructional practices were assessed using the Level of Technology Implementation (LoTi) digital age survey. The researcher used the pre-assessment to understand the coaches and
teachers’ comfort levels, using the Personal Computer Usage (PCU) score, and current practices with technology using teachers’ estimated Level of Technology Integration (LoTi) level. Interviews, observations, and focus group discussions were also used to determine how teachers’ comfort levels and instructional practices changed and the overall impact on teaching and learning according to teachers’ perceptions. Student technology literacy achievement was assessed before and after the peer coaching treatment as well. Students were tested using learning.com’s Technology Literacy Assessment (TLA) at the beginning of the year, in September 2009, and the end of the eight week peer coaching treatment, in May 2010. Finally, at the conclusion of the study, teachers were also asked what helped and hindered them in the coaching and integration process. This was done to determine what actually happened during the coaching process and how teachers followed up in their classroom practices. It was also necessary so as to inform future research and practices with peer coaching.

Coaches and teachers were assessed at the beginning and end of the study, in March 2010 and May 2010, using the LoTi survey. The unit of analysis for this study, therefore, was the group of teachers involved in the coaching, including the coaches. A power analysis indicated that the minimum number of paired samples was 13. A pre-test/post-test paired comparison group design was used to determine whether teachers’ comfort level and practices with technology changed after the treatment. The results were analyzed using a paired sample t-test. Student results on the TLA were also analyzed using t-tests to measure change in technology literacy scores.

Teachers were placed in one of four Communities of Practice (CoPs), based on their subject area, with a coach assigned to each group. As stated previously, teachers were assigned to serve as cognitive coaches to their peers, offering assistance in the planning and instructional
implementation of technology to others in their group. The district technology literacy coach led the coaches through this process and made herself available to assist teachers with technology implementation during the instructional time with students, since coaches were not able to leave their own classes to assist. The coaches, teachers, and district technology coach worked together to develop lesson plans with student use of technology, based on their particular area of instruction.

The coaches were first made aware of the strategies of the Cognitive Apprenticeship (CA) model that would be used in order to prepare them for their role in the community. They then worked with their peer teachers by defining and modeling how to apply technology using spreadsheets, word processing, database systems, multimedia and presentations, and the Internet. These are all areas included on the TLA that assess middle school students’ technology literacy skills. The peer teachers, who acted as apprentices, were then coached through the process of developing lessons that involved implementation of each of the technology skills listed previously. The district TLC was also available to assist the teachers as they instructed the students with the designed lessons. This process took place over the course of eight weeks.

In order to interpret the effects of technology integration, the researcher addressed the additional strategies of the CA model by having teachers and coaches reflect on the coaching process during their meetings. Coaches and teachers discussed their own progress as well as their students’ progress with technology. They articulated their reflections to their teams, at which time they were to explore new methods and refine their plans for instruction. The researcher digitally recorded these sessions, one time per subject area, during the required collaborative planning time. These took place toward the end of the study so that teachers had plenty of time to practice the process. The recorded audiotape was saved for future transcription.
The researcher also completed observations during several of the lessons, in order to assess the change in practice resulting from coaching. Notes were taken to illustrate how technology was implemented into instruction, looking specifically at teacher roles, student activities, student use of technology, and the overall necessity of technology being used. The final observations were analyzed and results were shared with the teachers to verify what the researcher observed. All of the data collected was used to develop an understanding the impact of the CA model on teaching, learning, and practice in the classroom.

In order to understand the responses on the LoTi, teachers were asked to answer questions prior to and at the conclusion of the study. Teachers were asked to respond in writing to the following questions prior to the study:

1. Describe your comfort level with integrating technology in instruction and how often you use technology with your students.
2. How do you currently make use of technology with your students?
3. Give an example of how you’ve used technology for instruction this year.

At the conclusion of the study, teachers were asked to respond to the following questions. These responses were gathered through digitally recorded interviews with the researcher.

1. How are you using technology now, differently than you were prior to the study?
2. Has your comfort level with integrating technology in instruction changed? Please explain why or why not and how.
3. What helped you in the peer coaching and integration process? What hindered you in the coaching and integration process?

Teacher responses to the initial survey questions were collected and coded using
HyperResearch. The researcher analyzed the data for common themes that indicated their comfort level with technology and current use of technology. Responses to the questions at the conclusion of the study were collected orally with an audio recorder and coded using HyperResearch. The researcher looked for trends that indicated changes in the use of technology, comfort level, and factors that helped and hindered teachers in the coaching and integration process. The participants were asked to verify their responses during interviews to ensure the researcher was getting an accurate representation of their feelings. This was done after the results were analyzed as well. Member checking, therefore, was used both during the interviews and after analyzing the data to ensure the validity of the results.

Most teachers were also observed prior to and during the treatment in order to assess change in practice over the course of the study. The researcher made use of the International Society for Technology in Education (ISTE) Classroom Observation Tool to record observations (Appendix D). As stated earlier, classroom observations focused specifically on changes in teacher’s roles, student roles, technology used, and the necessity of technology used. Each area was examined and assessed for differences from the beginning to the end of the study.

Data Collection Instruments

LoTi Survey

Teachers began by participating in the online Levels of Technology Implementation survey (LoTi), which was used to assess teachers’ Personal Computer Usage, to determine comfort with technology, as well as teachers’ current technology implementation practices, using LoTi scores. This online survey contains 37 questions and took teachers approximately 20 to 30 minutes to complete (Appendix E). The questions are based on components of The National Educational Technology Standards for Teachers (NETS-T), which define the characteristics of
successful technology integration skills for teachers (Loti Connection Website, 2008). Teachers LoTi levels have scores that range from zero to four based on teachers’ implementation of computers in classroom instruction. The levels are defined below and range from 0 to 6. This information was obtained from the LoTi Connection Website (2011):

**LoTi Level 0 (Non-Use)**- This level is indicative of a teacher who does not have access to or makes use of technology in the classroom.

**LoTi Level 1 (Awareness)**- This level indicates that the teacher makes use of technology for administrative purposes or for teacher centered presentations.

**LoTi Level 2 (Exploration)**- At this level, some technology tools are used by the teacher but mainly as an extension to the instruction. Student projects may be lower level or teachers may use computers for drill-based activities.

**LoTi Level 3 (Infusion)**- At this level, teachers may be making use of tools such as databases, spreadsheets, multimedia, or internet for instruction.

**LoTi Level 4a (Integration: Mechanical)**- At this level, a teacher may automatically integrate technology tools into classroom instruction. Students are provided with a use of technology that helps build understanding of concepts.

**LoTi Level 4b (Integration: Routine)**- As the label indicates, integration is done in a routine manner that enhances instruction and learning for students. Students are able to solve problems and require higher level skills from students.
LoTi Level 5 (Expansion)-This level indicates the teacher is making technology a regular part of learning and communicating via the computer. Communication would expand to other networks outside of the school.

LoTi Level 6 (Refinement)-This level indicates that teachers are using technology as a tool for solving practical every day problems. Instruction and technology are no longer separate from instruction and students have easy access to many types of technology tools.

The Personal Computer Usage (PCU) score on the LoTi assesses teachers comfort and skill with computers and technology. Scores can range from 0 to 7. PCU levels are defined in three categories describing teachers’ comfort with computers (“Not true of me now,” “Somewhat true of me,” and “Very true of me now”). This information was also obtained from the LoTi Connection website (2011)

Not true of me now

Level 0-Participants at level 0 do not feel comfortable with use of the computer and may make use of more traditional tools such as the overhead projector or pencil/paper activities

Level 1-Participants have little skill with the computer for personal use. They are aware of the basic tools but do not use them.

Level 2-Participants have little to moderate skills for personal use of computers. They use the Internet, email, and word processing but do not have a lot of comfort. May use management tools for administrative purposes.
**Somewhat true of me now**

*Level 3*-Participants have moderate skills and may be regular uses of certain tools such as Internet, email, word processing. May have some comfort with trouble-shooting as well

*Level 4*-Participant has a moderate to high skill level with computers. May be able to use many types of software proficiently and can trouble-shoot without additional assistance.

*Level 5*-Participant has a high level of personal computer usage. Can create web pages and make use of web tools.

**Very true of me now**

*Level 6*-Participant has a very high level of personal computer usage. They are sophisticated users of computer technology and can trouble shoot with ease.

*Level 7*-Participant has an extremely high level of personal computer usage. At this level, participants often act as mentors and trainers for computer use.

**LoTi Validity**

The Levels of Technology Implementation (LoTi) survey was developed by Moersch in 1995 and was used to assess authentic classroom use of technology (Stoltzfus, 2009). This online assessment was taken in March and again at the end of May and scoring was generated by the website. It is made up of 38 items using a five-factor model, with alpha coefficients for each scale ranging from .66 to .93 (Stoltzfus, 2009). These factors include:

1. Using technology for complex student products requiring problem solving, critical
thinking, and real world applicability;

2. Teacher proficiency with using technology;

3. Student influences on teachers’ current instructional practices;

4. Dependence on resources and assistance to increase comfort level in using technology;

5. Challenges to teachers’ use of computers in the classroom (Stoltzfus, 2009, p. 7).

For the purposes of this study, only two out of the five scales were used to answer research questions one and four. These scales included numbers one and two listed above. These are reported in the data as LoTi levels, containing 12 items, and as Personal Computer Use (PCU) levels, containing seven items.

Technology Literacy Assessment

The Technology Literacy Assessment (TLA) is an online assessment that is designed to assess students’ technology knowledge and skills with the following areas: Spreadsheets, Word Processing, Database, Multimedia/ Presentations, Telecommunications and the Internet, Systems and Fundamentals, and Social and ethical issues dealing with computing and technology. It was created to help support the accountability portion of No Child Left Behind (NCLB) expectation that all middle school students be technologically proficient by the time they finish middle school. The district where this research was completed chose this assessment to assess students’ technology literacy skills and better understand if students are meeting the technology objective of NCLB. This interactive test consists of both multiple choice question and interactive responses that require students to demonstrate their use of the tools listed earlier. Sample test questions can be seen in Appendix F.

Technology Literacy Assessment Validity
The Technology Literacy Assessment was used to assess students’ proficiency with basic technology tools and applications. This online, interactive assessment determines students’ technology knowledge and skills with the following areas: spreadsheets, word processing, database, multimedia/presentations, telecommunications and the Internet, systems and fundamentals, and social and ethical issues dealing with computing and technology. Scores were determined by the website. This middle school test was tested using three different models. The initial model was accepted as the best fit, which “estimates one ‘slope’ or discrimination parameter for all items” and used a specific parameter to determine the ease or difficulty of an each item on the test (Patelis, Sireci, & Wiley, 2006, p. 2). The alpha coefficient for this scale is .90, which is quite high.

**ISTE Classroom Observation form (ICOT)**

This observation form can be found at [http://icot.iste.org/icot/index.php](http://icot.iste.org/icot/index.php) and is provided in Appendix D. The form is used to guide classroom observations of technology integration. The researcher used it to assess change in practice over the course of the eight-week study and focused on specific components of the observation form for the purposes of this research. The setting, which includes student and room characteristics as well as description of computing devices in the room, was used to give the observer a better picture of what technology was available to teachers. Additionally, teacher roles in the classroom, learning activities, technologies used by the teacher and students, and evaluation of the necessity of those technology tools to the lesson were observed and noted from pre- to post-observation. All teachers were observed initially. For the post-observation, however, all but two teachers were observed due to the fact that those teachers taught inclusion classes with other teachers. The collected data from the observations are presented in Tables six through eight in Chapter four.
Data Analysis

The LoTi survey results were analyzed using $t$-tests. A paired sample $t$-test was performed to determine if there was a difference from pre-test and post-test. A significance level of .05 was used for all analyses. TLA scores for the 6th grade student group as a whole were also assessed using a $t$-test to determine whether there was a significant difference between test scores at pre-test and post-test.

The researcher proposes the following research questions designated within the four categories:

**Comfort**

1. Do teachers’ comfort levels with technology increase as measured by the pre-/post-assessment?

2. How do the teachers describe their comfort level with integrating technology in instruction prior to the pre-coaching treatment?

3. How do the teachers describe their comfort level with integrating technology in instruction after the peer coaching treatment?

**Practice**

4. Do the teachers’ instructional practices with technology change as measured by the pre-/post-assessment?

5. How did the teachers make use of technology with their students prior to the study this year?

6. How are the teachers using technology differently than they were prior to the study?
Student Achievement

7. Do the students, taught by teachers participating in the coaching process, show improvement in their Technology Literacy Achievement from pre- to post-test?

Process of Coaching

8. How do peer coaches influence teachers’ instructional practices?

9. What factors helped and hindered teachers in the coaching and integration process?

The researcher proposes the following hypotheses:

Research Question 1 Hypothesis

$H_0$ - The teachers will not improve significantly in terms of comfort with technology as measured by the LoTi survey at post-test.

$H_1$ - The teachers will improve significantly in terms of comfort with technology as measured by the LoTi survey at post-test.

Research Question 4 Hypothesis

$H_0$ - The teachers will not improve significantly in terms of technology implementation practices as measured by the LoTi survey at post-test.

$H_1$ - The teachers will improve significantly in terms of technology implementation practices as measured by the LoTi survey at post-test.

Research Question 7 Hypothesis

$H_0$ - Students will not improve significantly in terms of technology literacy achievement as measured by the Technology Literacy Assessment at post-test.

$H_1$ - Students will improve significantly in terms of technology literacy achievement
as measured by the Technology Literacy Assessment at post-test.

Data Collection

Qualitative data were analyzed to assess teachers' perceptions of their comfort with technology, current instructional practices with technology, and technology integration needs. The researcher searched for patterns in responses from teachers. At the conclusion of the coaching process, teachers answered follow-up questions regarding their comfort levels with technology, instructional practices with technology, and what enabled and impeded them in the coaching process. Both surveys were analyzed using HyperResearch for coding purposes. Finally, observations were completed using the ISTE Classroom Observation Tool to assess teacher’s role, learning activities, technology used by the student and teacher, and whether technology was essential to the lesson or not. The following four tables, broken into the four areas of inquiry, identify specific details about the quantitative and qualitative data that was collected and how the data were analyzed for each area researched including comfort with technology, change in instruction practices with technology, student technology literacy, and the coaching process.
Table 1. Comfort Research Questions and Analyses

<table>
<thead>
<tr>
<th>Quantitative Question</th>
<th>Hypothesis</th>
<th>Independent Variable</th>
<th>Dependent Variable</th>
<th>Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1: Do teachers’ comfort levels with technology increase from pre- to post-test?</td>
<td>H1: Yes, the teachers’ comfort levels with technology will increase from pre- to post test.</td>
<td>The process of providing technology integration support through trained peers who act as coaches</td>
<td>Score on Personal Computer Usage (PCU) scale on Level of Technology Implementation survey</td>
<td>t-test</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Qualitative Questions</th>
<th>Data Collection Methods</th>
<th>Data Analysis Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2: How do the teachers describe their comfort level with integrating technology in instruction prior to the peer coaching treatment?</td>
<td>Pre-responses to open-ended questions</td>
<td>Descriptions, trends, and patterns Results will be coded and analyzed for trends and patterns</td>
</tr>
<tr>
<td>Q3: How did the teachers describe their comfort level with integrating technology after the coaching treatment?</td>
<td>Interviews, focus groups Post open-ended question responses</td>
<td></td>
</tr>
</tbody>
</table>
### Table 2. Change in Practice Research Questions and Analyses

<table>
<thead>
<tr>
<th>Quantitative Question</th>
<th>Hypothesis</th>
<th>Independent Variable</th>
<th>Dependent Variable</th>
<th>Analyses</th>
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</thead>
<tbody>
<tr>
<td>Q4: Do the teachers instructional practices with technology change from pre-test to post-test?</td>
<td>H2: Yes, the teachers’ instructional practices with technology will increase from pre-test to post-test.</td>
<td>The process of providing technology integration support through trained peers who act as coaches</td>
<td>Level of technology implementation score</td>
<td>t-test</td>
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</table>

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<tr>
<th>Qualitative Questions</th>
<th>Data Collection Methods</th>
<th>Data Analysis Methods</th>
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<tr>
<td>Q5: How did the teachers make use of technology with their students this year prior to the study?</td>
<td>Pre-responses to open-ended questions</td>
<td>Descriptions, trends, and patterns</td>
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<td>Q6: How are the teachers using technology differently than they were prior to the study?</td>
<td>Interviews, focus groups, Post open-ended question responses</td>
<td>Results will be coded and analyzed for trends and patterns</td>
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Table 3. Student Technology Literacy Research Question and Analysis

<table>
<thead>
<tr>
<th>Quantitative Question</th>
<th>Hypothesis</th>
<th>Independent Variable</th>
<th>Dependent Variable</th>
<th>Analyses</th>
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</thead>
<tbody>
<tr>
<td>Q7: Do the students, taught by teachers participating in the coaching process, show improvement in their Technology Literacy Achievement from pre- to post test?</td>
<td>H3: Yes, the students’ scores will show improvement from pre- to post-test.</td>
<td>The process of students being taught by teachers participating in technology integration coaching/support from trained teacher peers.</td>
<td>Student Technology Literacy Achievement scores as measured by an annual technology literacy assessment purchased from vendor</td>
<td>$t$-test</td>
</tr>
<tr>
<td>Qualitative Question</td>
<td>Data Collection Methods</td>
<td>Data Analysis Methods</td>
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<td>Q8: How do peer coaches influence other teachers’ instructional practices?</td>
<td>Interviews, focus groups.</td>
<td>Descriptions, trends, and patterns</td>
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<tr>
<td>Q9: What practices enable and impede the teachers in the coaching process?</td>
<td>Interviews, focus groups</td>
<td>Results will be coded and analyzed for trends and patterns</td>
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<td></td>
<td>Observations of team time</td>
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<td></td>
<td>Post open-ended question responses</td>
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</table>
Limitations

This study had several potential limitations. The first, and most important, limitation was the lack of a comparison group from which to compare results. This made it difficult to prove the connection between coaching and improvement in comfort and practices. The researcher initially had a comparison group with a similar school who would complete the same assessments but not participate in the peer-coaching process, however only three teachers out of sixteen agreed to take the initial assessment. The comparison group was therefore dropped due to lack of participation. Another limitation that emerged was the size of the teacher group being studied, with a total of 13 teachers participating from beginning to the end of the data collection. As a result of these two circumstances, additional qualitative data were collected to supplement the data of study group and better understand the integral process of peer coaching.

The length of time the study took place was also a limitation. Eight weeks is potentially a short amount of time for the coaching process to be implemented and assessed. Though the time was abbreviated, positive results were seen offering some evidence that the process does work to improve teachers’ comfort level and practices. Additionally, the improvement in student achievement indicates that long-term treatment may improve student achievement even more significantly.

Relationships play a key role in successful peer-coaching experiences. This factor may have affected the results of some of the teachers’ learning and technology integration, and thus became a potential limitation. As Marshall and Rossman state: “Human actions are significantly influenced by the setting in which they occur” (2006, p. 42). It is also possible that the power dynamics, which existed naturally in the group, may have affected teachers’ overall desire to
improve their instruction with technology (Marshall & Rossman, 2006). Additionally, self-reported data were used to assess teachers’ own technology integration. For this reason, the data may not have illustrated an accurate picture of how well they integrated technology over the course of the study. Observations should help support the study with data to better understand the impact on teachers’ practice. In addition, teachers may have tried to complete the survey and follow-up responses quickly due to their tight schedules and heavy workloads. These factors were monitored during the study and will be reported in the results. Finally, the student technology literacy scores were collected initially at the beginning of the year and again at the conclusion of the study. For this reason, it is possible that the final scores may be a result of work done with students prior to the eight-week study at the end of the year.

Because of the large data collection, it is difficult to include all of the information in the final report. This was done intentionally so that if one form of data is not available or teachers elect to drop out of the study, there will be ample data from which to draw conclusions. Because the researcher was involved in the practice of coaching, it is possible that judgment and interpretation may be included although the researcher did her best to discern which data were pertinent to the final results and used member checking to ensure the responses were adequately interpreted (Schwandt, 2007). Finally, it is important to understand that that the results of this study are specific to the setting and context in which the research took place and therefore cannot necessarily be replicated to another setting (Marshall & Rossman, 2006).

**Overview of Chapters 4 & 5**

The next two chapters will reveal the results of the study. Chapter four will present the findings of how peer coaching affected teachers’ comfort levels and instructional practices with technology. It will also show the results of students’ technology literacy achievement from pre-
to post-test of students who learned from teachers involved in the coaching process. A discussion of the results will be presented in Chapter Five to better understand what occurred over the course of the study. Both chapters will show that comfort levels improved over the course of the eight weeks and instructional practices changed to incorporate increased use of technology in most of the curricular subject areas. Student test scores also improved significantly from pre- to post-assessment, demonstrating that teachers’ technology integration practices improved student achievement with technology. Finally, teachers’ responses to what enabled and impeded them in the coaching process and suggestions for further research will be shared.
CHAPTER FOUR

FINDINGS

This study investigated the effects on comfort level and instructional practices of teachers participating in peer coaching for technology integration. It also sought to determine if technology literacy achievement changed in students who were instructed by the teachers participating in the practice of peer coaching. The purpose of this chapter is to report the findings of this study. Although quantitative and qualitative results differed in the degree of impact, results were generally positive regarding improved comfort levels and change in practice. Student achievement with technology improved greatly from pre- to post-test. This study also assessed the factors that helped and hindered teachers in the coaching process and how coaches influenced their teachers. Some of the barriers to improvement included personality factors between coaches and their teams and lack of available technology, factors primarily outside the control of the researcher. The results of the analysis of data for each of the four areas in response to the nine research questions that guided this study will be presented. Chapter five will then present a discussion of these findings and the implications this research has on educators and students. It will also offer suggestions for future research in peer coaching.

Comfort with technology

Research Questions One, Two, and Three

Question 1: Do teachers’ comfort levels with technology increase as measured by the pre-/post-assessment?

Question 2: How did the teachers describe their comfort level with integrating technology in instruction prior to the study?

Question 3: How did the teachers describe their comfort level with integrating
Comfort was measured by the Personal Computer Usage (PCU) portion of the LoTi, which assessed teachers’ degree of comfort with technology and student resources for learning prior to and at the conclusion of the study. Only the 13 teachers who completed the study, from beginning to end, were included in the final scores. All tests for assumptions of normality of the data were conducted and met. On a scale from level zero to seven, the mean pre-PCU score was 1.38. The post-PCU mean was 2.23, with a difference of .85 points. A paired sample $t$-test ($t(12) = -2.085, p = .059$), indicates that teachers’ change in comfort level, from pre- to post-test, while non-significant, was approaching significance. Nine out of the 13 teachers increased their comfort by at least one level. If there had been a larger group of teachers, it is possible that the change in comfort level would have been significant due to increased statistical power.

In order to understand the effects on teachers’ comfort level with technology, teachers were also asked to describe their comfort with technology resources prior to the treatment. For the purposes of better understanding teachers’ comfort levels, both the pre- and post-PCU score and teachers’ personal descriptions of comfort are displayed in Table 5. The table is designed to demonstrate the change in comfort for both teachers and coaches using both the PCU score and the participants’ self-described comfort levels. Each score is listed from pre-treatment to post-treatment with teacher role and subject area indicated. Subject areas are listed as follows: LA/Language Arts, M/Math, SS/Social Studies, and S/Science.

Participants in this study had PCU scores ranging from a low of 0 to high of 4, however scores can range from 0 to 6. All six levels are described in the methodology based on the description on the LoTi website (http://www.loti.com). The table lists the four teachers who served as coaches, followed by the remaining nine teachers. It is important to note that the pre-
descriptions are brief as these were written responses, while the post-descriptions were collected orally through individual interviews.

As Table 5 illustrates, most participants scored a zero or one on the LoTi PCU pre-test although two participants, one being a coach, scored a PCU level two while two participants scored higher than level two. The coaches, listed first in the table by subject area, had an average comfort score of one while the teachers had an average comfort level of 1.6. One coach, in fact, scored a comfort level of zero. This is important to note, as it indicates the coaches did not necessarily report greater comfort with integrating technology than the teachers at the beginning of the study. As mentioned previously, coaches were chosen through recommendations from the school’s administration, based primarily on their ability to lead teachers and instruct students by designing pedagogically sound lessons. The coaches’ experience with technology, therefore, was not a primary factor in being selected for coaching. In fact, the principal acknowledged that typically if a teacher was good with instructing students, they were also the teachers she observed using technology most frequently. This implied to her that those teachers were comfortable with integrating technology. It is also important to note that all of the coaches except the math coach indicated in their open responses that they felt “very” comfortable with integrating technology into instruction, although the math teacher obtained the highest PCU score of all of the coaches. For this reason, in examining the PCU scores it appears that coaches felt no more comfort with integrating technology than the teachers.

There could be several reasons the coaches’ PCU scores failed to parallel the statements they made regarding comfort. The coaches may have felt more confident with their skills once they were chosen to lead the teachers, resulting in personal statements that revealed their comfort at that point even though the LoTi did not reveal such comfort. If this is the case, the math
teacher may have lacked comfort with technology as compared to the other teachers or may have confidence with the tools addressed in the LoTi, but may not have comfort with math tools he/she felt should be used in math class. It is also possible that the coaches, being outstanding teachers as the principal indicated, were more critical of their own skills on the survey but were able to express their comfort in words more confidently.

The results of the teachers’ PCU scores are worth noting as well. T1 and T7 both described themselves as having an especially high comfort level with technology, however, T7 scored at a PCU level of three while T1 scored level one. Other teachers who scored a level one described their own levels as low or moderately low, which is likely comparable to a score of one. Additionally, T9 obtained the highest PCU level of four, but only indicated he/she was moderately comfortable with technology when asked to express his/her comfort in words. This could be a result of teachers misunderstanding the survey and therefore ranking their response incorrectly or possibly stating their comfort more or less confidently in words than they did on the survey. The remainder of the teachers obtained PCU scores that closely matched the description of their comfort levels according to the PCU scale listed.

Another point to acknowledge regards the two teachers, T7 and T9, whose scores were noted earlier as the highest on the pre-test. Oddly, both teachers demonstrated a drop in their score on the post-test while they stated that they felt their comfort improved over the course of the study. There could be several reasons for this. It is possible that their initial high score was due to outside factors, such as completing the survey hastily or not understanding the questions. Both participants asked several questions during the actual survey and both stated they did the best they could to answer the questions accurately. They also may have felt good about what
they accomplished during the study and yet as a whole, did not feel as comfortable with the technology assessed in the LoTi survey.

At the conclusion of the study, the teachers and coaches participated in the LoTi survey and received a PCU score as well as responded verbally as to whether they felt more comfortable with technology integration. Results varied with regards to the PCU scores. While the average of the coaches’ PCU scores was lower than the teachers initially, at the conclusion, the coaches had an average PCU level of 2.75 while the teachers had an average PCU level of two. In the group of teachers, five of the participants showed increased comfort levels, one did not change, and three teachers’ scores went down one or two levels. It is possible that the teachers who received lower scores may have become more aware of what they did not know once they took the post-assessment and thus answered the questions more accurately. This would explain why their verbal answers indicated improved comfort while the assessment revealed lower comfort. In fact, after finishing the pre-assessment, two of the teachers expressed their confusion with questions on the survey and then stated the post-assessment was much easier to understand. In other words, these teachers may have been more aware of their actual lack of knowledge as they became more familiar with technology over the course of the study. All of the coaches demonstrated increased their comfort by at least one level. Teachers and coaches verbal responses regarding comfort appear to have paralleled the change in their LoTi PCU score. It may be worthy to note that the teacher whose PCU score did not change, T5, also missed some of the planning sessions with his/her team and chose to be coached in the classroom where he/she shared teaching responsibilities, as a co-teacher, with the language arts coach. T5 had been teaching for more than 25 years when this study took place. When asked why he/she did not attend the planning meetings, he/she stated that special education responsibilities hindered him/her from attending
the meetings. He/she also expressed his/her discomfort with the use of technology several times during the study leading the researcher to conclude he/she was unwilling to try to learn to use technology for learning at this late point in his/her career.

To answer research question three, the researcher held individual interviews with each participant at the conclusion of the study. This section will describe the overall change in comfort of the group of teachers. Individual stories will be shared in the section that follows.

Teacher responses will be reported in three general categories. Teachers are identified with two letter codes, not the participants’ initials, which are shown in parenthesis after their comments. Though coaches and teachers are both included in the collected responses, it is specified in the text whether the participant was a peer coach or teacher. In looking at teachers’ change in comfort over the course of the study, the following categories of responses emerged as teachers discussed factors affecting their change in comfort level. The three areas are as follows:

1. The peer coach and district technology coach made it a priority and through their influence and assistance, improved comfort
2. Availability of resources, including coaches, improved comfort
3. Student readiness improved teachers’ comfort

Almost half of the teachers acknowledged that comfort level improved because it was made a priority by their peer coach, which forced them to integrate technology into their lessons. The study took place during the last eight weeks of school, after the required annual standardized tests. The timing of the study was suggested by the school administration to ensure teachers were able to prepare for the required annual testing, prior to the study, and then make time to participate in the technology coaching. This was helpful as several teachers stated that it gave them time to focus on new skills with their students. Making it a priority helped encourage some
teachers to use the technology and, in turn, improved their overall comfort level. “Being forced is what changed me. Comfort level went up a bit and I’ve got room to grow. I’ve used technology differently more in the last eight weeks trying to prepare for the end of the year and hopefully next year I’ll do even more” (PP).” Another teacher said, “I don’t know about comfort level, but I have done more. I still question what I’m doing. I’ve tried more because we had to, just don’t know that I’m more comfortable with it (BG).

Teachers also stated that having the district TLC available to come into the classroom helped improve comfort. Peer coaches were encouraged to ask for assistance from the district coach if their teachers needed assistance during classroom instruction, given that they had their own classes to instruct. “Since you had the ability to come into the classrooms, it made things a lot better. We felt comfortable because you were in the room with us” (AC). “Having you as a coach with that second set of hands and eyes to help us improved comfort while we were teaching” (PO).

Another thing that improved comfort was the availability of resources, including coaches and equipment, which was mentioned by three teachers. “I think knowing stuff is out there and that we’re going to have it available has made it important to me. I feel better about trying things on my own now that I know resources are available” (OP). “I’m more relaxed that I have the resources to talk to people if I’m unsure about how to use technology for learning” (JJ).

The last factor mentioned by teachers as improving comfort was the result of an entire grade level of teachers using technology more frequently with their students. This may have improved student readiness to make use of technology and thus, helped improved teachers comfort with technology. “When I didn’t know something, I would ask the kids. I picked up things from you (the district TLC) and the kids” (DW). Another teacher affirmed this stating,
“The students know more from using it in their other classrooms, that made me more comfortable. Because the kids know more, I’m willing to do more with it” (JJ). Student comfort due to practice in class, in effect, may have had an impact on improved teacher comfort with technology.
### Table 5. PCU and Self-Described Comfort

<table>
<thead>
<tr>
<th>Coach (C) or Teacher (T)</th>
<th>Pre-PCU Score</th>
<th>Self-described comfort level</th>
<th>Post-PCU Score</th>
<th>Self-described comfort level</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1- LA</td>
<td>1</td>
<td>I am very comfortable integrating technology into instruction as long as I have time to practice.</td>
<td>3</td>
<td>My comfort improved when I had the time to put into the lessons. I felt good about integrating technology when the time was available.</td>
</tr>
<tr>
<td>C2- M</td>
<td>2</td>
<td>I need a lot of practice, but am willing to learn</td>
<td>3</td>
<td>Even though my comfort wasn’t that great, I decided to coach because we are all here for the same purpose and if I can do something to help all kids, I’m going to do it. I feel more comfortable because I helped get plans set up for using the technology and had time to look at different ideas to implement.</td>
</tr>
<tr>
<td>C3- SS</td>
<td>0</td>
<td>I feel very comfortable with integrating technology. However, many times when I have tried to integrate it in the classroom the lab or carts are already in use.</td>
<td>1</td>
<td>My comfort didn’t change much but I did pick up new resources and did more in depth projects because of you and the suggestions and technology knowledge you shared with me.</td>
</tr>
<tr>
<td>C4- Sci</td>
<td>1</td>
<td>I feel very comfortable using and having students use technology in the classroom. Often lack time to teacher and learn new technology that is available.</td>
<td>4</td>
<td>My whole team is so good that we all felt comfortable. I would bring them ideas, and they were eager to implement them. I feel more comfort because I’m willing to waste a couple class periods out to teach a program before using it for learning.</td>
</tr>
<tr>
<td>T1- Sci</td>
<td>1</td>
<td>Very well, I would love to use it with students more</td>
<td>2</td>
<td>Well, because I used it personally by myself on a regular basis, it stayed about the same. However, I wanted to endeavor to try some other things, but because we have limited use of laptops and complications with using Apples as opposed to PCs, that was one of my issues and time.</td>
</tr>
<tr>
<td>T2- Sci</td>
<td>2</td>
<td>Moderately low: need more help on how to use/implement it</td>
<td>1</td>
<td>I don’t know about comfort level, but I have done more but I still question what I’m doing. I’ve tried more because we had to, just don’t know that I’m more comfortable with it.</td>
</tr>
<tr>
<td>T3- LA</td>
<td>1</td>
<td>I struggle with the amount of time it takes to use the technology. I also struggle handing all of the technical issues and tech questions that come up within a class. Added to this is the problem of too little tech resources.</td>
<td>2</td>
<td>I guess I could say I’m a little more comfortable than I was before, I’m also more wary but I am more comfortable. I’m wary because I saw all the varied and different ways it goes wrong.</td>
</tr>
<tr>
<td>T4- M</td>
<td>0</td>
<td>Not comfortable at all</td>
<td>2</td>
<td>I’m a little better. I’m more willing to venture out, more excited about doing stuff.</td>
</tr>
<tr>
<td>T5- LA</td>
<td>1</td>
<td>Very low comfort level</td>
<td>1</td>
<td>I’m not more comfortable. I wish we could have some really specific ways to integrate technology in the classroom.</td>
</tr>
<tr>
<td>T6-SS</td>
<td>1</td>
<td>I’m not that comfortable using technology, I need modeling and practice</td>
<td>3</td>
<td>Um, when we started, I was uncomfortable but excited that I might learn something because we haven’t had technology workshops in a while. I picked up a lot of new stuff from you (researcher) and the kids, as they got better with technology.</td>
</tr>
<tr>
<td>T7- M</td>
<td>3</td>
<td>Very comfortable</td>
<td>2</td>
<td>On a scale of 1-10, prior to the eight weeks 5 and now 7. Comfort level went up a bit and I’ve got room to grow.</td>
</tr>
<tr>
<td>T8-Sci</td>
<td>1</td>
<td>Need more training</td>
<td>3</td>
<td>Well, now I’m comfortable in a sense that I’m not fearful of trying something new, I’m more relaxed about it and feel that I have resources to talk to people if I’m unsure about it and the students know more so that helped me feel more comfortable and now I’m pretty comfortable.</td>
</tr>
<tr>
<td>T9- SS</td>
<td>4</td>
<td>Scale of 1-10. I’m a 5</td>
<td>2</td>
<td>I’m much more comfortable now working with students in the classroom, checking problems. Working with you made it a lot easier than it was before, like last year.</td>
</tr>
</tbody>
</table>
Teachers’ Stories about Comfort

Four teachers, one per subject area, stood out in regards to their growth in comfort level from the beginning to the end of the study. All four of the teachers stated that their comfort levels were initially low but improved over the eight weeks. The stories of those four teachers are shared below.

Language Arts

NN started his/her teaching career at the participating school and has been there for a total of seven years, all but his/her first year were spent in 6th grade language arts. He/she, though nervous about integrating technology, did so in order to get much needed help with technology integration. In fact, when he/she was first told about the study, he/she hesitated but stated that he/she knew it was important to use technology. The researcher/district coach was familiar with the teacher from working with him/her on projects earlier in the year and therefore this participant trusted the TLC to help him/her through the process of integration.

The teacher’s peer coach, PO, began making plans for integrating technology as soon as the study began, knowing there would be competition to obtain the computer labs. The coach put together a plan to have all language arts classes create a book based on a topic of students’ choice, such as their favorite sports star or an animal they wanted to learn more about. The students were to make use of the Internet and library database for research and then create a book using PowerPoint by creating slides they would connect together to tell their story. Students were given their expectations and the parameters for completing the assignment that was planned to last a total of two weeks.

NN was very vocal about not being happy about having to use technology with students who she felt needed basic skills more than they needed to learn how to use technology to create a
book. She had bad experiences with technology and specifically technology training in the past, which may have influenced his/her uncertainty about participating in the study.

When the district coach entered the classroom to assist the teacher, NN was clearly uncomfortable with the technology and many of the students were off-task. It was obvious that the teacher was in a state of frustration and needed assistance not only with the technology, but in getting students to learn how to make use of it in a productive manner. NN clearly knew the objective of the lesson, but did not appear to know how to teach the students while they were using the technology. The students were not using the Internet or library database properly and several students were looking at websites that had nothing to do with their projects. The first day, the coach spent time walking around the class assisting students and helping the teacher as needed to get students back on task. Once students were ready to make use of PowerPoint, the TLC began by teaching students. She modeled three main skills for use in creating their book each day. This was demonstrated using a laptop and projector so students could follow along. Management skills, such as having students close their laptops and watch initially, then participate with the teacher, and finally demonstrating the skill for partners, were also modeled. The teacher watched the coach teach these skills the first two classes and then the teacher was in charge of teaching students in subsequent classes. NN stated that this assistance in the classroom helped build his/her comfort not only with the technology, but also with managing his/her class. “I would have gone out of my mind and given up the project a lot earlier if you hadn’t been there telling them how to insert a picture initially. And some of it was management issues, figuring out how to keep students’ attention on the teacher instead of the technology. I’m thinking in the future they close the lid of the computer or they face the person with their hands on their knees, things like that. Otherwise they’re too interested in the technology, which is great, but they’re so
interested in the technology that they miss the point of the assignment.” Additionally, the teacher felt that knowing how to use technology and be comfortable with its use was not an inherent skill that should be expected from teachers: “We know technology and we can use technology, just like we know science and math and can teach those but don’t ask us to teach science and math if it is at a higher level, because we are language arts teachers and technology may not be within our comfort zone.” This teacher also felt that learning how to trouble shoot from the district TLC helped improve his/her comfort with integrating technology. NN stated, “It’s so much better to have someone come in and, even if you can only teach one lesson, show us how to teach the technology because we aren’t technology teachers. Then we’re ok. It’s been so much better to have the coach because that’s another person in there with the technology when normally it’s just me in a class with twenty-eight students. Then the tech coach comes in and helps with one class and helps me understand how to trouble shoot and I can see trouble shooting in action, so I can see what I need to do. Telling someone verbatim how to trouble shoot doesn’t work for me. I can do things myself but the coaching process has been so much more helpful.”

In the case of this teacher, observing the district TLC model both how to teach and manage a class while using technology was necessary to improve comfort. Assistance with trouble-shooting also helped improve the teacher’s comfort level with technology. NN was very frustrated trying to learn this on his/her own without assistance and modeling by the TLC. The teacher’s PCU score increased from a level one to level two over the course of the eight weeks study. NN indicated comfort improved though he/she also learned more about what could go wrong with technology through the process. In looking toward the future he/she stated: “Something I would do in the future, before I let them do what they wanted, is teach them how to use the technology by showing them. It was easier to teach them this way and when I use
technology next year, I’m gun-shy but not going to be run off completely. I’ve decided next year when I use technology, if you’re not available I’m going to have to call in parent volunteers or something. You know, you just need another extra person to walk around, that extra set of eyes.”

When asked if he/she felt more comfortable with technology after the eight weeks of peer coaching NN expressed a bit of uncertainty: “I guess I could say I’m a little more comfortable than I was before, I’m also a little more wary, but I am more comfortable. I’m wary because I saw all the varied and different ways it goes wrong. I’ve worked with technology before but never an extended project. So, I’ve seen how easy it is to get off track and when you have limited technology resources. I’ve also become wary because making sure your end product is actually printed and put together which doesn’t always happen but it did with me this year. If you can’t get the end product because of printer difficulties it’s not good, which makes me wish more and more that we were allowed to have students have their own email so that students could send me the final product and I could print it. I wish they would do that.” Overall, the experience seemed to improve NN’s comfort though the researcher believes more time should be spent with the team coach as well as the district coach in the classroom.

Math

The teacher who acted as the peer coach for math indicated initially that he/she was not very comfortable with technology but “was willing to learn.” ST was supportive of using technology for learning, but felt that his/her comfort level was not as high as the other coaches. “I use technology because students like it and they always want to get on the computer after they’ve finished an assignment.” ST obtained the highest PCU score, level 2, of all of the coaches despite the fact that he/she seemed to feel less comfort with technology. At the conclusion of the study, ST was asked about his/her change in comfort over the course eight
weeks and what was done to make him/her feel more comfortable. ST stated, “I have spent hours on the computer trying to find different things to do and I know the kids love technology, that’s why I made a technology center for them. They do work toward using it and if you tell them they can get on cool math, you can get four or five assignments from them if you tell them that when they finish, so I know they like it. I always look for things like math frog because that has technology and a follow-up so I’m always looking for stuff. And I know my counterparts aren’t from the time of technology so that’s why I use more with the students.”

Comfort was not an area addressed by the math coach either. ST felt that improving his/her teammates comfort was something that had to be done by the teachers themselves. “You’ve gotta go out and look at this stuff yourself, you can’t wait for someone to give you something and get up in front of the kids and do it.” However, when asked how he/she would do things differently in the future, ST stated he/she would work with his/her team more starting earlier in the year. “I would start at the beginning and do more ‘let’s work through this’ and see how it works and since everyone does things differently, see how we can work it for you into their lessons. Everyone wants you to do something but just because I do it, you have to go do it and figure out how it fits what you do in your classroom.”

Interestingly, even though ST did not meet with his/her team often to discuss their needs or work to improve comfort, the math teachers indicated verbally that their comfort had improved (Table 5). In looking at the PCU scores of the math teachers, one teacher went up two levels from the pre-assessment to post-assessment while the other teacher’s PCU score went down by one level. This may have been due to the district TLC checking in on these two teachers to assist them with ideas for lessons. She also shared technology resources with the teachers and offered help when needed.
It is important to note that at the beginning of the study, there were a total of four math teachers plus ST, the math peer coach, participating in the study. Two of the math teachers, however, decided to discontinue their participation and declined to take the post-test. Thus, only three math teachers, including the coach, were included in the final results. Unfortunately, this could have contributed to the lack of concern as it came to peer coaching and integration of technology with the math group. To the knowledge of the researcher, teachers never met again after the meeting called by the district TLC described earlier.

Science

JJ has been teaching science for more than 20 years. He/she is an experienced teacher and was even named Teacher of the Year one time in his/her tenure at the school. JJ did not express hesitation about using technology for learning, but did state that he/she definitely needed more assistance with learning how to use technology with students. When asked about comfort initially, JJ stated he/she had a “moderately low” comfort level with technology and that more help was needed in learning how to use it. Interestingly, this teacher did not request help from the district TLC during class instruction. Instead, the teacher depended on his/her peer coach only to assist in learning how to use the needed technology and how to integrate it properly. “Our peer coach, SC, is very knowledgeable with technology and makes you comfortable with using the technology with the kids.” Similar statements were made by other teachers on JJ’s team, indicating the science peer coach was helpful enough that the district TLC was not needed. Another teacher on the team, HA, felt: “It was good to have our coach immediately available. He always has great ideas and we work as a team to build those ideas until we are comfortable teaching it ourselves.” JJ indicated that although his/her comfort improved through the peer coaching process, students being more comfortable helped improve his/her comfort with
technology as much as the coaching. “The kids being comfortable with the technology helped a lot, because they were using it in a lot of their other classes. They were able to help other students when I couldn’t get to them and so they were able to share their knowledge, which helped them learn. They felt comfortable with this because they were doing it so much in their other classes. Plus, they really knew what they were learning along the way, I didn’t need to tell them. It made it easier on me. It just made other students more knowledgeable with using technology resources on their own without my guidance or help and they clearly got the opportunity to use it because I think every social studies class used it and did different things with it. So I think that was a very good part of this process.”

JJ’s PCU score started at a level one and improved to level two by the end of the study. More importantly, JJ indicated he/she felt more comfortable about using technology in the future: “Well, now, I’m comfortable in a sense that I’m not fearful of trying something new. I’m more relaxed about it and feel that I have resources to talk to people if I’m unsure about it and as well, the students themselves know more so therefore that helped me feel more comfortable and now I’m pretty comfortable. When asked if his/her comfort level changed specifically in the two month period in which the research took place JJ stated: “Oh yeah, I think because the kids even know more and I’m willing to even do more with it.”

Social Studies

SG is a social studies teacher that has been teaching for nearly 30 years. He/she teaches all but one of the inclusive education students with a co-teacher, DW. DW also had nearly 20 years of teaching experience. When the study was introduced to the two teachers, both SG and his/her inclusion teacher appeared to be very hesitant to participate. SG told the researcher that he/she thought technology was important but had not had favorable experiences with using it
with his/her students. SG stated verbally that he/she would rank his/her comfort level at a five out of ten, however, he/she obtained the highest PCU score of all of the teachers. This concerned the researcher early on because it did not appear that SG was at a high comfort level with technology. DW also indicated she needed a lot of practice and did not feel comfortable at all with technology. His/her pre-assessment PCU level was one.

This subject area group was coached through guidance in creating lesson plans for technology integration. When the coach shared his/her plan, the teachers chose the form of technology they felt most comfortable with, PowerPoint. Though this was the program they were most knowledgeable about, the researcher immediately noticed the teachers needed a lot more assistance and practice in learning how to teach students with this program. The district TLC spent time teaching the students and guiding teachers at the same time. The district TLC was careful to ensure the students were not aware of what the teachers were comfortable with and what they still needed assistance in learning, so they could teach the students properly.

Over the course of the project, it was clear that the primary teacher, SG, and the inclusion teacher, DW, were becoming more comfortable with the technology and teaching students to use it appropriately. SG stated “I’m so much more comfortable now working with maybe 30 students in the classroom, checking problems, working with you (the district TLC) made it a lot easier than it was. I mean, I did incorporate some technology last year but I really enjoyed the projects we did at the end of the year and so did the students. Using technology with the students earlier this year was a nightmare and I actually enjoyed this project. DW agreed with this stating: “When we started, I was uncomfortable but excited that I might learn something because we haven’t had technology workshops in a while. And so, I was just really excited that I might learn something new because the things I know are getting old and it’s time to add things to it.”
DG was asked if he/she felt more comfortable with technology after the peer coaching and
district TLC assisted, he/she stated: “I did, I picked up a lot of new stuff. Working on the Mac
computer I wasn’t real familiar with it so when I didn’t know much. I would ask the kids, they
knew a lot more about the Mac than I did, and they taught me a lot. So working on the Mac, you
know, I picked up a lot of stuff I didn’t really know.” DW was more specific about what was
learned stating:

I learned little stuff like how you exit you know or back it up, even the fact that Safari is
the Internet. I didn’t know that kind of stuff. So I think that helped and I did learn a lot. I
didn’t really know that much about a business PowerPoint. I didn’t really know how to
go in and select the text and do the line around the textbox. So, it was all very helpful.
You helped us teach the kids things I never knew about or felt comfortable with before
you modeled it for us.

Each of the teachers also expressed their discomfort with technology due to management issues.
They had attempted to use student response systems with their students just prior to the study,
which actually caused the teachers resist using technology again. SG reflected on using
technology with students prior to the study, “We used the student response systems a month
before this project and it was a disaster. I think part of it was preparation, we weren’t ready, and
part of it was keeping the students on-task.” Both teachers were asked what helped them most
with the coaching, SG responded: Having another coach come in, when you came in and worked
with me and the students, it was just a lot smoother, more hands-on, you have more experience
which really helped me. I learned a lot because you taught me things. I did become a lot more
comfortable with it and I think it was beneficial for me and the students.” DW felt that the
district TLC even helped getting students prepared to use the technology even improved their
comfort because students were better behaved. “Each day we got the computers out, it got better and better. We got better at handing them out each day because it was a consistent routine. By the end, there wasn’t as much misbehavior and redirecting. Those who finished early didn’t get antsy because they wanted to help others. The project lasted the perfect amount of time and ended right when it needed to end.”

Both teachers indicated verbally that their comfort level improved over the eight-week study. They sounded more confident with their skills and expressed appreciation with student technology use. SG even stated: “The peer coaching got us started; it got us on the same page and got us going in the right direction. So we knew what we were doing wrong, we knew what worked, and what didn’t work cause the teachers started it and then talked about it, you know. You need to be careful about this or you know, this is how we pass the computers out and little things even like behavioral things.” For both of these teachers, therefore, comfort level was best improved through peer coaching as well as coaching with the district TLC during classroom instruction.

Practice

Question 4: Do the teachers’ instructional practices with technology change from pre-test to post-test?

Question 5: How did the teachers make use of technology with their students this year prior to the study?

Question 6: How did the teachers make use of technology after the peer coaching treatment?

Research Question Four

A paired sample t-test was performed comparing the teachers’ pre-LoTi and post-LoTi levels. The average pre-LoTi level mean was 1.45 and the post-LoTi level mean was 1.73, on a
scale from zero to seven. It is worthy to note that the LoTi is intended to measure substantial change in practices, therefore a change of 1.45 to 1.73 is substantial. In fact, while seven out of 13 teachers showed improved LoTi levels, four teachers LoTi levels decreased and two stayed the same. In other words, almost half of the teachers did not demonstrate improvement in their LoTi level. Because this study took place over the short course of eight weeks, the LoTi may not have been able to detect the subtle changes teachers made in their instructional practices with technology. No significant differences were found in the scores from pre- to post-test and the limited number of participants may have contributed to this finding.

**Research Question Five**

As mentioned previously, change in practice was assessed quantitatively, through teachers’ individual LoTi scores, as well as qualitatively. This section will address research questions five and six to examine how teachers’ instructional practices were affected from the beginning to the end of the study. The results were analyzed and presented first as a whole and then more specifically within subject area teams. Finally, individual teacher’s experiences with changing practices will be reported.

At the beginning of the study, teachers were asked to acknowledge how they used technology in the classroom prior to the study. This was done to determine what technology skills teachers had already addressed with their students, as well as to understand what technology teachers were already using prior to the coaching. The researcher found five common resulting responses. Prior to the study, teachers responded that they used technology mostly in the following ways:

1. Student use of test preparation/curriculum-based software
2. Student use of word processing software
3. Presentation software used for teacher-centered learning

4. Internet research.

Two teachers mentioned using student-centered presentations with the use of presentation software as well. In response to how computers were used prior to the study, a total of 12 out of 17, six each, mentioned using technology for their own presentations or using the Internet for research. The responses did not clarify whether teachers, students, or both did the Internet research. Additionally, two teachers responded that they made use of word processing software along with a district purchased graphic organizer program, Inspiration, used to organize thoughts prior to writing. Three teachers responded that they made use of curriculum based test preparation software prior to the study. It should be noted that when the teachers’ and coaches’ responses were analyzed separately, both groups had virtually the same number of responses in each of the above categories. It is likely, therefore, that coaches were using technology in a similar manner as the teachers prior to the start of the study, although the quantity of time and specifics about quality of use is not known.

Research Question Six

Research question six was addressed through interviews and focus groups at the conclusion of the study. Teachers and coaches were also observed prior to the study and during the course of the study in order to determine if change in practice had occurred as a result of the coaching. Observational data are reported in Tables 6, 7, and 8 as well, to better illustrate teachers’ classrooms, their roles, and instructional practices with students. Seventeen responses from coaches and teachers were coded and four common themes resulted. These four themes are listed below.
Teachers used more “student-centered” technology. The vast majority of the teachers and coaches responded that they used more student-centered technology as a result of the coaching. In fact, nine statements out of a total of 17 indicated technology use was more student-centered once the coaching process began. One teacher stated, “We had the students create a brochure and they could go on the computer and research information. They could also do a PowerPoint but they’ve been doing so many PowerPoints in other classrooms that they were able to do that on their own. So they researched it and used word processing so they could type it up with pictures and such.” (JJ). Another teacher stated that the student-use helped them to see what kids were capable of doing so they could use it more in the future, “The student projects we did were so good, they learned a lot doing it on their own. Now we can see what the kids can do and start working it into our plans at the beginning of the year” (SG). Student-centered technology was also positive in at least one of the small group special education classes, “We did the PowerPoint project and we’re doing presentations with the kids with snacks and other teachers to let them see what we’re doing. My kids did all of the sections but we worked slower and longer. They really do so much better and get into and focused on things when using technology.” (DW).

Little changed but I learned new methods of integrating technology to be used in the future. Even when there was not much change in how the teachers were using technology, some statements were made that indicated the teachers would continue to work on technology integration with their students due to the coaching. One teacher, who spent little time in the team coaching meetings due to obligations to the special education department, picked up ideas from his/her coach and other teammates during the classes they co-taught together. BG stated, “Watching my team try different things has helped me. Just hearing different ideas from people about how they are using things, that part was good.” He/She went on to state, “I’d like to do
more next year. I just don’t know what’s out there until I’m shown” (BG). Another teacher stated, “I’m more encouraged by what technology can do and would like to start the year using technology so I can use it a little in each unit” (OP).

Not all teachers were as encouraged by the student technology use, however. One teacher stated, “Have we made progress in learning how to use it, yes. Has it been worthwhile with students using it, perhaps? Has it been doable and feasible and the best and most efficient to teach children, no. There have been so many issues, errors, and problems that it takes too much time to teach with technology than without because of the issues. By the end of the tech issue, when it messes up, I’m so flustered that I can’t even concentrate.” (NN).

_A lot changed, and motivated me to use more next year._ Two teachers responded that their practice changed and that they were motivated to continue working as a team for technology integration, with the district TLC’s help. Speaking about instruction, one teacher stated: “Mine has changed a lot in that I want to use technology a lot more starting at the beginning of the school year and really maybe, with you, we can work out a schedule to integrate it throughout the year when the labs aren’t booked up right away” (SG).

The researcher completed pre- and post-observations of teachers, using the ISTE ICOT prior to the coaching and during the time coaching was underway. Teachers were told prior to the study they would be observed twice. The results of the observations are reported in Table 7 and 8. All of the special education teachers’ observations were done within the inclusion classes; hence, there are fewer observations to report than the number of participants. Teachers often asked the researcher to come in to observe classes when technology was being used, so while the first observation may have been unannounced, the teachers often knew the researcher would be observing the second time. Table 6 reports data regarding the technology available in each
individual teacher’s classroom as well as the highest number of students taught in the classroom.

The researcher highlighted this because teachers discussed the lack of access to technology as a factor that may have hampered them in their integration. As Table 6 shows, the number of students per computer varied greatly from room to room. The classroom the distribution of technology among the teachers, therefore, was not equitable according to the number of students taught. Interestingly, coaches and special education teachers had the smallest student to computer ratios of all of the teachers. None of the teachers could explain how the computers were distributed or why some teachers had a lot more equipment than others.

Table 6. Classroom Technology Inventory

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>Students in class</th>
<th>Student computers</th>
<th>Ratio of students to computer</th>
<th>Other technology in the room</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA Coach</td>
<td>32</td>
<td>6</td>
<td>5</td>
<td>Interactive White board, Student Response Systems, projector, LCD Projector, printer, teacher laptop</td>
</tr>
<tr>
<td>LA</td>
<td>32</td>
<td>4</td>
<td>7.5</td>
<td>LCD Projector, printer, teacher laptop</td>
</tr>
<tr>
<td>LA Sp.Ed.</td>
<td>7</td>
<td>3</td>
<td>2.3</td>
<td>LCD Projector, printer, teacher laptop</td>
</tr>
<tr>
<td>M Coach Sp. Ed.</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>LCD Projector, printer, teacher laptop</td>
</tr>
<tr>
<td>M</td>
<td>32</td>
<td>3</td>
<td>10</td>
<td>LCD Projector, printer, teacher laptop</td>
</tr>
<tr>
<td>M</td>
<td>12</td>
<td>3</td>
<td>4</td>
<td>LCD Projector, printer, teacher laptop</td>
</tr>
<tr>
<td>SS Coach</td>
<td>15</td>
<td>5</td>
<td>3</td>
<td>Interactive White Board, LCD Projector, printer, teacher laptop</td>
</tr>
<tr>
<td>SS Sp. Ed.</td>
<td>7</td>
<td>3</td>
<td>2.3</td>
<td>LCD Projector, printer, teacher laptop</td>
</tr>
<tr>
<td>SS</td>
<td>32</td>
<td>2</td>
<td>15</td>
<td>LCD Projector, printer, teacher laptop</td>
</tr>
<tr>
<td>Sci Coach</td>
<td>32</td>
<td>5</td>
<td>6</td>
<td>Interactive White Board, LCD Projector, printer, teacher laptop</td>
</tr>
<tr>
<td>Sci</td>
<td>32</td>
<td>5</td>
<td>6</td>
<td>LCD Projector, printer, teacher laptop</td>
</tr>
<tr>
<td>Sci Sp. Ed.</td>
<td>7</td>
<td>3</td>
<td>2.3</td>
<td>LCD Projector, printer, teacher laptop</td>
</tr>
<tr>
<td>Sci</td>
<td>32</td>
<td>4</td>
<td>7.5</td>
<td>LCD Projector, printer, teacher laptop</td>
</tr>
</tbody>
</table>
Table 7 highlights the teacher’s roles in the classroom during the observations and how necessary technology was to the lesson, prior to the treatment and after the treatment. While the initial observations showed teachers primarily in the role of Lecturer, the second observation found teachers acting more in the role of facilitator or coach. Similarly, in the first observation the necessity of technology was either “Useful” or “Not Needed.” The second observation yielded two “Somewhat Useful,” three “Useful,” and six “Essential” uses of technology. This indicated a clear change in practice among the majority of teachers’ classrooms.

*Table 7. Teacher Roles and Technology Usage*

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>Teacher Role</th>
<th>How necessary was technology</th>
<th>Teacher Role</th>
<th>How necessary was technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA Coach</td>
<td>Lecture using interactive white board</td>
<td>Useful</td>
<td>Facilitating/Coaching</td>
<td>Essential</td>
</tr>
<tr>
<td>LA</td>
<td>Lecture</td>
<td>Not Needed</td>
<td>Facilitating/Coaching</td>
<td>Essential</td>
</tr>
<tr>
<td>M Coach</td>
<td>Interactive Direction</td>
<td>Useful</td>
<td>Facilitating/Coaching</td>
<td>Essential</td>
</tr>
<tr>
<td>M</td>
<td>Facilitating student work</td>
<td>Useful</td>
<td>Interactive Direction</td>
<td>Somewhat Useful</td>
</tr>
<tr>
<td>M</td>
<td>Lecturing</td>
<td>Not Needed</td>
<td>Observing students</td>
<td>Somewhat Useful</td>
</tr>
<tr>
<td>SS Coach</td>
<td>Interactive Direction</td>
<td>Useful</td>
<td>Facilitating/Coaching</td>
<td>Essential</td>
</tr>
<tr>
<td>SS</td>
<td>Presenting</td>
<td>Useful</td>
<td>Facilitating/Coaching</td>
<td>Essential</td>
</tr>
<tr>
<td>SS</td>
<td>Lecture</td>
<td>Not Needed</td>
<td>Facilitating/Coaching</td>
<td>Essential</td>
</tr>
<tr>
<td>Sci. Coach</td>
<td>Interactive Direction</td>
<td>Useful</td>
<td>Modeling</td>
<td>Useful</td>
</tr>
<tr>
<td>Sci.</td>
<td>Lecture</td>
<td>Not Needed</td>
<td>Interactive Direction</td>
<td>Useful</td>
</tr>
<tr>
<td>Sci.</td>
<td>Lecture</td>
<td>Not Needed</td>
<td>Facilitating/Coaching</td>
<td>Useful</td>
</tr>
</tbody>
</table>
Table 8 lists student learning activities and student use of technology from the pre- to post-observation. Once again, student learning changed with drill and practice and lecture being the primary student activity in the pre-observation and various activities such as research, writing, information analysis, and creating presentations in the following observation. Additionally, almost all students made use of technology in each subject area. Computers were used for learning with presentation software, library databases, Internet, and word processing software.
<table>
<thead>
<tr>
<th>Subject Area</th>
<th>Pre-</th>
<th>Post-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Student Learning Activities</td>
<td>Student Use of Technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LA- Coach</td>
<td>Drill and Practice</td>
<td>None</td>
</tr>
<tr>
<td>LA</td>
<td>Lecture</td>
<td>None</td>
</tr>
<tr>
<td>M-Coach</td>
<td>Drill and Practice</td>
<td>None</td>
</tr>
<tr>
<td>M</td>
<td>Game</td>
<td>None</td>
</tr>
<tr>
<td>M</td>
<td>Drill and Practice</td>
<td>None</td>
</tr>
<tr>
<td>SS-Coach</td>
<td>Drill and Practice</td>
<td>None</td>
</tr>
<tr>
<td>SS</td>
<td>Drill and Practice</td>
<td>None</td>
</tr>
<tr>
<td>SS</td>
<td>Lecture</td>
<td>None</td>
</tr>
<tr>
<td>SC- Coach</td>
<td>Drill and Practice/Research</td>
<td>Research Internet</td>
</tr>
<tr>
<td>Sci.</td>
<td>Drill and Practice/Research</td>
<td>None</td>
</tr>
<tr>
<td>Sci.</td>
<td>Drill and Practice</td>
<td>None</td>
</tr>
</tbody>
</table>
Teachers’ Stories about Change in Practice

When the process of peer coaching started, teachers were told exactly what the research would entail and their expectations. Coaches and teachers were each given consent forms and informed of their right to withdraw themselves from the study at any point during the eight weeks (Appendices G & H). Some teachers immediately decided they would participate while others were more hesitant. As stated earlier, a school administrator encouraged teachers to participate stating that they would need to learn technology integration skills in order to improve their instruction. He shared that this would be evaluated through their instruction in upcoming school years. For this reason, several teachers seemed to quickly volunteer regardless of their low comfort with using technology and technology integration. A few teachers discussed their concerns with the researcher and all of the concerns dealt with the teachers’ current lack of comfort with technology. They did not feel they would have the time or knowledge to develop ways to use technology for learning. Some teachers also stated they did not feel comfortable using technology themselves, which made them fearful of using it with their students. In fact, one teacher became quite emotional confiding in the researcher his/her lack of basic typing skills, which according to the participant, was enough to keep him/her from using any technology with his/her students. He/she expressed his/her distrust of technology and stated that it was a waste of time to use it with students who could not even learn basic skills in his/her class. This participant dropped out of the research just prior to the post-test. This is essential to note as low comfort level may actually prevent teachers from making use of technology with their students.

The following section relates the individual stories of teachers whose practices changed over the eight-week study. Each teacher appears to have changed according to his or her own
comfort level, experiences with coaching, and individual integration experiences. The stories are
told using observational data and individual interviews to illustrate how change in practice took
place during the study.

*Language Arts*

NN’s practices with technology use in the classroom were minimal prior to the study. He/she did not have a lot of good experiences with technology, especially when used by students and claimed it “got him/her so flustered” it just was not worth the trouble of using of it. There were only three language arts teachers in the 6th grade: NN, his/her peer coach, and the inclusion teacher who co-taught with the language arts peer coach. For this reason, it was imperative to gain the knowledge and guidance from his/her peer coach to plan for technology implementation. NN’s peer coach, PO, remarked: “NN is very knowledgeable but he/she doesn’t really like using technology much so I try to plan the lessons. While he/she helps me plan, he/she doesn’t always seem open to doing the same things we do. We often end up doing different things. He/she does what he/she wants to do and I do what I need to do with students.” The researcher was not certain NN would initiate any change in practice for this reason. This is part of the reason the district TLC was necessary in the learning process for NN. Observations of NN proved that his/her instructional practices did indeed change over the course of the study. Unfortunately, it is unknown whether those changes would continue after the study.

NN’s room had a total of three computer stations available for student use, a printer, and LCD projector for use with his/her teacher laptop. This was very different from his/her coach who had six student computer stations, a projector, an interactive white board, document camera, and student response systems. When the researcher observed NN for the first time, there was no teacher or student use of technology. NN started with a warm up using his/her white board that
required students to correct three sentences with grammatical errors. After that, NN transitioned into a whole-class lecture on the specific grammar topic for the day. Lecturing and modeling were the primary roles of the teacher. The class then completed a drill and practice assignment from the book based on the topic the teacher presented to students. Technology was not essential to the lesson or learning activities.

The second observation yielded decidedly different results. This was during the time NN was implementing the lesson he/she planned with the peer coach and after the district TLC came in to assist and model technology integration for the teacher. NN started the class by asking students to get their research out and ready to work and had two students assist in passing out computers. The students’ task was written on the board so they were able to get working as soon as they received their computers. Once computers were handed out, the teacher spent time showing the students three skills they could use for creating their PowerPoint. Since some students were using Microsoft Word, NN incorporated skills that could be used on either application. Students worked in pairs to learn the new skills and practice them together on individual laptops. Student learning activities, therefore, included research, information analysis, and creating presentations. Technology was essential to the lesson whereas it was not needed in the lesson that was observed previously. When asked if he/she had changed practices over the course of the study, NN responded in this manner:

Yes, I have used technology differently in these last eight weeks. Before when I used it, I would just go over quickly what we needed to do to insert a picture but I wouldn’t teach a real lesson on it. I would stop and teach them how to reformat this and reformat that and I found that doing it that way, provided the kids were paying attention, it was a lot easier.
Something I would do in the future, before I let them do what they wanted. It was much easier to teach them this way.

NN also indicated that basic changes in his/her teaching language were made. “I have specifically tried to use technology language, like I tell my students to turn their paper landscape or portrait.” He/she expressed the desire to have more lesson plans or “mini-lessons that we can insert here or there using something like Inspiration. I don’t even know if we have it anymore since we were trained on it so long ago. I’d love to use it with kids, I just have to be able to use it.” Additionally, NN stated he/she had learned a lot from the peer coach and district TLC alike stating, “It just reinforces that you learn best from your peers. Seeing a technology lesson presented so I could model after that was much more helpful.”

NN obtained a LoTi score of one on the pre-assessment and two on the post-assessment, showing a slight increase in his/her level of integration. NN also discussed future plans for use of technology, which led the researcher to believe long-term changes would be challenging for him/her. “I know this much, and I’m just talking off the top of my head here. If they don’t provide the extra support so I can have other people help me with some of this stuff, and they don’t do whatever, and they still want me to use technology with my students next year…I will do the bare minimum and do it as quickly as possible to get it over with and they will never see it again. I will use the textbooks and worksheets if that’s what I have to do, if that’s how they have to learn, that’s how they’ll have to learn.” While NN did implement changes in his/her instructional practices seemingly due to peer coaching, he/she made it apparent that support would have to remain in order for her to continue using technology for learning in the future.

Math
ST used technology in his/her math classroom minimally prior to the study. Technology was used primarily for drill and extension activities by having students go to math gaming websites or other activities when they finished their daily assignment. ST indicated that he/she did not feel strong as a coach, because of his/her lack of technology prowess, and had to work extra time to learn to use the technology and plan appropriate activities. ST put time into finding learning activities that would incorporate the use of technology for student learning. The coach even asked the district TLC for assistance pointing out resources that could be shared with the group of math teachers. “If we had certain lessons that were planned with the technology use in lessons, something very specific and word-for-word or templates they could use, they would feel better about using it, and so would I.” Regardless of the lack of knowledge, ST did improve his/her LoTi level increasing from a level of two to a level of three over the course of the study (C2 in Table 8). It is possible that this coaches’ change in practice came from the time he/she put into learning the technology on his/her own, in order to prepare lessons for other teachers. The act of coaching, therefore, may lead to change in comfort and practice.

The researcher’s first observation revealed that ST had three student computer stations, a projector, a printer, and laptop computer. Being that ST was a math teacher, each student also had his or her own calculator, which was being used during the first observation by the researcher. ST had a total of five students in his/her class, as it was a small group special education class. Students worked individually in the beginning and then moved into pairs as ST taught the lesson. Calculators were used to solve problems on the concept taught in the lesson. The primary teacher role was that of modeling and interactive direction as the teacher showed students how to solve the problems, modeled how they should use their calculators, and talked them through the process step-by-step until they were ready to do the problem on their own.
Students participated in drill in practice for their learning activity during that particular lesson. Technology use, which included calculators only, was useful though not necessarily essential depending on individual student needs.

The second observation included student use of computers to complete a project to review what they had learned during the previous math unit. The plan was developed for ST’s team of teachers as part of his/her peer coaching activities. He/she sent the final plan out to teachers via email so they could make use of it in their own classroom instruction if they wanted. The activities gave students a choice of completing three activities, one or two of which had to be computer-based learning activities (Appendix I). Students were given the option of using word processing, presentation, or video editing software to complete part of the project. They could also make use of websites, such as Comiqs a comic strip creation site, where the students were to explain how to solve problems based on topics from the current chapter. Students were able to work as pairs although one student chose to work alone. The teacher then acted as a facilitator or coach to students as they worked. Student learning activities included creating presentations, information analysis, and writing. Drill and practice was also included as an activity the students were required to complete several math problems to review for the upcoming test. Even though ST created this lesson, he/she seemed a little uncomfortable with the technology, as it was the first time he/she had implemented a lesson like this. “I really had to take a good bit of time on my own looking for different ideas and things students would enjoy doing. I wanted them to make use of the technology, since they enjoy it, but keep my focus on them learning the content. I think it turned out pretty well.”

Changes in ST’s practices were evident to the researcher as the role of both the teacher and students changed from observation one to observation two. Additionally, many different
types of technology applications were used, although students were given a choice in the application they wanted to use. ST informed the researcher this was to ensure students felt comfortable with the software they wanted to use. This would prevent it from hindering them or taking too much class time to teach. The changes made to his/her instruction seemed to be due to ST’s internal motivation to provide students with what they liked, and complete part of the peer coaching duties that were assigned. ST stated: “We’re all here for the same purpose and if I can do something to help your kids, it’s not like my kids, your kids, they’re all our kids.” Overall, it appears the preparing to coach the teachers actually helped this coach make changes in his/her own instruction that ensured use of technology for learning.

Science

JJ’s classroom had a total of six student computer stations for up to 32 students, a projector, and laptop for use by the teacher. Though he/she felt technology was something he/she felt was necessary for effective instruction, JJ admitted he/she needed to make better use of technology for learning. He/she was highly dependent on his/her peer coach for ideas on incorporating technology into learning. JJ expressed his/her satisfaction with the coaching process primarily because the peer coach for their team was very knowledgeable and helpful. “Our peer coach is so comfortable with technology, he/she offers us ideas, shares how he/she used it in class, and then we talk about how we should all use the same lesson. If it weren’t for him/her, I’m not sure I would think of the ideas and know how to integrate technology as well.”

JJ’s first observation was completed in the computer lab. All science teachers were using the computer labs for their classes that day because SC helped create a plan for using the web for a web quest. Students were given a web quest worksheet to complete on the computer based on the topic they were currently studying. JJ’s coach found the web quest and the team of teachers
worked together to create bookmarks for the students using ikeepbookmarks.com. This helped keep students on the safe websites provided by teachers. Students worked individually while JJ walked around and facilitated as students looked for information to answer the questions on the worksheet. The learning activity used, therefore, was drill and practice in locating information they were studying in class. Technology was somewhat useful although another approach, such as a textbook, may have been just as effective in teaching students about the topic they were learning since the sites were not interactive and students had little time to find needed information. Students were able to make use of technology for learning which appeared to keep them engaged in their work for the most part.

The second observation was completed when students were working to create a presentation based on an animal they were learning about in their science classes. Students were given the choice of using PowerPoint or Publisher to create a brochure about their animal. JJ stated, “They were allowed to make use of PowerPoint and a few students did because they knew it from using it in their social studies and language arts classes, but a lot of the kids wanted to use Publisher because it was different and they wanted to do something different.” Students in JJ’s class worked in pairs or groups to complete the project because, “All of the teachers were using the labs and laptops for their projects so I had to improvise and share the lab when I could.” The teacher role in the classroom was to act as a coach to students as they worked. “What helped me with using technology though was that I didn’t have to help as many students since they were able to help each other. They learned a lot of skills in their other classes and I could focus on the students who really needed the help.” Learning activities for students included creating presentations, research, information analysis, and writing as they were creating their presentation
on the animal they were assigned. Technology was essential to this activity for both the research and creation of the final product.

JJ’s LoTi level increased from level 2, on the pre-assessment to level 4A on the second assessment. The researcher noticed big changes in JJ’s instruction, but it did not appear to be only from the coaching. Though he/she gave his/her coach credit for helping a lot with learning how to incorporate different types of technology, students being able to use the technology more proficiently on their own also helped. “It made it easier on me because students didn’t need my help, so that was a very good outcome of this project for both the students and me.” The changes in JJ’s practice made him/her want to make use of technology even more. “I’d like to get past using PowerPoint and Word and using thing that are more interactive like PhotoStory or videos to help students learn the material. That’ what I would like to continue doing to move into a more advanced form of technology with students.” This indicated to the researcher that JJ not only changed his/her practices but also may continue to work with his/her peer coach to move to more sustainable and sophisticated uses of technology.

Social Studies: Change in Practice

As previously stated, SG and DW had used technology in their classroom prior to the study although it was mainly teacher focused for presentations or other administrative type activities. Both teachers had difficulty putting technology in the hands of their students because it often became chaotic and “Students would get off-task very quickly. We never wanted to spend too much time with the technology because it became more of a game for students than learning activity.” Their classroom had three computer stations for up to 30 students in a classroom. Like the other teachers, a laptop, projector, and printer was also available for use by students in the classroom.
The first observation by the researcher was done as they were starting a new unit. The teachers were getting prepared to do a project using technology, which was yet to be planned with their peer coach so the teachers told students they would be using technology very soon, depending on their behavior. The lesson started with SG trying to project a document on the screen for students to view. The teacher immediately encountered difficulties and turned to the researcher to help get the document up on the screen. As students started getting off-task the teacher remarked, “See, this is exactly why I do not use technology with my classes. This is so frustrating.” The teacher headed to the front of the class to start lecturing to the students. After a short lecture about what the students would be learning soon, SG told students to pull out their social studies books and read five pages while he/she got the screen back up. Some students started to read while others looked around the room or sat at their desks waiting. The researcher re-started the computer and the teacher found the document he/she was seeking, but allowed students to read for a little longer. The teacher discussed some concerns with the researcher regarding his/her classes and how they were overloaded and not particularly well behaved. The last ten minutes of class time, the teacher pulled a word document up on the screen with all of the standards the students would be studying that unit listed in order. The teacher lectured students on what they would be learning by reading and discussing each individual standard. At the end of class, the teacher reminded students that they would be using laptops to create a presentation based on the standards discussed in class and that assignment would be given to them in the upcoming week. Teacher roles in the classroom included lecturing only while learning activities involved individual reading. Technology truly was not needed for the lesson and other approaches would have been better.
After working on the unit with their coach, SG and DW started their project with the plan of having the district TLC come in an assist with technology. As stated previously, the project started off very unsuccessful and the peer coach had to meet with the team again to revise the plan. This helped because students were given their country to research along with a list of priority information they should be looking for during their research analysis. “The research was a little overwhelming for the kids, we should have done a better job in preparing the lesson. Some of it is just learning how to do the research. Students need to know how to access and read from the computer and they had trouble with this” (DW). The researcher also pointed out that the assigned research was a little too complicated and long for 6th grade students. If students were to truly research and find answers to all of the questions, it would have taken them an extremely long time to complete. In addition, students were getting off-task because they were not able to find the information using the websites provided and the information was not there. The district TLC, as with the language arts teacher NN, modeled and coached the teachers use technology for projects. It was difficult for the teachers, the researcher observed, because of the various levels of student experience with technology, classroom management issues, and finally the teachers’ lack of comfort with technology. Neither teacher felt comfortable with the technology and the district coach had to model skills in the use of PowerPoint, Internet, and library database for students. The teachers actually acknowledged picking up these skills while the coach was teaching and assisting students. “I learned so much from watching you. I didn’t know how to do any of those things in PowerPoint and I had never used the library database before this class project. I picked up a lot of new skills that I can use with students.” When asked what changed in his/her practices DW remarked “Well, I did this project with you in this class and in my other classes. Students were asking me to do things I didn’t know how to do. Before, when I didn’t know what to do, I
would ask the students and hoped they knew. Now I know more and I am able to use more technology with them.”

The second observation was completed after the coaching from both the peer coach and district TLC, while students were making their final presentations. Students worked in small groups of four or five to find different information about a country they were assigned. Both teachers acted in a coaching or facilitator role helping students, as they needed it. Students learning activities included research, information analysis, writing, and creating presentations. Technology was essential to the lesson. DW’s pre-LoTi level was a zero and post-LoTi level increased to a one. SG started at a pre-LoTi level of three. As noted previously, this score appeared a little high as the participant shared with the researcher early on his/her lack of technology use with students. SG’s post-LoTi level was lower that the pre-LoTi by one level. For this reason, it is possible that this teacher overestimated his/her integration practices and/or did not understand the questions on the survey. During the initial assessment, SG did ask what a lot of the questions meant on the survey. After finishing the survey, he/she finally said, “I just did my best and hope it’s accurate.” It is the researcher’s belief that the second survey result was actually more accurate that the first. The participant even stated that the survey was much easier to understand the second time around, perhaps because he/she had more experience with integrating technology at that point.

SG indicated both he/she and his/her co-teacher, DW, made a great deal of progress with technology integration. They felt that the TLC modeling instruction in one class so they could pick it up during the next class was most helpful. This was something the teachers had never done before this project. “I think if we had started using technology at the beginning, they would have built on skills throughout the year” (SG). SG also noticed a change in classroom
management using the methods modeled for the teachers by the district TLC. “I was very impressed with how the students worked. They loved it and it kept them engaged, and we really didn’t have any discipline problems at all like we had before.” The teachers were initially hesitant to have the students’ work together, but the district TLC assured them this would actually be more effective. At the conclusion of the project SG stated, “I loved seeing the kids help each other. I would show one person and they showed someone else. The peer interaction worked well. I’m not sure my kids would have been successful if it hadn’t been for you.” The change in practice that occurred in these teachers’ classes not only helped with student learning, it helped the teachers understand more about what students were capable of which may influence their future instruction. “Now we can see what the kids can do and start working it into our plans at the beginning of the year. It’s not really a choice anymore; it has to be done for differentiation. It’s something we’re supposed be doing and administrators will be looking for it next year.”

Student Achievement with Technology Literacy Skills

Research Question Seven

*Question 7: Do students, taught by the teachers participating in the coaching process, show improvement in their Technology Literacy Achievement from pre- to post-test?*

Students’ technology literacy skills were assessed at the beginning of the school year, September 2009, and at the end of the study, May 2010. Only students who took the pre- and post-test were included in the results. Students who left after the pre-test or entered the school after the pre-test were excluded from the results, so all students included had attended the school the entire year. There were 190 students who took the pre-assessment and 183 took the post-assessment; however after excluding students who did not take both the pre- and post-test, 177 students were included in the final results. The test was made up of a total of 40 questions. A
passing score is 220, however pre-test scores ranged from a low of 115 to a high of 273 and post-test scores ranged from a low of 118 to a high of 281. The highest score a student can earn on the test is 300. Students were matched from pre- to post-test in order to perform a paired sample $t$-test. Tests for assumptions of normality of the data were conducted and met. The mean pre-test score was 184.25 and the mean post-test score was 211.21, a difference of 26.96 points. The paired sample $t$-test revealed a significant increase from pre- to post-test ($t (176) = -7.605$, $p < .001$). Scores, therefore, did indeed increase from pre- to post-assessment. However, since the pre-assessment was taken at the beginning of the year rather than just prior to the study, improvement on the post-assessment cannot be directly linked to the peer coaching. The choice to give the pre-assessment at the beginning of the year, rather than prior to the study, was made by the district who funded the test. This decision was made in the effort to better understand the students’ technology literacy skills from the time they entered middle school. For this reason, the timing of the initial survey was out of the control of the researcher.

The Process of Peer Coaching

This section will address the process of coaching which includes questions eight and nine addressing peer coaching influence. This also included the factors that helped or hindered teachers in the coaching process.

**Research Question Eight**

*Question 8: How do peer coaches influence teachers’ instructional practices?*

The purpose of this question was to establish the processes coaches used with teachers and how they influenced teachers’ comfort and technology integration practices. During the orientation meeting for the project, the teachers and district TLC established the goal of improving student technology literacy achievement and instruction by making plans for using
technology for learning. Coaches were given a list of resources and brainstormed ideas for integrating according to each subject area (Appendix J). The coaches were told to spend their collaborative planning time with teachers for the purposes of modeling, planning, reflecting, and revising plans, according to the CA model, so teachers could integrate technology properly into instruction. They were to make use of the district TLC only when their teachers needed assistance with integrating technology during the instructional period. Coaches were given the freedom of determining how to best integrate technology into their particular subject area, provided they focused on the middle grade standards of technology literacy. As listed in the methodology, this included teaching students about systems and fundamentals, social and ethical uses of technology, and using a library database. It also included learning how to use the Internet, word processing, spreadsheet, and multimedia presentation software. At the conclusion of the study, teachers and coaches participated in individual interviews as well as subject area focus groups to respond to inquiry regarding how peer coaches influenced their instructional practices with technology.

Modeling

Modeling was a key part of the process of coaching that was most influential with teachers. In fact, teachers who had the district TLC assist in the classroom stated that this gave them practical learning they could use immediately. The district TLC even assured the language arts teacher NN, who was hesitant initially, that she would be there to assist if needed during classroom instruction after his/her peer coach met with him/her to plan the lesson. This was to help make the teacher feel comfortable before the integration practices even started.

In order to assist this teacher, the district coach first modeled assisting students as they worked. The teacher imitated the support he/she observed the district TLC was giving students
and followed her lead. Then, when it was time to teach the students skills, the district coach took the lead in teaching the class so as to model appropriate technology integration. The teacher watched the coach teach these skills the first two classes and then the teacher was in charge of teaching the students in subsequent classes. NN stated that this assistance in the classroom helped build his/her comfort not only with the technology, but also with managing his/her class.

*Effective Communication*

During the planning time with their peer coach, SG listened carefully to the ideas presented for technology integration. His/her peer coach presented and modeled a technology-based lesson in a culminating project, which had students research and present a country they had studied that school year. Though the peer coach presented and modeled use of video editing software to narrate and illustrate the project, the other teachers, including SG, decided PowerPoint would be a better use of their students’ time. It was also the technology they felt more comfortable using with their students. The district TLC attended the meeting and SG immediately asked for assistance with teaching the students to use the technology for the project. Students were to research using a library database and the Internet to conduct their research prior to creating their presentations. The teachers developed questions for the students to answer based on standards from their subject area. This was used to guide their research. SG asked the district TLC to come help when it was time to begin using PowerPoint with the students, what he/she needed most help with teaching the students. The students had two days to complete their research, one with a substitute teacher, and the district TLC would then come to the classroom to model and assist with teaching. When the TLC came on the scheduled day however, students were not even close to finished working on their research. There was a lot of confusion with how to use the database and finding accurate information on the Internet. The teacher stated she had
not used the database before and needed help with that as well as making sure students stayed on task with the Internet. The district TLC showed students how to use the database to find answers to their questions and save pictures to use for their PowerPoint presentations. Once again, class management and teaching students how to research using the Internet and database were causing issues for both the teacher and his/her co-teacher. Additionally, the questions they provided for the students were too sophisticated for them as they were gathered from a book. Though their peer coach provided different questions, the teachers on the team added their own questions, many of which were extremely difficult to answer using the resources students had available. For this reason, the lesson questions had to be adapted not only to help the students but also improve the teachers’ comfort level with using the technology resources available to students for research.

Supportive Learning

Effective coaching, by both peers and the district TLC, involved learning that was supportive and not judgmental. When assisting in the teachers’ classrooms, the district TLC made sure to teach the lesson as if it was being modeled only for students, when it was truly to help teachers learn new skills as well. Supportive practices were used to influence teachers. This included working alongside teachers rather than in a coaching capacity. Peer coaches did the same, they worked as a team with teachers in the planning process. One group acknowledged, “We managed to weed through a lot of that stuff because we talked about it and I think we were all on the same page. I think that was good. I think we were all doing the same kind of project, we were all working on the computers and we all knew we were going to accomplish the same thing. So, I guess the peer coach is the one who got us started with everything. He/she gave us the idea and said this was what we were going to do. We were all on the same page. Not that we were all ending up with the same process, but at least we had the same product.”
Coaches Learning

One noteworthy byproduct of the peer coaching was the fact that coaches actually reported increased comfort and improved practices simply by preparing to coach their peers. The math coach, ST, indicated he/she was not as comfortable with the idea of coaching as the other coaches may have been. He/she took on the coaching because he/she wanted to help ensure students were learning with technology. “Kids love technology, which is why I use it. I wanted to help make sure other teachers could use it too.” In fact, this coach acknowledged why he/she decided to coach despite his/her lack of comfort with technology. “It’s a goal for me to learn about using technology in the classroom. So I knew being a coach would help me. If you show someone how to use something, you learn it.” Other coaches also demonstrated improved comfort levels and change in practice over the eight weeks. The coaches learned primarily through the time they spent preparing to coach and when they worked with their teams of teachers. One coach stated, “We just worked together to devise plans that would work. I made my plan but I learned from them because they modified the plan with other ideas. The coaching process helped me as much as them” (AC). Although teachers’ and coaches’ comfort and change in practices altered equally, preparing to teach their peers appeared to be the primary catalyst for change for the coaches. Thus, it appears the coaching process was influential for both the coaches and teachers participating in the study.

Research Question Nine

Question 9: What factors helped and hindered the teachers in the coaching process?

At the conclusion of the study, teachers were asked, both in focus groups and individually, what helped and hindered them during the course of the coaching process. Responses varied between the four groups, however they all had several common themes.
Teachers and coaches reported most frequently that having district TLC as a resource during instruction was what enabled them most in the coaching process. While teachers were able to plan their instruction with coaches, classroom instruction could only be assisted through the TLC who was able to come into the class to assist with modeling and integration practices. The other four responses all had equal frequency of responses, which included awareness and access to resources, student readiness, and coaching/team relationships and communication. Interestingly, those same three areas were mentioned as impeding them in the process of coaching as well, with nearly the same frequency of responses. Each area is discussed in detail below.

Comfort, Time, & Influence

Comfort, time, and influence from the district TLC were all mentioned equally, six times each, as a contributing factor in whether teachers were influenced by their coach. Each of these areas will be discussed in detail below.

Comfort Level with Technology. Teachers and coaches mentioned comfort level with technology as heavily influencing technology use during this study. In fact, one coach even mentioned his/her own comfort level as affecting his/her progress with peers. “I feel like I was helpful, but I feel like I have quite a bit I have to learn myself. Because this was the first year, I feel like I still need to get a grip on some things myself” (ST). Another coach discussed having to build his/her comfort in order to help the team, “I feel comfortable with knowing a little bit and then throwing something out there to see how it went. Sometimes it worked, sometimes it didn’t, but if I felt like they were learning something, I knew I could bring it back to my group of teachers depending on the students response to it” (SC).

Teachers felt comfort affected influence as well, “I just have to learn to be comfortable first before I can deliver it to my students” (PP). Another stated, “We’re pretty comfortable with
technology and we still did not feel comfortable doing certain things without help. But even when we are comfortable with technology, we find there are all kinds of issues when you’re actually teaching others how to use it” (NN). This teacher mentioned trouble-shooting as an area he/she was particularly uncomfortable with during instruction.

*Time.* Time was an influencing factor in the peer coaching. Two time factors that were mentioned involved both time to plan as well as time to make use of technology during instruction. One coach, who sent instructional plans via email (Appendix I), rather than meeting with his/her team, stated, “There was no time to plan with everyone. When two people were here, these two weren’t here so in sending out the email, no one could say they didn’t get it or they weren’t here that day or didn’t know. You can track who opened the email better, that’s why I sent it out” (ST). A special education teacher in another subject area who consistently missed meetings stated, “Every time planning came up, we had other meetings or something else to do” (BG). It is necessary to note that there were four special education teachers participating in this study, one per subject area. All of these special education teachers worked as co-teachers, with other teachers in the study, for the majority of the day. Each of these also had one small group special education class they taught during the day. Out of the four, only two participated in all of the coaching meetings. The two that did not participate stated that they had other special education team obligations that prevented them from planning with their teams. They also stated that they considered the time when they taught with their co-teachers, during the day, to be their time to be coached. Interestingly, both of these teachers had inclusive classes with the coach for their team. Both stated that they felt coaching was very helpful as they learned while their coach was instructing their co-taught classes. One of the teachers felt the coaching still helped, even though he/she often missed the planning sessions, “I have my coaching when I come into the
classroom, she was patient and taught me all kinds of things” (RL). The other teacher had a similar experience: “Every time planning came up, the special education department had something else for us to do. So the coach always caught me up with what we were doing in class. Watching how they do things in the classroom, that has helped” (BG). This teacher went on to explain how his students’ needs differed from the regular education classes he taught alongside his co-teacher. “My small group kids needed something different anyway because the special education kids had different needs and I needed something completely different for them” (BG).

Lack of class time. Other teachers mentioned lacking the class time to integrate technology. One of the coaches stated, “I’m the guy that would burn three days of class to teach PowerPoint, for example, but I don’t get too tied up in the pacing guide. I know in order to stay on the pacing guide; you have to waste a day to teach the students a skill. You’re wasting curriculum time, but you’re not wasting teaching time in that manner” (SC). A teacher on the same team stated, “We all want to learn, but we just don’t have the time. We can’t necessarily take up time in class for students to learn a program” (JJ).

Value of technology. The last area, mentioned by three of the four coaches as influencing their teachers, was the value teachers placed on making use of technology. All three stated that teachers who felt that technology was a positive instructional tool, essential to use for student learning, were much easier to influence in the coaching process. One coach said of one of his/her more hesitant teachers, who was not convinced of the value of technology initially, “She does what she wants to do and I do what I need to do with students” (PO). Another coach said it was imperative to get his/her people in front of the program so they couldn’t say, “‘Hey, I don’t have time or I gotta move on’ because they have more important things to do” (SC). Finally, one coach said the teachers did not make time to meet because it was not important to them. This is
the reason this particular coach said that she sent an email with ideas for integrating technology, rather than meeting with their team to participate in the coaching process.

**District TLC.** The outside influence of the TLC was mentioned most often as enabling teachers in the peer coaching process. Originally, the TLC was expected primarily to lead the coaches in the process of coaching through guidance and assistance in the planning process. As the study went on, however, the coach was called into teachers’ classrooms as they prepared to use technology with their students. The teachers also liked the modeling provided in the classroom by the TLC. A teacher on the math team commented, “We had no choice and you made me. When you get a demonstration, it’s a lot easier to go ahead and do it than when someone says ‘Here’s a website, go try this.’ When you actually brought it to me and had me use it in class with you there, that’s what made the difference” (OP). Another teacher, in still another subject area, stated what helped him/her most, “Having another teacher come in, when you came in and worked with me and the students, it was just a lot smoother, more hands on and gave me more experience” (NN). Finally, a one of the coaches stated, “We need to continue the same thing we’re doing next year, you (the TLC) is the glue that holds it all together. If you continue this, what we started this year, I think it will work because you’ve got people willing to do it now” (AC).

**Awareness and access to resources.** Teachers stated that being made aware of resources and easy access to resources, including their coaches helped them in the coaching process. One teacher stated, “I really liked having someone right there I could run down the hall and say to me ‘Hey, try that, don’t try that’, so it was very beneficial. It was good to have a coach or someone immediately available. They can’t necessarily solve your problems right away if you have one, but just having someone to bounce your ideas off of to see if it’s going to work or not helps.
Having the resource person to go to benefitted us a lot” (HA). “I learned so much about the things that were out there. They loved making the digital posters. The students did this based on a curriculum based activity and worked in groups to create presentations” (AC). Some teachers felt that the emphasis on technology as well as the availability of technology resources in the building was helpful and made them want to learn about more resources. “Having the technology and making it a focus is what helped me. I’m hoping we’ll have SmartBoard training this summer to get on board with those too” (JJ). Other teachers felt that they did not have access to resources or that they could not use the resources available for their subject area, and in turn, felt this impeded them in the process. This was especially true of the math team. “Not knowing that there was a coach so I could go over and ask questions, cause everyone is busy, you know, was the problem for me. Our coach didn’t really meet with us much and emailing us didn’t give us what we needed” (PP). The coach from this same subject area stated, “Trying to stay with the pacing guide and not having the technology that would present or enhance it was an issue. Technology just for the sake of using technology did not resonate with me” (ST). One special education teacher, on another team, who missed the coaching meetings with his/her team, stated, “I don’t know what’s out there, and it’s not that I’m not comfortable, I just feel like we’re running in so many different directions so fast to get to where we’re supposed to be that there’s not a lot of time to go and ask about that sadly.

**Student readiness/expertise.** Teachers and coaches in each group mentioned student readiness with technology as something that enabled them in the coaching process. Once teachers planned lessons with their teams, they went to their own individual classrooms to implement their lessons. Over the course of the study, they made use of technology at various times and some felt that the continuous practice assisted them in making use of technology.
“Each day we did the computers, it got better and better. We even got better at handing them out and there wasn’t as much misbehavior and redirecting” (SG). Another teacher felt student comfort improve his/her comfort, “The kids being comfortable with the technology, because they were using it in a lot of their other classes helped a lot because they were able to help other students when I couldn’t get to them. For example, yesterday I asked a student if he had his PowerPoint that he needed to work on for social studies and one student said, ‘I don’t know how to do this’ and the other student said, ‘Well, let me show you.’ So they were able to share their knowledge and they felt comfortable sharing their knowledge because they were doing it in other classes. Plus, they really knew what they were learning along the way. So it made it easier on me. It just made other students more knowledgeable with using those resources on their own without my guidance or help and they clearly got the opportunity to use it and do different things with it. So, I think that was a very good part of this process” (JJ). “There are kids who can teach other kids or me. I think that is so important too. They don’t even ask; it’s such a natural thing they just get up and help others. Some of the worst kids in the class will get up and help without even asking if they can. They just feel so much better about themselves” (DW).

One of the two special education teachers, who participated in the planning sessions with his/her coach, felt the students benefitted a lot from using technology. It even resulted in the students developing their own peer coaching activities. “What was interesting was to watch the special education kids and how they did with their own peer coaching. One kid came in and knew how to do everything and helped every kid around him and he was just in his element. I was impressed with what he was teaching the other kids” (DW). Math teachers, who did not integrate technology as much due to curricular pressures, brought this up as a concern rather than a benefit. “I think my thing is, what we are really struggling with is the amount of time it took to
teach them to get them to learn the computer part and we are tight with the timeline of teaching. I know you can integrate anything, but with the sixth grade, they don’t have the skills they need” (OP). A teacher in the same group stated, “The kids have to get to a certain level before they can do a certain activity. The sixth grade math curriculum is, you have no time to waste, not that technology is a waste of time but it takes extra time to get them to a level in which they can appreciate it and move smoothly through the technology activity. You have to build that level of understanding first and getting to that level took most of my time” (PP).

Coaching/team relationships and communication. Each subject area mentioned the communication of their particular coaching team as enabling them. All but one felt the strength of their team and communication was the contributing factor that helped them in the coaching and integration process. “The coaching helped but we needed even more time with our teams for planning” (SC). Another team suggested that their team saw a lot of success because they were able to plan, implement, and come back to revise what they needed to change. “This time was kind of rough but we now know how to work out the rough patches. We know what to expect and what the traps are and how to avoid them. Next time we do it, it will be much better” (SG). Another teacher stated, “We ended up merging the projects, which worked out a lot better because everyone contributed. It just worked better that way” (DW). A teacher from another team stated, “We all did the same things with a different approach, but it all worked out for the kids” (NN). There was one team, however, that felt that their communication and team relationship hindered them in the coaching process. This team actually struggled with the coaching relationships and one teacher stated, “I think we had a problem with our team. We were a bit dysfunctional. Even when we were in planning sessions, my suggestions were pretty much
trashed” (OP). Another teacher on the team agreed stating, “I don’t know exactly why, but it wasn’t very good. I think it was more personality conflicts than anything this year” (PP).

**What Hindered Teachers in the Coaching Process**

In addition to the three areas listed above, five additional areas were mentioned as impeding teachers in the coaching process. The vast majority of teachers felt their efforts were inhibited by two prevailing factors. These two areas were lack of availability when it came to computers and time. Three additional areas were mentioned quite frequently as well: The timing of the coaching project, teachers’ comfort level specifically with trouble-shooting and classroom management.

*Lack of availability.* As mentioned earlier in the observation chart (Table 7), most teachers have between three and five computer stations in their rooms for student use, not nearly enough to work on a classroom project. The school as a whole has two computer labs with 32 computers in each lab as well as two Mac-based laptop carts with 32 computers each to be shared among approximately 72 classroom teachers across the school on a first come first serve basis. While teachers were planning their lessons, they attempted to schedule time to use the computers by staggering their projects. While this helped, teachers still struggled with getting enough time with the computers. Lack of availability was mentioned by 11 of the 13 teachers as hindering them in the coaching and integration process. In fact, two teachers mentioned having a different platform with Mac laptops as an issue. “We have no support with the Mac computers, I wasn’t able to print or save easily and I don’t feel comfortable with them” (NN). This may have created more problems with availability because some teachers refused to use them. “The Macs are just so different too. I can do a lot of on the other computers but I just don’t like the Macs” (RL). One teacher felt availability was the biggest challenge “It would be nice if each grade level
would have their own lab. Having only three computers in my room doesn’t really help. It would almost be better to take those computers from each classroom and create another lab” (SC).

Another teacher said, “I mean, I like having five computers in my room, but when they put them in my room, they stuck them all in one spot and trying to put 10 students on those five computers just doesn’t work” (AC). One teacher attempted to send his/her students to other teachers’ rooms to work on their projects. “It would be good to have a lab to use because farming my students out to other classrooms, like I did, sets us up for frustration. We’re basically creating a decentralized computer lab. We shouldn’t have to do that, it’s crazy” (SC). Finally, one teacher said, “We need better access to computers with the population that we have. After testing, everyone wanted to do the projects we were planning. We didn’t have enough computers to go around” (PO).

Over the course of this project, several teachers developed a deeper understanding of the importance of integrating technology during the school day with the students at this Title I school. This is worthy to note as it helped make integration worth working through its challenges. “Some kids don’t have computers or access to internet at home so we have to take that into account (SG). “I would say that access to technology with the amount of students we have, students that hadn’t previously used the technology, so you have to do more one-on-one instruction with how to do this and that. With trying to get computer labs that makes it a little inconvenient because you need more time with the computers” (NN).

*Time.* Time, needed for both teaching students using technology and coaching, was another area mentioned by more than half of the teachers involved in the process. As mentioned above, teachers felt that the students they were working with needed more time with technology, perhaps because they do not have access to the technology at home for practice. “It seems like if we can block out time to take the test, we could block out time to come in and teacher the kids
how to use the programs, and even teach us” (HA). “We probably need to get used to wasting a
class to teach the kids a program so when it comes to specific projects, they are able to do them
more effectively” (SC). “We didn’t have time to view the projects because we worked so hard to
teach the programs. Although, I think it’s ok to see the ones with errors so we can talk about
what they can learn from it. The technology is really an important way to learn for kids, so it’s
important to learn instead of listening to us talk or lecture but technology throws us off because it
takes so long. You almost have to keep going with different directions once you start with
technology. I don’t think we do enough with technology because we’re so worried about
standardized testing and practice with those skills” (SG).

Teachers and coaches also noted that planning time with their coaches was valuable and
needed if they wanted to continue to integrate technology into instruction. “We don’t have
enough time to do this. We really need more time if we want to be more tech savvy and more
tech oriented and more time for coaching and less time for let’s sit in a room for an hour and
show you something that’s going at a speed we can’t keep up with and then expect you to go
present this to your kids and bring back work samples from it afterward” (NN). One teacher
noted that time may help with the accessibility problem. “We need planning time or instruction
to make plans for using fewer computers, maybe to set up a lesson to rotate kids through it”
(DM). “We probably need to work on lesson planning and integrating technology into standards
more. Maybe create student projects we can incorporate throughout the year within the
curriculum” (SG). Through the coaching process, teachers were expected to make time to reflect
and articulate factors that worked and those that needed revamped and revise their plans by
exploring different ways to integrate. One group worked specifically on this and felt it pressed
the time issue even further. “Time to plan is such a big issue. You know our plan didn’t work
originally and we had to revamp it to work with students. It took even more time than we expected” (DW).

While the lack of time to plan was an issue, teachers mentioned the timing of the study, equally in frequency, as area of concern. Several teachers mentioned the importance of starting the coaching process at the beginning of the school year in the upcoming school year. Originally, the timing of the study was strategically chosen to take place at the end of the school year, after the pressures of standardized testing were behind the teachers. After participating in the coaching study however, teachers seemed to find the benefits of coaching worth the time to make it a focus throughout the year. “The last eight weeks it was kind of hard because other people were trying to implement technology. I think starting at the very beginning of the year it would be awesome if we could get to know programs and build a community of learners.” (ST). Do it earlier in the year, the beginning of the year, and introduce programs so they can do brochures or other projects” (JJ). “I would start at the beginning and do more ‘let’s work through this and see how it works’ because everyone does things differently. See how we can make it work for each person since everyone does things differently” (PP). “I’d like to have something for each unit, an activity that would involve technology but starting from the beginning of the year instead of at the end” (OP). It is evident from the teachers’ statements, that many teachers felt that the coaching and integration of technology benefitted them enough to make it a priority throughout the year.

Comfort with trouble-shooting and classroom management. These two issues were revealed early in the study and appear to relate to each other. Many teachers felt that their biggest problem with integrating technology was their lack of comfort with trouble shooting when there were problems with the computers. Additionally, teachers’ frustration with classroom
management when using technology was a problem. These two problems oftentimes coincided with each other. “Some of it is management issues figuring out how to keep students attention on the teacher instead of the technology. I’m thinking in the future, they close the lid of the computer or face the person with their hands on their knees. Otherwise, the technology is so, they’re so interested in the technology, which is great, but they’re so interested that they miss the point of the lesson” (NN). “I think for most of us, people who don’t use it much, it’s a comfort level issue. If something happens, how do you fix it? And also, it’s a management in how you set it up and how you partner, simple things like that” (AC). One teacher discussed in detail his/her frustration with using technology with students when his/her comfort level was not strong prior to the study. “We had no clue what we were doing and we made so many mistakes that it turned us off to technology. If we had someone to tell us more about it from the start and had a work session where it was modeled for us, it would have been better. I mean, we need to know what kind of trouble we could possible have with technology and how we can make it work with our kids because the kids act up when we have trouble. Every day I struggle; I have to get people to help me. You can’t just show someone how to do something and give them instructions and think they’re going to feel comfortable with it and expect they’re going to learn how to do it” She went on to discuss the merits of using technology during the coaching process, “I think the more we did the technology project, the more the expectations and behavior improved. It all smoothed out because they got it and then we got it and made a production that made them proud” (DW).

The Teacher’s Stories: Factors that Helped and Hindered Subject Area Teams

It was found that successful coaching was quite dependent on three areas, which included how well the personalities of the coach and team connected, the assistance of the district TLC,
and the particular subject area involved in the coaching. The needs of the particular subject area teachers may have actually influenced the value in which the teachers placed on use of technology versus other priorities as well. Each subject area, therefore, had varying experiences with influence. One group of teachers, in fact, felt their peer coach offered no influence during the course of this eight-week study. This may have been due to all three of the themes listed as affecting influence.

Language Arts

While all four of the coaches acknowledged the importance of coaching style in working to influence their teams, they also felt the strength of their team depended on how their personalities meshed. The language arts team, made up of the coach, the coaches’ inclusion teacher, and another language arts teacher collaborated weekly though not all parties were in attendance. The coach’s inclusion teacher, RL, often let the two regular education teachers plan together while he/she worked on other special education responsibilities. “I received my coaching in the classroom while PO was teaching. He/she made the plan and I followed it, helping my students according to what he/she did with his/her students” (RL). PO therefore committed to coaching NN individually but did not always feel his/her influence was always positive or productive. “It’s difficult because we have two different styles of planning, she’s knowledgeable, but doesn’t really like using technology much so we ended up doing different things” (FS). The researcher, who attended some of their collaborative planning sessions, noted that PO would make a plan, model what he/she was planning on doing with technology, and offered various ideas to NN for using technology with students.

PO’s grasp on peer coaching was inherent and done as discussed in the coaches training. NN, however, often times expressed the need to do something different with his/her kids because
they would not behave for him/her. In fact, the researcher noted a little tension when the teachers were planning one particular unit. PO suggested creating a video book talk with his/her students in order to meet the language arts standard of students learning the way a story teller would share a story. NN very quickly recommended that they do not create a video with students because he/she could not “handle their behavior or deal with the risk of bringing expensive equipment into the room.” The researcher offered an idea to combat this problem by allowing one group of students, take this task initially in order to model it for the class, and then maybe do it with other students later. NN stated that he/she didn’t want to get the cameras and “have to deal with getting the wires out and all and to figure that out with students.” Instead, NN suggested borrowing a video from the media center of someone telling a story for students to watch. This sentiment was captured earlier in the study when the district TLC stopped by to discuss how a particular project, planned with PO, was going to determine what help he/she needed. “I’m working on the same project as my coach but it is not worth it. It’s more of a headache than it’s worth” (NN). The influence PO had on NN’s practices in the peer coaching process, therefore, was to contribute ideas and plans to his/her instruction. Much more influence appeared to come from the district TLC who came into NN’s class to model and assist with classroom instruction. NN experienced both change in comfort and change in instructional practices when the district TLC came into the room. When asked why it helped to have someone in the room with him/her NN stated, “It’s been a thousand times better than before when we were given a class and shown how to do something and having to make a lesson plan and bring the data afterward. It’s so much better to have someone come in, even if you can only teach one lesson, show us how to teach the technology because we aren’t technology teachers.” From the district TLC’s perspective, it took a good bit of time to build NN’s comfort with him/her and influence change in practice. The
district TLC took time to ensure NN felt comfortable with her being in the room and understand that no judgments would be made regarding NN’s classroom management. From talking to NN prior to entering the classroom, it was clear that he/she needed someone who was not going to tell him/her everything he/she was doing wrong. The district TLC was there as a coach to assist and model and give ideas when they were needed. In other words, once a relationship was established between the district TLC and the teacher, influence on comfort and practice was easier to accomplish. During the focus group interview with the whole language arts’ team, NN commented, “We’re pretty comfortable with technology and we did not feel comfortable doing these things without your help, am I right about this? We’re competent and can do all kinds of things. But even we, who are comfortable with technology, find there are all kinds of issues when you’re actually teaching others how to use it.” It is clear from his/her comments that influence for this teacher came from both the peer coach and the district TLC in different forms. Both were necessary for this particular teacher.

Math

From the researcher’s perspective, the math coach had the most difficult time with coaching his/her team of teachers. A lot of this had to deal with the strict time-line of the pacing guide for the math curriculum, provided by the district. The math teachers consistently brought this up as a concern when coaching meetings were called. The district TLC and peer coach had to call a special meeting to try and understand what could be done to motivate change. “I don’t really have time to use technology in this unit. The administrators are on my back about getting everything done and I’m already behind in my pacing guide” (PD). The math peer coach felt the challenge of trying to influence his/her teammates during the eight-week period. When asked whether he/she was able to help his/her peers through coaching ST reported, “I don’t, because it
was like everyone was going their own different directions and some people had already shut
down since it was close to the end of the year. They were not receptive to putting in effort to do
something different” (ST). It is important to note that this particular coach did not spend much
time face-to-face with his/her team; instead the coach sent the team formal plans with
instructional activities for integrating technology by the use of email. In response to the same
question, this coaches’ peer teachers stated, “She sent us stuff. I looked into it a bit but did not
take my classes through it. The biggest part was finding time to analyze it and determine if I
could use it and I didn’t have that time” (OP). Another teammate laughed saying, “If I’m being
honest, I didn’t even know she was our coach. I received information but thought it was just
sharing information rather than coaching.” (PD). While the other teachers did know ST was the
coach, his/her coaching was not observed during the study.

The math team itself had problems from earlier in the year and for some reason did not
seem to communicate or interact well together during the coaching process. The coach assigned
to the group, ST, was known for working more individually rather than collaborating with the
team. In fact, the peer coach did not make it common knowledge that he/she was assigned as the
coach to the team throughout the process. At one point, ST decided to send an email with ideas
for integrating technology and a specific project teachers could use with their students (Appendix
I). For this reason, the district TLC decided to initiate a coaching meeting to try and understand
what the issues were and what assistance the teachers needed in moving forward with coaching
and integration (Appendix J). During the meeting, ST did not lead the group in discussing how
they would integrate technology into instruction. Instead, the district TLC initiated asking what
their needs were and how to improve their comfort with using technology in their math classes.
The teachers expressed their concern that to get all of their curriculum covered in the last eight
weeks of school and may not have time to use technology. The district TLC, a former math teacher, offered assistance and stated that after meeting with their peer coach they could request in-class assistance with integrating technology. The teachers asked specifically for websites they could use to help students better understand surface area and volume, something their students were struggling with at the time. They also brainstormed ideas for projects they could do and indicated they would meet again, with their coach, to create a subject area lesson they could all use. They then planned to get together within two weeks to reflect on the effectiveness of using the websites and determine a technology-based project they could all do with their students.

After the meeting, ST approached the district coach and said she did not have time to look for websites the teachers may not even use. For this reason, the district TLC offered assistance to the coach by finding three websites for each topic and sending it out to the teachers (Appendix K). Teachers stated this would help them most in enhancing their instruction and still allow them to finish their curricular timeline for the year. The coach also sent a project idea for teachers to use with their students.

In looking for reasons why coaching was not effective with this team, the researcher found several compounding issues. First, the team did not have effective communication with each other. When the other teachers were asked if they knew ST was the coach, OP replied, “Yeah, I did, but I think we had a problem with our team. We were a bit dysfunctional compared to last year; we weren’t the team we were last year. Communication was our biggest problem.”

Though ST was well respected for his/her teaching, the other math teachers felt he/she was not someone who liked to share his/her ideas or lessons. Thus, communication was a big problem for the math team. The math coach was also a special education teacher, with fewer students who had different needs. This may have made it difficult to plan lessons that would meet the
requirements of the other teachers. Additionally, the math teachers had trouble finding the time and appropriate technology they could use within the curriculum they were studying. “The 6th grade curriculum makes it so you have no time to waste. Not that technology is a waste of time but it takes extra time to get them to a level in which they can appreciate it and move smoothly through the technology activity. You have to build that level of understanding first and getting to that level would have taken most of my time, you know. Sixth grade curriculum is just so compacted and you only have so much time, there’s no time to waste. It would be nice if we had a program that students can make use of to help them practice with rational numbers” (PD). For these reasons, neither the peer coach nor the district TLC were able to guide the teachers’ in technology integration practices in math.

Science

Science teachers, on the other hand, had quite a successful experience with their coach. All of the teachers on the team felt that their peer coach was highly capable and influential improving their practices with technology integration. This appeared to be not only because of the coach, but because the personalities of the teachers on the team meshed well together. SC, the science coach, stated in response to how he/she coached his/her team, “I think it helped because teachers felt more at ease with the programs and had the opportunity to play with them more and see what they could do to plug it into their curriculum. I tried to make sure they were comfortable by working with them to make that happen.” This particular coaches’ team felt they all worked well as a team. “We just work together really well. Whatever our coach does, he sends to us and we do it (JJ). Another teacher on the same team stated, “Mr. SC is very knowledgeable with technology and makes you comfortable with using the technology with kids” (HA). Another reason the coach was influential was the overall teams desire to use more
technology. “One important fact is that we all want to incorporate more technology and meeting together gets us on the same page, and we were able to get ideas from our coach” (JJ).

There are many reasons this team of teachers may have experienced more success with coaching. This team of teachers had been working together for several years. All of the teachers were also very motivated to do what was best for the students. In fact, two of the teachers had been named Teachers of the Year in previous years. The teachers on this team did not call on the district TLC for any assistance in the classroom. The only support the district TLC gave the teachers, therefore, was to offer ideas during the collaborative planning sessions. Teachers did often ask for suggestions, but the science peer coach was willing to take those suggestions and put them into action. Other teams, however, were not as easily led to do it on their own. Overall the science team was successful because they were easily coached with a team that worked very well together.

Social Studies

The peer coach and the district TLC equally influenced the social studies team. When the researcher met with the team, the teachers were eager and ready to incorporate technology though a couple of the teachers were nervous about using technology with their students. The coach started the planning session by discussing where the teachers were in the curriculum at the end of the year. They all agreed to complete a culminating project that would allow students to create a presentation based on a country they had studied that year and then share the presentation with the class. This would give all of the students different perspectives of the countries they studied and summarized what they had learned throughout the year. The team easily accepted the plan; however, deciding on the manner of presenting it was a little more challenging. The social studies peer coach, AC, was both a 6th and 7th grade advanced content
teacher and thus used the peer coaching model with both grades of social studies teachers.

Additionally, since AC taught a smaller class of advanced students this coach was able to plan to make use of movie editing software, a more advanced form of presentation, with his/her students. The 6th grade regular and inclusive education teachers, however, felt that PowerPoint would be a better way to present knowing both the skills of the students and comfort level of the teachers. In regards to working with the 7th grade social studies teacher AC stated, “When Mr. X and I planned together, we were on fire, the partnership really worked and I shared the wealth and knew that I was doing it with the kids I teach too.” AC said he/she felt he/she helped the 7th grade teacher more because they were more similarly skilled. The 6th grade teachers, on the other hand, took AC’s ideas and created a lesson they could use with their on-level and inclusive education students. SG, one of the 6th grade social studies teachers stated, “The peer coaching got us started, it got us on the same page and got use going in the right direction. We knew what we were doing wrong, what worked and what didn’t because each teacher started it differently. We knew all kinds of things and we talked about it. We were all on the same page, not that we were all ending up with the same process, but at least we all had the same product.” Similar to the language arts teacher, the entire social studies team of teachers requested assistance from the district TLC. For this reason, the district TLC was quite influential with changing teachers’ practices in this subject area. Teachers who had help from the district TLC remarked that this was a pivotal factor for them. “I want say this too, obviously the district TLC did an awesome job helping us, I was supposed to be the coach but all I had to say is ‘Ya’ll, we’re going to do a computer project’ but we were all just willing to do it because of your support. Everyone was just so willing and it turned out great. We sat down there that Friday and it worked out. No one was afraid to do it.” The teachers felt the district TLC helped them as well through the coaching
process, “My kids wouldn’t have been successful if it hadn’t been for you (the district TLC). It made me want to use technology more with my students, and now I feel like I can do it” (DW). This subject area benefitted from peer coaching both from their coach and the district coach. Guidance, therefore, was needed from both in order to impact instruction with this and the language arts team. For this reason, a blended approach to the peer coaching may be the best way to effectively prepare teachers to integrate technology into their instructional practices.

The district TLC, who led the coaches in the coaching process, was found to be an essential element of the coaching practice. This was an unintentional outcome that evolved as the study progressed. From the beginning of the study, the TLC stated that she was available to help during class time if teachers needed it, as this was part of his/her job as a district coach. Coaches quickly found that the teachers were requesting her assistance since they were not able to actually help the teacher during the school day. Both coaches and teachers mentioned the TLC as influencing teacher practice through classroom assistance and modeling of technology. One coach stated, “We got together as a team but you (TLC) helped them more just because of the nature of you being able to go in the classroom. The coaching is a great process though” (AC). A teacher in another subject area had a similar reaction, “DW and I made a lot of progress on technology in the classroom. It really helped bringing in the carts and working individually with students on projects. You teaching the students particular skills in one class so we could teach them to the next class helped too” (SG). His/her co-teacher stated, “My kids wouldn’t have gotten as far as we did if you hadn’t come in to show us how to teach the program. It’s important for us as teachers to learn the programs to perfection first so we can teach the students” (DW). Finally, one of the teachers stated, “You should be very proud of what you did getting this started because I think the kids, the sixth grade, they got it in science, social studies, and
language arts. The whole point is, because of your efforts, every child was able to get some exposure to technology. It should be an easier transition to do these projects next year” (SG).

Overall, the coaching process had its positive and negative aspects. While the context in which the coaching took place made a difference, most of the participants agreed that the process overall was beneficial. Most of the factors that hindered the coaching process were minor or had to do more with personality factors between coaches and their teams as in the math team. Ultimately, the findings offered evidence that this coaching model was effective in improving teachers’ comfort and practices with technology integration.

**Key Findings**

The researcher’s findings regarding change in comfort varied between the quantitative and qualitative data. A t-test run on participants’ pre- and post-PCU scores showed that the change in comfort was approaching significance. If there had been a larger sample size, it is possible comfort would have measured changes at a significant level. Many of the teachers originally revealed their comfort level with technology was low or very low. After the study, however, most of the teachers indicated verbally that their comfort had improved over the course of the eight weeks. For this reason, it appears that comfort level did improve even if it was only slight.

Change in practice was measured quantitatively using teachers pre- and post-LoTi levels. A t-test, however, revealed there was no significant change in practice from pre- to post-assessment. When examining both the pre- and post-classroom observations and statements teachers made regarding change in practice, there was a definite shift in integration practices. There could be several reasons for this. Once again, the small sample size could have made it difficult to measure any significant changes in instructional practices. Secondly, though the
change in practice was considerable to the teachers, the LoTi test may have been too sophisticated to pick up the little changes teachers made in their classroom practices. In other words, teachers would need a lot more time and practice with different uses of technology for learning to develop changes that truly impact their scores on the LoTi.

Comfort and change in practice improved for a variety of reasons depending on the subject area. The researcher found that most teachers achieved these changes for different reasons. The language arts and social studies groups made changes by working with their peer coach, during planning sessions, and their district TLC during classroom instruction. For these two groups, both the peer coach and district coach were necessary to improve comfort and practices. The science group worked with their peer coach only and was able to make changes to their instruction that worked for them, though as a whole, they didn’t indicate that they felt more comfortable because of the coaching. The math group did not benefit from the peer coaching or district TLC much at all. According to the teachers, this was due to the rigors of their pacing guide and curriculum as well as the dysfunction of the team and their lack of communication. Overall, it seems that a hybrid model of peer coaching, which includes a leader such as a district TLC who can come into the classrooms when needed, is the most beneficial form of a coaching program.

Students’ scores on the Technology Literacy Assessment did improve significantly from pre-test to post-test. It is very likely that the teachers’ focus on technology integration during the last eight weeks of school, just prior to the assessment, helped to prepare students for the test. The upcoming assessment caused a sense of urgency in the teachers because they knew what students needed to learn and wanted to ensure they learned it. According to teachers, students had not received much instruction using technology prior to the start of the study. It is likely,
therefore, that the technology integration done with students during the study helped improve their skills with technology, resulting in higher post-test scores.

Finally, the main factors that helped teachers in the coaching process were the peer coaching assisting them with planning lessons, the district coach assisting in the classroom, and teachers having the resources they needed to integrate technology appropriately. Some of the overlying factors that hindered teachers in the coaching practice included lack of time, difficulty in accessing computers, and student-readiness for using computers.
CHAPTER FIVE
DISCUSSION, CONCLUSIONS, AND IMPLICATIONS

This chapter will offer a summary of the results of this study presented in Chapter 4, as well as the implications they may hold for educators in professional learning, technology integration, and student technology literacy. Conclusions and recommendations for future research on the topic of peer coaching for technology integration will also be discussed.

Summary of Study

This research set out to determine how peer coaching affected (1) teachers’ comfort level with technology; (2) instructional practices with technology; and (3) student technology literacy achievement. The study also gathered information on the process of peer coaching. A mixed methods collection of data was utilized to better understand the research questions. The quantitative data included the LoTi survey, which provided teachers’ Personal Computer Usage (PCU) and Level of Technology Integration (LoTi) scores, revealing teachers’ comfort with technology and instructional practices with technology. This was supported by the qualitative data, which included teacher’s open responses, both oral and written, to better understand teachers’ comfort and instructional practices with technology. Pre- and post-observations assessed teachers’ practices and how they changed over the course of the study. Additionally, student achievement data were used to understand whether teacher’s participation in peer coaching impacted student achievement with technology literacy. Finally, teachers were interviewed individually and through focus group discussions to understand how coaching influenced teacher’s practices and what helped and hindered teachers in coaching and integration practices.
There were a total of 13 teachers, four of them coaches, who completed this eight-week study, which took place at the end of the 2009-2010 school year. After the researcher trained the coaches, they worked with their subject area teachers to lead them in planning and integrating technology, specifically addressing technology literacy standards for middle school students. These standards were also used to evaluate student technology literacy achievement on the TLA and included the following technology-based concepts: system fundamentals, social and ethical use of the Internet, word processing, multimedia presentations, spreadsheets, database, and the Internet. There were 177 students included in the analysis of student technology literacy achievement. Students took the pre-assessment at the beginning of the year in September 2009 and the post-assessment in May 2010, at the conclusion of the eight-week study. Teachers were also assessed one week prior to the study and at the conclusion of the eight weeks using the LoTi survey. Written responses were collected at the beginning of the study to clarify what technology the teachers had used prior to the study. Teachers’ self-described comfort levels with technology resources were also addressed through an open-ended question on the survey. Each teacher, including coaches, was observed prior to the study and as the coaching process took place. Finally, teachers were interviewed, individually and as a group, at the end of the study to better understand comfort, change in practice, and the coaching process.

Overview of the Problem

Teacher training in the use of technology resources has been around for decades. Unfortunately, many teachers continue to struggle with the use of technology for instruction and student learning. Students must be able to use technology for learning as these skills are growing in demand by institutions of higher learning, the work place, and for day-to-day life skills. The skills are so important, in fact, that the National Assessment for Educational Practices will be
adding a technology literacy component in the year 2013 (NAEP Technology and Engineering 2014 website, 2008). For this reason, educators must ensure teachers are comfortable with technology for learning and integration of technology into their daily instructional practices. The purpose of this research was to determine if this particular peer coaching model was more an effective method of training teachers to utilize technology than the current model for technology training. The following questions were used to guide this research on peer coaching:

**Research Questions**

1. Do teachers’ comfort levels with technology increase from pre- to post-test?

2. How do the teachers describe their comfort level with technology prior to the study?

3. How did the teachers’ describe their comfort level with technology after participating in the peer coaching process?

4. Do the teachers’ instructional practices with technology change from pre-test to post-test?

5. How did the teachers make use of technology with their students this year prior to the study?

6. How are the teachers using technology differently than they were prior to the study?

7. Do students, taught by the teachers participating in the coaching process, show improvement in their Technology Literacy Achievement from pre- to post-test?

8. How does peer coaching influence teachers’ instructional practices?

9. What factors helped and hindered the teachers in the coaching and integration process?
Review of the Methodology

The study took place at a Title I funded school, designated as such because of its high number of students on free and reduced lunch. All Title I schools in this particular district were assigned Technology Literacy Coaches (TLCs) in order to assist teachers and students with using technology for learning. Each coach, however, was responsible for two to three schools, each holding 75-100 teachers. This provided a challenging task to assist all of the students and teachers. For this reason, four peer coaches, who were well skilled in pedagogy and curriculum, were assigned to assist teachers within their subject areas in integrating technology into instruction. They were trained in the coaching process by the district TLC and given guidelines for integrating technology according to the Middle School Technology Literacy standards, for which students would be assessed using the TLA. Coaches also spent time with each other to determine what types of projects would fit best with their curriculum.

Peer coaching was done within subject area teams through modeling, lesson planning, guidance, and providing feedback to teachers as they integrated technology into their curricular lessons. Coaches were also able to enlist the aid of the district TLC, when needed, to help teachers during class time. Quantitative and qualitative data were collected to understand teachers’ change in comfort and practices over the course of the study. Coaches and teachers were included in the data analysis, a total of 13 participants, as the coaches were teachers responsible for learning and improving student technology literacy with their classes as well. Additionally, the coaches were not necessarily chosen for their technology skills, as is evident in their scores at the beginning of the study. Student technology literacy achievement was also measured quantitatively with the Technology Literacy Assessment. Results differed between
subject areas and among coaches, as reported in Chapter Four. The next section will review those results and discuss the major findings, surprises, and conclusions that resulted. Implications and recommendations for future research will also be shared.

Summary of Major Findings

The researcher’s findings indicate that coaching did improve most of teacher’s comfort level with technology over the course of the study. Comfort appears to have been affected by three main aspects: peer coaching, coaching within the classroom instruction, and improved student skill due to the increase in technology use across the grade level. Change in practice was not significant according to the results of the LoTi assessment; however, observations and interviews indicated that teachers changed their practices by providing student-centered uses of technology. Prior to the study, teachers used technology primarily for their own purposes. In general, practices changed because it was made a priority by the coaches and they worked to plan lessons that would utilize technology for student learning. Additionally, student technology achievement improved significantly from pre- to post-test. The peer coaching process, therefore, may have been a contributing factor in students’ progress with technology literacy skills although further research, with the use of a comparison group, would provide more conclusive results.

Results indicated that both the peer coaches who helped with planning for integration, and the district TLC who assisted teachers during instruction were necessary in the coaching process. The coaches’ use of modeling, effective communication and supportive practices were helpful in influencing teachers’ practices. All of these factors likely helped to improve comfort and support change in teachers’ classroom instruction. It is the conclusion of the researcher that this model of coaching, which utilized both peer coaches and the district TLC was effective in
improving comfort and integration practices. It provided a cost-efficient way of helping more teachers achieve effective technology integration. Use of subject area peer coaches as well as a district coach may be necessary if educators are to see a change in technology integration practices. This helps because teachers who need the one-on-one assistance in the classroom can get what they need while others, who just need a team coach to help them plan, have that option as well. Overall, this model of coaching was found to be successful with teachers and their students who showed improvement in their technology skills.

Findings Related to the Literature

Peer Coaching for Professional Learning

Research has shown that most teachers are dependent on professional learning activities to learn how to make use of technology for student learning (Baylor and Richie, 2002). Unfortunately, even after years of trying to improve technology use, research has shown that teachers still lack the support they need to initiate and sustain technologically integrated instruction that improves teaching and student learning (Matzen & Edmunds, 2007; Palak & Walls, 2009). Often this is simply because technology training lacks modeling that focuses on instruction utilizing technology rather than just the technology itself (Brinkerhoff, 2006; Matzen & Edmunds, 2007; Palak & Walls, 2009). Training that focuses merely on technical skills can result on teachers falling back on their traditional teaching practices (Matzen & Edmunds, 2007). Ultimately, this may be what has prevented teachers from changing their practices to more student-centered approaches of learning with technology.

Professional learning must be centered on instruction that is context specific and learned within a collaborative community of teachers who can provide the proper modeling of instructional practices (Borthwick & Pierson, 2007; Garret et al, 2001; Knight, 2007; Russo,
This research demonstrated that teachers were more likely to make use of technology when they were given instructionally sound ways to do it.

Past studies have researched the use of peer coaching from different angles. For example, the eMints study made use of a coaching technique, which appointed trained coaches specifically to assist teachers during instruction (Martin, Strother, Beglau, Bates, Reitzes, & Culp, 2010). Sugar (2005) also completed a study making use of peer coaching with a high school teacher who acted as a coach to teachers from an elementary and middle school in order to assist them with developing technology based lessons. While both of these studies found success with coaching, this research utilized a form of peer coaching that allowed teachers in the same grade level, subject area, and school to work together and plan for instruction with a peer leader acting as the coach. This was based on the idea that people tend to learn better through social experiences working toward context specific objectives (Fiddler, 2000; Fullan, 2006; Taylor, Marienau, & Vygotsky, 1978). Also, Hew and Brush (2003) found that both inservice education on technology applications and collaborative support was necessary to sustain long-term growth with technology integration.

A study completed by Holahan, Jurkat, and Friedman (2000) emphasized the importance of choosing coaches that were highly motivated and well-respected. Knight (2007) also suggested choosing coaches who are not only good teachers, but patient, caring, and understand how to assist teachers through kind yet candid feedback. The research proved this to be the case as well. The peer coaches were respected and quite helpful in preparing teachers for using technology in a way that would work with their students. In fact, use of both peer coaches and the district coach in this capacity were critical to this process. The district TLC assigned to the participating school was available to assist teachers in the classroom when needed. This seemed
to be helpful as it gave the peer coaches the ability to scaffold and individualize learning for those who needed extra assistance. While some teachers appeared to benefit from the peer coaching alone, others needed more assistance during instruction to help improve comfort and initiate change in practice. This model of peer coaching, utilizing teacher leaders with a district coach, offers educators a cost-efficient way supporting teacher leadership in a school, which may lead to long-term improvement in technology integration practices.

Improved Comfort

Measuring teacher comfort levels was fairly important to this research because lack of comfort may prevent teachers from using technology. When teachers are comfortable with technology, however, they are more apt to use it in a student-centered manner (Brinkerhoff, 2006; Matzen & Edmunds, 2010). The teachers in this study seemed to experience improved comfort because of the coaching, both through their peers and the district TLC, as well as students who were better prepared to use technology. This was due to the fact that students were learning how to use technology in most of their other classes. This was an unexpected result of the research, especially considering the short time in which the study took place. In fact, the assistance of the district coach, who was skilled in technology, seemed to help teachers learn more integral technology skills, which caused these skills to spread to the teachers and other students. In fact, one teacher noted that when his/her students were completing their projects, they were participating in their own form of peer coaching by helping each other with skills they learned during the eight weeks.

This study found that trouble-shooting was an area of discomfort for a few of the teachers as well. It was even stated as a reason for avoiding student technology use altogether. Grove, Strudler, and Odell (2004) recognized this as a problem due to the fact that teachers do not have
the time to trouble-shoot difficulties that may occur during use. Ensuring teachers are comfortable with the problems that may arise through technology use, therefore, appears to be a necessary component of improving instructional practices with technology. One teacher was appreciative of the district TLC’s modeling of trouble-shooting during class stating, “Telling someone verbatim how to trouble shoot doesn’t work for me. I can do things myself but the coaching process has been so much more helpful.” Research has shown that certain teachers may need more individual assistance to improve trouble-shooting and/or classroom management skills while using technology (Jones, 2001; Vanatta & Fordham, 2004). This was another unanticipated problem that the district TLC had to address during the research. Several teachers needed more individual assistance with classroom management during technology integration. For this reason, individual attention with someone skilled in technology and teaching that can address trouble-shooting and classroom management, such as the district TLC in this study, may be needed by certain individuals in order to sustain comfort with technology integration.

Changes in Technology Integration and Student Learning

The ultimate goal in training teachers to make use of technology is to prepare them for improved instructional practices that will support student learning and achievement. As other studies have shown, training teachers within a specific context with people they have built relationships with can help with this (Fullan, 2001; Knight, 2007). Also, by appointing teachers who were instructionally and pedagogically competent, the focus was placed on using technology for learning rather than technology for its own sake (Earle, 2002; Matzen & Edmunds, 2007). Teachers were also able to implement the changes immediately, according to the plans they created with their peer coaches, and reflect on what was working and what needed to be adjusted in a timely manner (Barron et al., 2009). This appears to have supported the
teachers in changing their practices as well as helped them bond as a community of learners (Cole et al., 2002; Matzen & Edmunds, 2007; Seels et al., 2003). What was different about this study, however, is that change in practice was measured both through the LoTi survey, so teachers could self-assess their change in practices quantitatively, and observations that assessed change in the day-to-day instructional practices. The results, though mixed, suggested that teachers may have overestimated changes in their own instruction verbally. Though the observations showed teachers’ practices did indeed change, the degree of change did not appear to be sophisticated enough to demonstrate significance on the LoTi. Using both forms of data helped make this more apparent. The change in practice was notable, however, and did appear to help ensure more students made use of technology for learning.

The ultimate goal of changing teachers’ practices with technology is to improve student learning. Although, measuring the impact on student achievement has been challenging for educators in the past. In fact, there have been few professional learning activities that result in measures that demonstrate improved practices with students (Martin et al., 2010). Research has shown that while teacher use of technology is low, student use is even lower (Vanatta & Fordham, 2004). Teachers must be able to distinguish the impact of using technology for learning in order to value it for learning (Bradshaw, 2002; Hughes & Ooms, 2004; Vanatta & Fordham, 2004). The researcher sought to understand the impact on student achievement with technology for this reason. This study focused on student use of technology. Peer coaches were trained to address student learning with the use of technology when planning lessons, so assessing student learning was important to this study. According to Barkley (2008), a culture of coaching in a school can improve teacher learning and thus student achievement. Student technology achievement did in fact improve significantly on the TLA. Due to the fact that the
pre-assessment was given months prior to the treatment, it is difficult to determine whether the peer coaching treatment was the cause of the increase in scores. However, when pairing the classroom observations, which indicated change in teachers’ instructional practices with technology, and the improved scores on the TLA, the peer coaching process may have influenced the increase in students’ technology literacy achievement although to what extent is unknown.

The researcher did not anticipate several of the results found in this study. For example, it was quite surprising to find how little technology was used with students prior to the last eight weeks of school when the study took place. Although teachers stated that they had been trained in the past to use technology for learning, teachers gave many reasons why they did not make use of technology with their students. Part of this, it appears, was due to the lack of priority put on use of technology. Many teachers felt the coaches helped make technology a priority and that is why they changed their practices accordingly. Not all teachers changed their practices to make use of technology, however. The math group had a lot of difficulty both with communication between their coach and teachers and with finding ways to integrate technology into their lessons. This was a surprise to the researcher because, as a former math teacher, she felt she could help influence them to use technology with assistance. Sadly, the teachers in this group were not able to make the shift to improved practices with technology for various reasons. This was a disappointing result of the research. Finally, the researcher was concerned about the fact that the appointed coaches were not experts in technology and in fact did not demonstrate higher comfort levels on the LoTi than the teachers they were coaching. Fortunately, this did not seem to make a difference in the final results leading the researcher to believe that comfort and skill with technology are not the most important qualities in assigning coaches to teachers. What appeared to be more imperative was assigning teachers skilled in instruction and leading their
peers in improving instruction. For the most part, teachers followed the lead of their coaches and trusted them to help them design and implement lessons using technology. This is noteworthy because it indicates that teachers can be trained to be peer coaches regardless of their technology prowess. Consequently, it is the researcher’s belief that there are benefits to having both peer coaches and a technology-trained educator, such as a district TLC, to provide quality technology-based professional learning for teachers.

Conclusions

This research revealed several findings about peer coaching as a strategy for training teachers to effectively integrate technology. First, it revealed that this form of peer coaching does improve comfort and initiate change in practice. In turn, student technology literacy may be affected by teachers’ integration practices. This study also found several reasons why the coaching was effective and the challenges that make coaching difficult. While comfort with the use of technology is important, several features appear to affect comfort and thus the chances of teachers integrating technology for learning. Peer coaching can be a complicated process, so making it an effective form of professional learning takes an understanding of the learning processes involved in making it work. Finally, the researcher has found that this peer coaching model, which includes a district coach to lead the process, is a more effective way of implementing learning for teachers.

Improved Comfort and Practices with Technology

As stated earlier, teachers have struggled to integrate technology into their instructional practices for many years. For this reason, teachers depend on professional learning that will prepare them for proper integration. It was evident at the beginning of this study that the participants had difficulty providing student use of technology for learning. During this
examination, teachers were able to meet with their peer coach who helped them developing context specific, technology-based lessons. Peer coaches modeled and taught their peers how to best make use of the technology for learning and later reflected on their practices, good and bad, in a timely manner so needed adjustments could be made. Peer coaching helped teachers and coaches become more comfortable with the technology because they were able to discuss concerns and make improvements immediately.

Comfort with trouble-shooting, classroom management, and the technology itself were all issues that made the use of technology challenging for some teachers who revealed they avoided it altogether for these reasons. While peer coaching within a community of teachers was helpful to some, many needed more individualized attention through assistance during instruction to deal with these issues. The district TLC added this element of individualized learning to the coaching model by making herself available to assist teachers during instruction. Change in practice and improved comfort resulted and while some only needed help from their peer coaches, others benefited from the more individualized approach from the district TLC. For this reason, the researcher can conclude that peer coaching led by a district coach who can follow up with teachers’ needs in the classroom is an effective form of professional learning for technology integration.

This model of peer coaching was effective in raising comfort levels and changing practices by providing teachers with individual help in using technology with students. Although the growth in comfort for the entire group was only approaching significance, with such a small group it is definitely notable. Comfort may have improved for a number of reasons. Many of the teachers who initially stated having low comfort levels improved according to both their statements and PCU level. Almost all of these teachers also had the assistance of the district TLC
in their classrooms. The teachers who did not have in-class assistance by the district TLC and/or did not attend all of planning sessions with their peers, however, did not demonstrate improved PCU scores or as much improvement in their stated comfort levels. For example, when BG was asked about his/her comfort level he/she responded, “I don’t know about comfort level but I’ve done more, but I still question what I’m doing. I’ve tried more, just don’t know that I’m more comfortable with it.” BG did not attend many sessions with his/her peer coach nor gain assistance from the district TLC. Another teacher who also did not attend all of the coaching sessions stated, “I’m not more comfortable. I wish we could have some really specific ways to integrate technology in the classroom” (RL). Since RL did not attend all of the planning sessions, he/she was not aware that specific lessons were offered from the team’s peer coach. This teacher, who taught inclusion classes with the coach, stated that he/she learned from watching the peer coach teach their students only thus, neither improved comfort level nor change in practice was achieved. The researcher found, therefore, that while peer coaching was helpful to some degree in improving comfort and changing practices for most teachers, those who chose not to attend planning sessions with their coaches or receive help from the district TLC did not benefit from this model.

Change in practice was measured through the LoTi and classroom observations. While results on the LoTi did not indicate significant changes in practice, observations demonstrated changes toward instruction that was more student-centered with technology. Thus, the researcher concludes that while the LoTi may not have been able to measure small changes in instruction in eight weeks, the teachers indicated their practices changed and observations verified these findings. A long-term study is recommended to better understand how this form of peer coaching affects teachers’ practices over time.
Peer Coaching Model

As stated previously, it was expected that the four appointed subject area peer coaches would take on the primary coaching duties during this research. As the coaching began, it became evident that the district TLC, who trained the coaches initially, would have to take a more central role in coaching. Though the coaches worked hard to ensure teachers were comfortable with the instructional plans and prepared to change their practices with technology, assistance was needed beyond their meetings. As these needs were communicated to the district TLC, it was quickly apparent that more individual scaffolding was needed in order for all teachers’ needs to be met. For this reason, the researcher has discovered that a hybrid form of peer coaching may be the most effective option for improving teachers’ comfort and practices with technology. While not all teachers needed the assistance of the district TLC, just making the resource available was helpful to some. This model provides a cost-effective way to make coaching successful because it made use of teachers already positioned in a school and trained them to coach their peers. This takes the place of hiring a person specifically charged with this task. The district coach was necessary, but needed only on occasion so it would not require numerous personnel to achieve these results. Though this study only collected data from one grade level of teachers, the district TLC was actually working with other grade levels in two separate schools and still had time to assist the teachers involved in the study. Therefore, the researcher found the district coaching position to be a crucial resource in assisting in the promotion of widespread technology integration practices.

Additionally, the researcher found that the peer coaches helped by bringing attention to the fact that individual assistance was available through the district coach. Prior to the study, teachers who did not feel comfortable with technology did not request assistance from the district
coach because there was no plan made to implement technology in instruction. Teachers, therefore, did not take the initiative to use technology on their own or ask for assistance from the district TLC. Peer coaches made the plan for integration and offered the district TLC as a resource to make integration a successful venture. It essentially provided a form of marketing for the district TLC by making the teachers aware of this valuable resource. This model is likely to be useful to educators who need a cost-effective model that provides for teachers’ needs and may sustain changes in technology integration practices over time. In conclusion, it is likely that peer coaching requires more than one level of coaching to prepare teachers for proper, long-term, improved technology integration practices.

Coaching Selection Process

Proper selection of teachers to act as peer coaches was likely a reason this coaching proved to be successful. Initially, the researcher was concerned when the results of the LoTi PCU levels revealed that coaches were not very comfortable with technology. Since the coaches were hand selected by the principal based on their ability to lead and plan pedagogically sound lessons, the researcher planned to assist the coaches as much as possible given the circumstances of the study. It turned out that this was not necessary at all. The peer coaches were immediately up to the challenge of learning the technology on their own if they did not know it. They often asked for assistance from the district TLC, but only if their teachers needed help during instruction. For this reason, the researcher concluded that expertise and comfort with technology were not the most important characteristics of a peer coach. In fact, expertise may not even be desirable, as the teachers appeared to feel comfortable with their coaches as they worked at a level that was practical for the teachers. If coaches had been experts in technology, it may have actually intimidated the teachers and prevented them from using technology. Instead, their ability
to lead teachers helped to build their team relationally, which seemed to facilitate teachers improving their integration practices. Thus, instructional savvy and leadership, it appears, may have been much more important in the peer coach selection process that it initially seemed.

The district TLC, who was skilled in teaching and learning as well as technology, seemed to help improve the coaching process as well. The district TLC had worked with the students in this school and other Title I schools prior to the study and therefore understood the students’ backgrounds and needs nearly as well as the teachers. Teachers felt comfortable with the district TLC coming in because she was well versed in teaching, classroom management, and working with students from Title I schools. The district TLC made sure to build relationships with the teachers so as to work as a team in the integration process. If the district TLC did not have proficient teaching skills, it is likely that the in-class coaching and modeling would not have been as successful. Since the district TLC could relate to the teachers and students, she was able to help them accordingly. Teachers were more comfortable and eager to improve their technology integration practices. Consequently, selecting a district coach skilled in technology and teaching may be crucial in making this model effective.

Influence

While the researcher found the coaches to be well selected by administration, it often took more than the coaching to improve comfort and practices with technology. Prior to the start of this research, the 6th grade teachers participating in this study admitted to using technology primarily for their own uses rather than providing student-centered learning activities. Like the students, however, teachers have individual needs and require more than coaching to influence them. Making technology a priority and working toward the objective of improving student technology literacy helped influence all of the teachers. Improving students’ technology literacy
scores became the ultimate objective and since teachers understood what they were working toward, it helped influence them to make use of technology for student learning. Additionally, some teachers simply needed to know what resources were available and what their colleagues were doing with them. “Watching my team try different things has helped me” (BG). “We help each other out a lot and learn from each other. I’ve learned a lot from just hearing what others are doing in their classes” (HA).

The individual coaches did not always feel as influential in the process, however. One coach felt no matter what he/she did, his/her peer would do something different in their class. It’s difficult because we have two different styles of planning, he/she’s knowledgeable, but doesn’t really like using technology much, so we ended up doing different things” Another stated his/her team was not cooperative in the process of coaching. “I don’t feel they’re going to take the time to do what I gave them anyway. They aren’t really interested in using technology like I am” (ST). According to the responses from these coaches’ peers, all of the peer coaches were at least somewhat influential in the coaching process. It was, however, also important to involve leadership from the district TLC in both cases. The researcher found that one-on-one time with teachers, whether during instruction or planning time, was sometimes needed to guide and assist teachers more individually and hence influence change. Though it was not planned, the district TLC became a part of the subject area communities that were working to improve practices. Initially, the district TLC was planning on letting the peer coaches do the primary coaching and act only as an advisor to the coaches, using more of a hands-off approach. As the study began, it became obvious that the peer coaches needed her for guidance and the teachers needed her for modeling and assisting with trouble-shooting in the classroom. Because of the nature of the job, the district TLC was obligated to help when needed and thus this model was established as the
best way of meeting the needs of the teachers. Also, the TLC felt that coaches were influenced not only because of their desire to help improve instruction, but because the district TLC respected and trusted them as equal leaders in improving technology implementation. In other words, as Knight (2007) suggests, relationships of partnership and genuine respect were vital to the coaching process. This led the researcher to conclude that a hybrid form of peer coaching, which involves the use of both peer coaches and a lead technology coach, was essential to this make this coaching process most effective.

**Student Technology Literacy**

Student technology literacy skills are becoming more and more important as evidenced by the state requirement to assess these skills at the end of students’ 8th grade year. This study offered evidence that using more student-centered forms of technology for learning may have helped improve students’ technology skills. As the findings revealed, students’ scores increased significantly from pre- to post-assessment. Though the improvement cannot be directly linked to the treatment, the observations yielded results that indicated teachers made changes in their instructional practices with technology, which may have contributed to improving student’s technology literacy skills. Teachers even noticed improved skills with technology, as they provided less one-on-one help to students during the eight weeks. Students would take the initiative to assist others in class who may not have been as experienced with technology. This also led to more comfort for several of the teachers since they did not have to help as many individual students during class time. Instead, they could focus on the students who really needed help. It also appeared to help with the teachers’ instructional practices because several teachers stated that as soon as they learned what the students were able to do, they felt more comfortable giving students more advanced tasks using technology. As one teacher stated, “Now we can see
what the kids can do and we can start working it into our plans at the beginning of the year” (SG). This domino effect likely occurred because of the culture that developed as teachers and students made increased use of technology for learning. The researcher’s conclusion, therefore, is that the positive results of change in comfort and practices with technology were dependent on improved student skills as well as the coaching.

*Teaching with the End in Mind*

Peer coaches helped encourage teachers to use technology for learning with students. In addition, knowing there would be a student assessment at the end of the eight weeks created a sense of urgency to work toward improving students’ technology skills. The researcher found it possible this factor may have actually improved the coaching process because all teachers were working toward a common goal of getting technology in the hands of students. Many teachers even said they used technology simply because they knew it was the expectation and students would be assessed at the end. “I think a lot of teachers are responding to the district TLC’s encouragement to get the computer project in before the end of the year. The teachers here are conscientious and want to do what they are supposed to do” (NN). Fortunately, this resulted in teachers using more technology, which contributed to improving both comfort and change in practices. “I learned a lot - I was so proud of what I did and how much I picked up from my team and you (the district TLC) and I used technology a lot more” (NN). Making technology a priority, therefore, may have made teachers use it a lot more which may have in turned helped improve comfort and practices with technology.

*The Coaching Process*

The coaching process was one that was definitely useful in this specific setting. The researcher found three qualities that likely made this model successful. These qualities included
modeling, communication between coaches and teachers, and supportive learning practices. Modeling was found to be most important in promoting change in teachers’ practices. One teacher, NN, stated of the coaching: “It’s been a thousand times better than before when we were given a class and shown how to do something and having to make a lesson plan and bring the data afterward. It’s so much better to have someone come in and say, even if you can only teach one lesson, show us how to teach the technology because we aren’t technology teachers.” While peer coaches provided a lot of the modeling, the district TLC was able to make it more practical by modeling practices in the instructional time with students. This was what a lot of the teachers needed most and may not have realized it until it was done for them. SG stated, “When we started, I was uncomfortable but excited that I might learn something because we haven’t had technology workshops in a while.” He/she went on to state, “You helped us teach the kids things I never knew about or felt comfortable with before you modeled it for us.” Modeling practice for teachers seemed to be one of the key features in improving their practice. Thus, the researcher found it to be a necessary component to successful coaching.

Communication and supportive learning were also key features in the coaching process. Most of the individuals felt supported in the learning process, whether through the peer coach or district TLC or both. The math group, who struggled with improving comfort and practices, seemed to lack both of these qualities in their coaching experience. In fact, their coach used email to send ideas for implementing technology rather than meeting with the group, modeling, and discussing the plan for implementation. They were the only group who mentioned communication as being a problem, and thus did not feel much support in the learning process. OP stated, “I think we had a problem with our team. We were a bit dysfunctional. Even when we were in planning sessions, my suggestions were pretty much trashed.” It was very important for
teachers to feel as if they were part of a learning team working toward the same goal and while the other teams felt this support most of the time, the math team did not. The importance of communication and supportive learning practices, therefore, cannot be overlooked in the learning process and in future studies, a focus on training coaches to provide these qualities is recommended.

More Challenges in Coaching

While several challenges have already been mentioned, there were some difficulties that were not controllable by the circumstances of this process. Time is a typical challenge for teachers in professional learning and implementation practices. This model incorporated the coaching into the time typically used for planning. While this was helpful, teachers still found time to be a particular issue. In fact, while time to plan was discussed as a challenge, the bigger problem was the amount of time teachers had to make use of technology in their curriculum pacing guide. This was a particular problem for the math group who felt extreme pressure from administration to complete their curriculum. For this reason, the district TLC decided not to pressure the teachers into integrating technology unless they felt comfortable with it. The researcher found it may have helped this group to have implemented this study at the beginning of the year instead of at the end. This would have given them more time to find resources that would work for their particular subject area within a specific unit. Unfortunately, it is possible that challenges such as this would be difficult to overcome in this process. If improving practices with technology results in more stress for teachers, it is not likely that teachers will be able to make useful or valuable changes in their instruction with technology.

The other big challenge that was mentioned repeatedly was the lack of availability of computers for students. This was an unexpected development, but one that indicated to the
researcher that teachers were making a concerted effort to get technology in the hands of the students. One outcome of this was that teachers learned how to make use of computers for group projects, of which many teachers had not done before this study. Some teachers also decided to stagger their projects so they could reserve computers as a subject area and share when necessary. One teacher even found this to be helpful because the students were able to help each other with technology more readily. “All of the teachers were using the labs and laptops for their projects so I had to improvise and share the lab when I could. What helped me with using technology though was that I didn’t have to help as many students since they were able to help each other” (JJ). While lack of resources was a challenge, teachers found ways to overcome the circumstances and still found ways to implement technology effectively.

Overall the challenges of the coaching did not hinder teachers so much that they were not able to use technology for learning. Teachers were able to overcome a lot of the problems and used their resources to make this an effective process. In the end, teachers were able to learn how to implement technology more effectively. Several teachers even spoke to the future of using technology because they saw the improvements it made in their instruction and student learning. AC stated, “I think the kids, the entire sixth grade, they got it in science, social studies, and language arts. The whole point is, because of your efforts, every child was able to get some exposure to technology. It should be an easier transition to do these projects next year.” This coaching process, therefore, made changes that may have a lasting effect on the teachers and perhaps cause them to make use of technology for student learning more in the future.

Implications for Action

This study established the fact that this model of peer coaching can be influential in improving teachers’ comfort with technology and changing teachers’ practices with technology.
Student achievement with technology also appears to have been affected through this process even over the short period of eight weeks. This research may benefit educators who are looking for improved practices with technology because it provides a method of professional learning for educators that can be built into their current planning time with skilled peers. No additional staff is necessary, however guidance from someone skilled in instruction and technology and able to guide the practice of peer coaching and assist teachers when needed is crucial. More guidance and training in the coaching process would benefit teachers and may improve the overall effect of peer coaching on teachers’ practices. While the TLC was trained in coaching techniques, the teachers did not receive any specific training in how to coach their peers. Additionally, the results of this study could help to establish important guidelines in identifying qualities of effective coaches. As Knight (2007) contends, coaches must be wonderful teachers who respect the teachers they work with and can offer kind but honest feedback. The researcher, additionally, found that expertise in technology is not as essential a quality as is a teacher skilled in instruction and pedagogy. This study also showed that more prevalent use of technology with students might improve their technology literacy as well as help teachers feel more comfortable using technology for instruction. When students’ skills improved, teachers’ comfort improved as well. This seemed to make several of the teachers more willing to implement technology based lessons. This is because students can help each other when teachers are not able to assist with learning. In other words, when less overall help is needed from the teacher more individual learning needs and students can be addressed. Consequently, since technology literacy skills are becoming more important to be successful in higher education and the workforce, a peer coaching format such as the one used for this study may be helpful to educators looking to improve instructional practices with technology. As a result, the researcher recommends that this
form of peer coaching be used in other schools provided the proper peer coaches are available with guidance from someone skilled in both technology and instruction.

Recommendations for Future Research

This study and the peer coaching practice lasted a total of eight weeks. The researcher recommends using the peer coaching practice with teachers for a much longer period of time to see if it is truly sustainable and if the results continue over time. It also involved a small number of participants, 13 total, and it is recommended that a larger group is utilized in future research. In fact, it would be valuable to research the coaches separately from teachers in order to determine whether coaches are able to advance their skills more quickly than the teachers they are coaching. This was not the case with this study as coaches and teachers were both assessed the same. The researcher chose not to separate them as the coaches were teachers who acted as leaders in the integration process and thus were learning and working with students throughout the study as well. This would also require a longer-term study as eight weeks may not be enough time to make this determination. It is also recommended that a student assessment be used to determine if there truly is a connection between peer coaching and student achievement with technology. In addition, the researcher recommends further research with use of a comparison or control group. Though this study started with a comparison group, the lack of participation made it necessary for the researcher to drop the group entirely. It is also recommended that a mixed method study be used in future research with qualitative methods that will clarify how the process of coaching works in different contexts. Finally, the small number of participants resulted in a lack of diversity within the group, which may not be representative of the larger population. The results are thereby specific to the setting where the study took place. Thus, further study is needed to examine whether the results can be replicated to another setting.
Concluding Remarks

This research revealed several components about the peer coaching format used for this study according to the findings shared in Chapter Four. This format, utilizing peer coaches within subject area teams with a district coach to guide the process, was found to have great potential as a form of professional learning for teachers. It allowed teachers the opportunity to plan for contextually specific uses of technology for learning within a collaborative community. More importantly, it offered extra assistance to teachers with the district coach who could model instruction with students. While not all of the teachers were more comfortable with technology, it did help the teachers who attended planning sessions with their peer coaches or had assistance in the classroom from the district coach. The collaborative communities also assisted in establishing the use of technology for learning a priority. Teachers, therefore, focused on preparing students with the technology literacy skills that were assessed at the end of this study. Selection of coaches highly skilled in curriculum and learning seemed to be more important than technologically adept teachers. Finally, improved student learning seemed to improve comfort as well as influence teachers to incorporate more technology because students were able to use it more independently. For these reasons, this form of peer coaching for technology integration has offered a promising form of professional learning for educators who want to improve practices with technology.
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Appendix A  
Technology Integration Coaching Guidelines Handout 1

Integrating Technology

Harold Wenglinsky (2006) “We can measure how various activities in the school and in the classroom— including computer access and use— correlate with student performance.”

We must “prepare their children for a society where learning and employment are increasingly dependent on digital access and expertise” (Staples, Pugach, Himes, 2005, p. 285).

Coaching plan: During CPT with your peers

- **Modeling**- Offer ideas and demonstrate how you would use/integrate technology in the classroom
- **Coaching**- Provide feedback and guidance as they plan, scaffolding when necessary
- **Reflection**- When you meet again, reflect on how it went
- **Articulate** reflection
- Finally, **explore** ways you can do it differently next time

Also

- Try to find one lesson/project you can use one of the following programs: excel, powerpoint, word, photo story, moviemaker, internet search making use of technical vocabulary as it is taught or something similar to get students making use of technology.
- Let me know what assistance, resources, and/or time you will need. I will help you throughout this process.

Free Resources

- **Etherpad**- Real time collaboration on documents, ideas, questions
  
  http://etherpad.com/

- **EduGlogster**- digital posters: fun, interactive, can add sound and video
  
  http://edu.glogster.com/

- **Voice Thread**- http://voicethread.com

- **Wall Wisher**- http://www.wallwisher.com
# Appendix B

## Guidelines for Technology Literacy Handout 2

### Spreadsheets

This module assesses tasks unique and central to creating, editing, manipulating, and interpreting data in spreadsheet tables, charts, and graphs.

<table>
<thead>
<tr>
<th>Creating, entering, sorting, filtering and saving information</th>
<th>Using common functions in spreadsheets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Worksheet</strong></td>
<td><strong>Value</strong></td>
</tr>
<tr>
<td><strong>Workbook</strong></td>
<td><strong>Cell address</strong></td>
</tr>
<tr>
<td><strong>Cell</strong></td>
<td><strong>Rows and columns (and how to add borders)</strong></td>
</tr>
<tr>
<td><strong>Active cell</strong></td>
<td><strong>Formula</strong></td>
</tr>
<tr>
<td>Ascending/descending</td>
<td><strong>Formula bar</strong></td>
</tr>
<tr>
<td><strong>Value</strong></td>
<td><strong>Function</strong></td>
</tr>
<tr>
<td><strong>Cell address</strong></td>
<td><strong>Range</strong></td>
</tr>
<tr>
<td><strong>Rows and columns (and how to add borders)</strong></td>
<td><strong>Operators</strong></td>
</tr>
<tr>
<td><strong>How to add borders</strong></td>
<td><strong>Filter</strong></td>
</tr>
<tr>
<td><strong>Formula</strong></td>
<td><strong>Sort</strong></td>
</tr>
<tr>
<td><strong>Formula bar</strong></td>
<td><strong>Cell references</strong></td>
</tr>
<tr>
<td><strong>Function</strong></td>
<td><strong>Auto sum</strong></td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td><strong>Merge cells</strong></td>
</tr>
<tr>
<td><strong>Operators</strong></td>
<td><strong>Legend</strong></td>
</tr>
</tbody>
</table>

### Multimedia and Presentations

This module assesses tasks unique and central to the creation and manipulation of graphic, audio, video, and other non-textual products by electronic means.

<table>
<thead>
<tr>
<th>Inserting graphics and other multimedia into documents</th>
<th>Creating, formatting and saving presentations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clip art and pictures from file</strong></td>
<td><strong>Template</strong></td>
</tr>
<tr>
<td><strong>Jpeg, bitmap, gif</strong></td>
<td><strong>Slide formatting</strong></td>
</tr>
<tr>
<td><strong>Vector</strong></td>
<td><strong>Hyperlinks to other slides</strong></td>
</tr>
<tr>
<td><strong>Crop</strong></td>
<td><strong>Action settings</strong></td>
</tr>
<tr>
<td><strong>Color palette</strong></td>
<td><strong>Custom animation</strong></td>
</tr>
<tr>
<td><strong>Group and ungroup graphics</strong></td>
<td><strong>Slide Sorter</strong></td>
</tr>
<tr>
<td><strong>Ordering objects</strong></td>
<td><strong>Slideshow</strong></td>
</tr>
<tr>
<td><strong>Lines and line styles</strong></td>
<td><strong>Transitions</strong></td>
</tr>
<tr>
<td><strong>Audio</strong></td>
<td><strong>Movie clip</strong></td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td><strong>Storyboard</strong></td>
</tr>
<tr>
<td><strong>Capturing and composing audio-visual presentations</strong></td>
<td><strong>Text box</strong></td>
</tr>
<tr>
<td><strong>Import</strong></td>
<td><strong>Use of AND, OR, NOT</strong></td>
</tr>
</tbody>
</table>

### Database

This module assesses tasks central to the use of common database interfaces, such as Web search engines, school library records, and specialized database design software.

<table>
<thead>
<tr>
<th>Searching the web or other databases using both single and multiple keyword searches</th>
<th>Sort, filter and search simple databases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Keyword</strong></td>
<td><strong>Datsheet</strong></td>
</tr>
<tr>
<td><strong>Multiple keyword search</strong></td>
<td><strong>Row/Record</strong></td>
</tr>
<tr>
<td><strong>Advanced search</strong></td>
<td><strong>Column/Field</strong></td>
</tr>
<tr>
<td><strong>Search engine</strong></td>
<td><strong>Field type</strong></td>
</tr>
<tr>
<td><strong>Use of AND, OR, NOT</strong></td>
<td><strong>Value</strong></td>
</tr>
<tr>
<td><strong>Table</strong></td>
<td><strong>Filter</strong></td>
</tr>
</tbody>
</table>

### Social/Ethical

This module assesses knowledge about accepted ethical norms as they relate to technology, as well as the impact of technology, past and present, on society.

<table>
<thead>
<tr>
<th>Identifying ethical and unethical behaviors with respect to the use and transmission of electronic files, software and other online data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Copyright</strong></td>
</tr>
<tr>
<td><strong>Plagiarism</strong></td>
</tr>
<tr>
<td><strong>Online safety (instant messaging, chat rooms and message boards)</strong></td>
</tr>
<tr>
<td><strong>Download/upload</strong></td>
</tr>
</tbody>
</table>
**Systems and Fundamentals**

This module assesses tasks central to the understanding and use of computer systems.

<table>
<thead>
<tr>
<th>Selecting a data format or technology tool appropriate to the task or audience</th>
<th>Knowledge of the basic parts of the computer, vocabulary and symbols of technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Application software (Word processing, Spreadsheet, Database, Graphics, Presentation, Desktop Publishing, Email, Browser)</td>
<td>• Hardware/software</td>
</tr>
<tr>
<td>• Operating system- makes computer function</td>
<td>• Hard drive</td>
</tr>
<tr>
<td>• Read only</td>
<td>• Input and output</td>
</tr>
<tr>
<td>• File extensions (i.e., .doc, .xls, .txt, .ppt)</td>
<td>• Input device</td>
</tr>
<tr>
<td>• USB port</td>
<td>• Output device</td>
</tr>
<tr>
<td>• USB drive</td>
<td>• Cursor</td>
</tr>
<tr>
<td>• File/Save</td>
<td>• Minimize/maximize</td>
</tr>
<tr>
<td>• Edit</td>
<td>• Restore &amp; close buttons</td>
</tr>
</tbody>
</table>

**Recognizing and distinguishing among file types**

<table>
<thead>
<tr>
<th>USB port</th>
<th>Cut/copy/paste</th>
<th>Network</th>
<th>Format</th>
<th>Edit</th>
</tr>
</thead>
<tbody>
<tr>
<td>File extensions (i.e., .doc, .xls, .txt, .ppt)</td>
<td>Network</td>
<td>Format</td>
<td>Edit</td>
<td></td>
</tr>
<tr>
<td>Read only</td>
<td>Network</td>
<td>Format</td>
<td>Edit</td>
<td></td>
</tr>
</tbody>
</table>

**Creating, storing and retrieving data on local area networks and peripheral devices**

<table>
<thead>
<tr>
<th>Basic troubleshooting for computer problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Ctrl + Alt + Delete</td>
</tr>
<tr>
<td>• Error 404 error (page not found on the Internet)</td>
</tr>
<tr>
<td>• Refresh to reload webpage</td>
</tr>
</tbody>
</table>

**Word Processing**

This module assesses tasks central to formatting text and text/page layout.

<table>
<thead>
<tr>
<th>Publishing, printing and saving documents in a variety of locations</th>
<th>Applying standard text formatting and layout options</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Mail Merge</td>
<td>• Font, font size and color</td>
</tr>
<tr>
<td>• Saving as a .txt file</td>
<td>• Style: Bold, italics, underline, normal, super and sub script</td>
</tr>
<tr>
<td>• Saving on a USB drive</td>
<td>• Alignment (left, center, right, justify)</td>
</tr>
<tr>
<td>• Print Preview</td>
<td>• Caps Lock</td>
</tr>
<tr>
<td>• Print the current page or a group of pages</td>
<td></td>
</tr>
<tr>
<td>• Spell check</td>
<td></td>
</tr>
</tbody>
</table>

**Telecommunications and Internet**

This module assesses tasks central to telecommunications, including intra- and inter-office Networks, and Internet software such as browsers and email.

<table>
<thead>
<tr>
<th>Locating and launching a web browser on a computer</th>
<th>Assessing content purpose and credibility as grade appropriate</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Back, Home, Refresh buttons</td>
<td>• Search Engine</td>
</tr>
<tr>
<td>• Favorites/bookmarks</td>
<td>• Website credibility</td>
</tr>
<tr>
<td>• URL (ability to recognize an incorrectly/correctly written URL)</td>
<td>• Understanding that anyone can publish a webpage</td>
</tr>
<tr>
<td>• URL suffixes (.edu, .gov, .com, .org, .mil)</td>
<td>• What is a blog and a podcast?</td>
</tr>
<tr>
<td>• HTML (hidden code)</td>
<td></td>
</tr>
</tbody>
</table>

**Accessing and sending email, including composing email distribution lists**

<table>
<thead>
<tr>
<th>Accessing and sending email, including composing email distribution lists</th>
<th>Assessing content purpose and credibility as grade appropriate</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Spam</td>
<td>• Search Engine</td>
</tr>
<tr>
<td>• Sent items</td>
<td>• Website credibility</td>
</tr>
<tr>
<td>• Inbox</td>
<td>• Understanding that anyone can publish a webpage</td>
</tr>
<tr>
<td>• Recipient</td>
<td>• What is a blog and a podcast?</td>
</tr>
<tr>
<td>• Domain name</td>
<td></td>
</tr>
<tr>
<td>• Composition of an email address <a href="mailto:example@domain.com">example@domain.com</a></td>
<td></td>
</tr>
<tr>
<td>• Attachments</td>
<td></td>
</tr>
</tbody>
</table>
Appendix C
Presentation for Coaches’ Training

Peer Coaching For Technology Integration
The Cognitive Apprenticeship Model
- Pairing knowledgeable educators experienced and comfortable with a skill to act as coaches to peers
- Modeling, Coaching, Reflection, Articulation, and Evaluation
  - Social interaction and peer influence will assist with technology integration
  - Build confidence and skills with integration

Plan for Coaches and Teachers
- Informed consent - sign and date
- Complete the CIIT survey pre/post (20-25 minutes today)
- Participate in two observations - I will observe
  - Plan collaboratively with group during OPT and lead teachers in the process
  - Will assist with ideas, programs/website that will help when needed
  - Will shadow into the classroom with the teachers during integration if needed

Technology Literacy Assessment
- Given at the end of May
- Make sure to have one project using one of the following: excel, powerpoint, word, photo story, movie maker, internet search
- This can be done after CIIT
- Most important thing is that teachers and students are using technology once a week

Plan for last 9 weeks
- Discuss the potential of technology with teachers
- Help teachers with learning the technology and let me know if they need in class help
- Provide experiences with effective technology integration
- Emphasize the effect on student achievement
- Improve the resources available to teachers

Free Technology for learning
- Etherpad - Real time collaboration on documents, ideas, questions
  - http://etherpad.com/
- Edutopia/Fred.com - digital posters - fun, interactive, can add sound and video
  - http://edutopia.com/
- Voice Thread - http://voicethread.com/share/109071/
- Smart Software
Appendix D
ISTE Observation Form

The ISTE Classroom Observation Tool (ICOT®) is a free online tool that provides a set of questions to guide classroom observations of a number of key components of technology integration. ICOT was developed by staff and consultants in the Education Leadership Department at the International Society for Technology in Education (ISTE) with support from Hewlett-Packard Company. For free access to the ICOT software and online tools, visit http://www.iste.org/icot.

1. Setting

Date: ____________________________ School: ____________________________

Project/Program: ____________________________ Site Code: ____________________________

Observer: ____________________________ Teacher: ____________________________

Grade: ____________________________ Subject: ____________________________

#Students: __________ Observation Start time: __________ End time: __________

(You can track technology use by three-minute intervals throughout the observation using the three-minute chart at the end of this form.)

2. Room description and student characteristics:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

3. Student groupings (check all observed during the period):

___ Individual student work
___ Small groups
___ Student pairs
___ Whole class
___ Other (please comment):

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

ISTE Classroom Observation Tool 2008 http://www.iste.org/icot/
4. Teacher roles (check all observed during the period):

___ Lecturing
___ Interactive direction
___ Discussion
___ Other (please comment):

___ Facilitating/Coaching
___ Modeling

5. Learning activities (check all observed during the period):

___ Creating presentations
___ Research
___ Information analysis
___ Writing
___ Other (please comment):

___ Test taking
___ Drill and practice
___ Simulations
___ Hands-on skill training

6. How essential was technology to the teaching and learning activities?

___ 1. Not needed; other approaches would be better.
___ 2. Somewhat useful; other approaches would be as effective.
___ 3. Useful; other approaches would not be as effective.
___ 4. Essential; the lesson could not be done without it.

Comment:

http://www.iste.org/coe/
7. Technologies used by teacher (check all observed during the period):

<table>
<thead>
<tr>
<th>Technology</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculator</td>
<td>Presentation</td>
</tr>
<tr>
<td>CD-ROM</td>
<td>Science Probe</td>
</tr>
<tr>
<td>Database</td>
<td>Shared Editor (wiki)</td>
</tr>
<tr>
<td>Desktop Computer</td>
<td>Simulation</td>
</tr>
<tr>
<td>Digital Camera</td>
<td>Spreadsheets</td>
</tr>
<tr>
<td>Drill/Practice</td>
<td>Tablet Computer</td>
</tr>
<tr>
<td>E-mail</td>
<td>Video Camera</td>
</tr>
<tr>
<td>Graphics</td>
<td>Videoconferencing</td>
</tr>
<tr>
<td>Handheld Computer</td>
<td>Web Authoring</td>
</tr>
<tr>
<td>Laptop Computer</td>
<td>Web Browser</td>
</tr>
<tr>
<td>Library Database</td>
<td>Web Log</td>
</tr>
<tr>
<td>Outliner</td>
<td>Word Processing</td>
</tr>
<tr>
<td>Podcast</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other (please comment):</td>
</tr>
</tbody>
</table>

8. Technologies used by students (check all observed during the period):

<table>
<thead>
<tr>
<th>Technology</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculator</td>
<td>Presentation</td>
</tr>
<tr>
<td>CD-ROM</td>
<td>Science Probe</td>
</tr>
<tr>
<td>Database</td>
<td>Shared Editor (wiki)</td>
</tr>
<tr>
<td>Desktop Computer</td>
<td>Simulation</td>
</tr>
<tr>
<td>Digital Camera</td>
<td>Spreadsheets</td>
</tr>
<tr>
<td>Drill/Practice</td>
<td>Tablet Computer</td>
</tr>
<tr>
<td>E-mail</td>
<td>Video Camera</td>
</tr>
<tr>
<td>Graphics</td>
<td>Videoconferencing</td>
</tr>
<tr>
<td>Handheld Computer</td>
<td>Web Authoring</td>
</tr>
<tr>
<td>Laptop Computer</td>
<td>Web Browser</td>
</tr>
<tr>
<td>Library Database</td>
<td>Web Log</td>
</tr>
<tr>
<td>Outliner</td>
<td>Word Processing</td>
</tr>
<tr>
<td>Podcast</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other (please comment):</td>
</tr>
</tbody>
</table>

ISTE Classrooms Observation Tool 2008 http://www.iste.org/ico/
9. NETS Teacher Standards Addressed:

- 1A.1. operating system procedures
- 1A.2. routine hardware and software problems
- 1A.3. content-specific tools
- 1A.4. productivity tools
- 1A.5. multimedia tools
- 1A.6. interactive communication tools
- 1A.7. curriculum-based presentations/publications
- 1A.8. curriculum-based collaborations
- 1A.9. appropriate technology selected
- 2A.1. developmentally appropriate learning activities
- 2A.2. technology-enhanced instructional strategies
- 3A.1. learning experiences address content standards
- 3A.2. learning experiences address student technology standards
- 3B.1. technology supports learner-centered strategies
- 3C.1. technology applied to develop students' higher order skills

Comments:

10. Three-Minute Chart.
During each 3-minute period, was technology in use by students and/or teachers, and was the time spent with technology used for teaching and learning (as opposed to recreation or routine tasks such as boot-up and log-on)?

<table>
<thead>
<tr>
<th>Technology in use</th>
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11. Estimated time technology used (if 3 minute chart is not used)

Total minutes technology used by students
Minutes students used for learning
Total minutes technology used by teachers
Minutes teachers used for learning

ISTE Classroom Observation Tool 2008 http://www.isste.org/loct/
Appendix E
LoTi Survey

The LoTi Digital Age Survey can be accessed on the LoTi website at:

The LoTi levels, defined below, are used to determine teachers’ level of technology integration practices. This information was obtained from the LoTi Connection Website (2011):

**LoTi Level 0 (Non-Use)**- This level is indicative of a teacher who does not have access to or makes use of technology in the classroom.

**LoTi Level 1 (Awareness)**- This level indicates that the teacher makes use of technology for administrative purposes or for teacher centered presentations.

**LoTi Level 2 (Exploration)**- At this level, some technology tools are used by the teacher but mainly as an extension to the instruction. Student projects may be lower level or teachers may use computers for drill-based activities.

**LoTi Level 3 (Infusion)**- At this level, teachers may be making use of tools such as databases, spreadsheets, multimedia, or internet for instruction.

**LoTi Level 4a (Integration: Mechanical)**- At this level, a teacher may automatically integrate technology tools into classroom instruction. Students are provided with use of technology that helps build understanding of concepts.

**LoTi Level 4b (Integration: Routine)**- As the label indicates, integration is done in a routine manner that enhances instruction and learning for students. Students are able to solve problems and require
higher level skills from students.

*LoTi Level 5 (Expansion)*-This level indicates the teacher is making technology a regular part of learning and communicating via the computer. Communication would expand to other networks outside of the school.

*LoTi Level 6 (Refinement)*-This level indicates that teachers are using technology as a tool for solving practical everyday problems. Instruction and technology are no longer separate from instruction and students have easy access to many types of technology tools.

The Personal Computer Usage (PCU) score on the LoTi assesses teachers comfort and skill with computers and technology. Scores can range from 0 to 7. PCU levels are defined in three categories describing teachers’ comfort with computers (“Not true of me now,” “Somewhat true of me,” and “Very true of me now”)

*Not true of me now*

*Level 0*-Participants at level 0 do not feel comfortable with use of the computer and may make use of more traditional tools such as the overhead projector or pencil/paper activities

*Level 1*-Participants have little skill with the computer for personal use. They are aware of the basic tools but do not use them.

*Level 2*-Participants have little to moderate skills for personal use of computers. They use the Internet, email, and word processing but do not have a lot of comfort. May use management tools for administrative purposes.
Somewhat true of me now

*Level 3*-Participants have moderate skills and may be regular uses of certain tools such as Internet, email, word processing. May have some comfort with trouble-shooting as well

*Level 4*-Participant has a moderate to high skill level with computers. May be able to use many types of software proficiently and can trouble-shoot without additional assistance.

*Level 5*-Participant has a high level of personal computer usage. Can create web pages and make use of web tools.

Very true of me now

*Level 6*-Participant has a very high level of personal computer usage. They are sophisticated users of computer technology and can trouble shoot with ease.

*Level 7*-Participant has an extremely high level of personal computer usage. At this level, participants often act as mentors and trainers for computer use.
1. What does a file's *extension* tell you?

A. What kind of file it is
B. How much memory space the file has
C. Who wrote the file
D. Where the file is located

5. Which slide is the easiest for the audience to follow when you give a presentation with a projector?

A. This is Paula the Parrot, my pet and good friend. She is almost 20 years old (more than my age). She also talks more than me, but she doesn't know any words. She just squawks when she wants out of her cage or a biscuit. If you put her in a room, she can come out of her cage and fly around. She is very loud but cute. When I need to go out, she sits down and won't let me go. I think that she is always in the dark, but actually she is very bright. I think everyone should get one.
B. This is Paula the Parrot, my pet and good friend. She is almost 20 years old (more than me). She also talks more than me, but she doesn't know any words. She just squawks when she wants out of her cage or a biscuit. If you put her in a room, she can come out of her cage and fly around. She is very loud but cute. When I need to go out, she sits down and won't let me go. I think that she is always in the dark, but actually she is very bright. I think everyone should get one.
C. **My Pet:**
   - Paula
   - A parrot
   - Noisy!
   - Sleeps in the dark
D. **My Pet:**
   - Paula
   - A parrot
   - Noisy!
   - Sleeps in the dark

8. You’re making a bike club poster. Insert the bitmap (.bmp) picture of the bike from the Desktop.

9. Change the top and bottom margins to .6 for this document.

Stringed Cousins: Violins and Mandolins

Violins are shaped like hour glasses; mandolins are shaped like tears. Violins are usually played with a bow, mandolins are usually played with a pick. They look and sound so different that most people do not realize the surprising links between these closely related instruments.

The clue is in the tuning. Violins have four strings. Mandolins have four pairs of two strings. For both instruments, the strings (or pairs) are tuned to G-D-A-E. These intervals are known in music as fifths, because each note is five apart on a scale from the note before or after it.
13. Use a two-category search to find all books about Alaska written by John Muir.

COUNTY LIBRARY
Search Engine

Search By:

Keyword(s):
   And  Or  Not

Keyword(s):

Sort Results By:

Title
Author

"The best way to find books, periodicals, and media in our great county."

15. The country Zaire has changed its name. Use a command to replace Zaire with its new name, DROC, everywhere in the spreadsheet.

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<td>9</td>
<td>Dakar</td>
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- A: West African Cities
- B: Country
- C: Country
- D: Country
- E: Country
17. Use Action Settings to add a hyperlink to the top text box on Slide 2. Create the hyperlink to go to the First Slide.

20. You're doing a report on desert baboons. Click on the most useful link for that topic.
Appendix G
Coach’s Consent Form

Informed Consent Form Authorization to Serve as a Research Participant: Coach

My signature below indicates that I have read the information provided and have decided to participate in the study titled "The effects of peer coaching on teachers’ instructional practices with technology" to be conducted at my school between the dates of February and April 2010. I understand that the signature of the principal indicates he/she has agreed to participate in this research project.

I understand the purpose of the research project will be to help determine whether peer coaching is more effective than traditional methods of staff development involving technology training. Teachers will be asked to complete a pre/post survey with follow-up questions which will take approximately 15-20 minutes per survey. They will also be observed by the researcher and plan technology-based lessons, time that is already incorporated into the work day. Finally, teachers will be asked to participate in a short 5 minute interview, if they choose this option over written responses, at the conclusion of the study. All coaching participants will be asked to lead in collaborative planning practices by modeling, coaching, reflecting, and implementing a technology based lesson, with the help of their district technology literacy coach. The following questions will be addressed:

1. Does the use of peer coaching combined with a district trainer have a significant effect on changing teachers’ practices with technology?
2. Is there an effect on student achievement related to teacher training with the use of the peer coaching model?

Potential benefits of the study include an opportunity for teachers to reflect upon their current instructional technology practices regarding technology integration. The information gleaned from the study will also help assess what teachers need for effective technology implementation at the schools involved in the study.

I agree to the following conditions with the understanding that I can withdraw from the study at any time should I choose to discontinue participation.

- The identity of participants and schools will be protected and no names will be recorded. All information will be reported in groups or in aggregate. Data will be destroyed within one year of the study.
- Information gathered during the course of the project will become part of the data analysis and may contribute to published research reports and presentations.
- There are no foreseeable inconveniences or risks involved by participating in the study, other than those associated with daily life.
- Participation in the study is voluntary and will not affect employment status or annual evaluations. If I decide to withdraw permission after the study begins, I will notify the school of my decision and all information related to the study will be destroyed.

Research at Kennesaw State University that involves human participants is carried out under the oversight of an Institutional Review Board. Questions or problems regarding these activities should be addressed to Dr. Ginny Z. Zhan, Chairperson of the Institutional Review Board, Kennesaw State University, 1000 Chastain Road, #2202, Kennesaw, GA 30144-5591, (770) 423-6679.
- Participation in the study is voluntary and will not affect employment status or annual evaluations. If I decide to withdraw permission after the study begins, I will notify the school of my decision and all information related to the study will be destroyed.

If further information is needed regarding the research study, I may contact Tricia C. Frazier at 678-699-7283 or via email at tricia.frazier@cobbk12.org.

Signature of participant: ___________________________ Signature of Principal: _______________
Appendix H  
Teacher’s Consent Form

Informed Consent Form Authorization to Serve as a Research Participant

My signature below indicates that I have read the information provided and have decided to participate in the study titled “The effects of peer coaching on teachers’ instructional practices with technology” to be conducted at my school between the dates of March and May 2010. I understand that the signature of the principal indicates he/she has agreed to participate in this research project.

I understand the purpose of the research project will be to help determine whether peer coaching is more effective than traditional methods of staff development involving technology training. Teachers will be asked to complete a pre/post survey with follow-up questions which will take approximately 15-20 minutes per survey. They will also be observed by the researcher and plan technology-based lessons, which is time that is already incorporated into the work day. Finally, teachers will be asked to participate in a short 5 minute interview, if they choose this option over written responses, at the conclusion of the study. The following research questions will be addressed:

1. Does the use of peer coaching combined with a district trainer have a significant effect on changing teachers’ practices and comfort level with technology?
2. Is there an effect on student achievement related to teacher training with the use of the peer coaching model?

Potential benefits of the study include an opportunity for teachers to reflect upon their current instructional technology practices regarding technology integration. The information gleaned from the study will also help assess what teachers need for effective technology implementation at the schools involved in the study.

I agree to the following conditions with the understanding that I can withdraw from the study at any time should I choose to discontinue participation.

- The identity of participants and schools will be protected and no names will be recorded. All information will be reported in groups or in aggregate. Data will be destroyed within one year of the study.
- Information gathered during the course of the project will become part of the data analysis and may contribute to published research reports and presentations.
- There are no foreseeable inconveniences or risks involved by participating in the study, other than those associated with daily life.
- Participation in the study is voluntary and will not affect employment status or annual evaluations. If I decide to withdraw permission after the study begins, I will notify the school of my decision and all information related to the study will be destroyed.

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If further information is needed regarding the research study, I may contact Tricia C. Frazier at 678-699-7283 or via email at tricia.frazier@cobbk12.org.

Signature of participant:__________________ Signature of Principal:________
Math Teachers,
To review for the unit 8 test I am going to do the attached choice activity board with my students. Students will take the required activity which is a review sheet and create other study tools like cubes, comics, mini books and etc. The projects will involve technology like using word to type into the cubes and to create mini books. For the comics, Tricia has some great sites that my students and I will explore together since I am new at that too. There is also a great site for making digital posters and voice over projects in which students can explain the problems step by step or draw responses. I am learning with my students, so I would not be the best to ask about the sites. Tricia would be best. You are not obligated to use this activity it is just a suggestion. Your required activity does not have to be a review sheet if you don't want to make one. The required activity can be a few problems you make up.

Here are a few sites (you can also Google a lot of stuff):


Voice Thread - [http://voicethread.com](http://voicethread.com)

Wall Wisher - [http://www.wallisher.com](http://www.wallisher.com)

comiqs.com

Pixton - comic strips

ST
Appendix J
Math Technology Assignment

Math 6 Unit 8 Direct Variation Review Choice Activities

Standards/Objectives: M6A2. a-g

| 1. Make a review **cube** with questions from the unit 8 study guide. You must include an answer key that works each problem out step by step or explains the question thoroughly. **The problems chosen can not be used in any other choice.** |
| 2. Create a **mini book** explaining step by step how to solve a minimum of 6 problems from study guide. **The problems chosen can not be used in any other choice.** |
| 3. Create a sample review **game** with questions from unit 8 study guide. The game must include at least 6 questions from the study guide. You must include an answer key that works each problem out step by step or explains the question thoroughly. **The problems chosen can not be used in any other choice.** |

| 4. Write a **letter** to a student explaining step by step how to solve 6 of the problems from the study guide. **The problems chosen can not be used in any other choice.** |
| 5. **Required Activity**
  *Unit 8 Study Guide* |
| 6. Create a **comic strip** that explains step by step how to solve 6 problems from the study guide. **The problems chosen can not be used in any other choice.** |

| 7. Create a **power point** presentation showing step by step how to solve 6 questions from the study guide. **The problems chosen can not be used in any other choice.** |
| 8. Create a **fortune teller** with 8 problems from the study guide. **The problems chosen can not be used in any other choice.** |
| 9. Create a **video presentation** showing step by step how to solve at least 6 problems from the study guide. |

I choose activities # _____, # 5 and # ______.

Name ______________________________________ Due Dates ____________, ____________, ____________

Test Date ____________________________________
Math Teachers,
Here is the list of sites I found that may be useful for surface area and volume that you could use with students. You will need to help students use some of the sites, but I believe they would be terrific for use as stations. Some of them are interactive, see what you like and recommend to the others if you find them useful.

http://www.csgnetwork.com/surfareacalc.html
http://www.shodor.org/interactivate/activities/SurfaceAreaAndVolume/

Here are some for probability. I could probably find some more but here are just a few:

http://my.hrw.com/math06_07/nsmedia/homework_help/alg2/alg2_ch11_02_homeworkhelp.htm l
http://www.bbc.co.uk/skillswise/numbers/handlingdata/probability/game.shtml
http://www.powerhousemuseum.com/gambling/common/index.html

Tricia
District TLC