# EXPLORING MIDDLE SCHOOL TEACHERS' PERCEPTIONS AND APPLICATIONS OF A SITE-BASED, TECHNOLOGY-RELATED PROFESSIONAL DEVELOPMENT PROGRAM FOCUSED ON INTERACTIVE WHITEBOARDS AND CLASSROOM RESPONSE SYSTEMS

By

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A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF EDUCATION

UNIVERSITY OF FLORIDA

2012

To my loving and supportive parents, Jayant and Sharmishtha

ACKNOWLEDGMENTS

I thank my parents for their love, patience, and support through this degree program and dissertation process; without them, it would have been most difficult to persevere. I also thank my brother, Vidit, my “sister,” Shruti, and my friends, especially Harold, for their encouragement, support, and understanding. The encouragement of my parents and friends was an essential factor in the completion of my doctoral program and this dissertation.

I thank Dr. Kara Dawson, chair of my committee, for her guidance and knowledge through the dissertation process. I also thank Dr. Swapna Kumar and Dr. Erik Black for serving as mentors throughout the doctoral program and dissertation process. I am grateful to them for their continued support, expertise, and mentorship. This dissertation also would not have been possible without the assistance of Jacki Donaldson, who assisted me with the final piece of the dissertation.

I acknowledge the assistance of the teachers and principal at my school for their participation in this project; I appreciate their willingness to participate in the study.

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| | |
|---|---|
| CRS | Classroom Response Systems |
| IWB | Interactive Whiteboard |
| PD | Professional Development |
| TRPD | Technology-Related Professional Development |

Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Education

# EXPLORING MIDDLE SCHOOL TEACHERS' PERCEPTIONS AND APPLICATIONS OF A SITE-BASED, TECHNOLOGY-RELATED PROFESSIONAL DEVELOPMENT PROGRAM FOCUSED ON INTERACTIVE WHITEBOARDS AND CLASSROOM RESPONSE SYSTEMS

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December 2012

Chair: Kara Marie Dawson
Major: Curriculum and Instruction

This qualitative study examined five middle school teachers' perceptions of a site-based, technology-related professional development (TRPD) program focused on the interactive whiteboard (IWB) and the classroom response system (CRS) and the practices implemented in the teachers' classrooms as a result of participation in the TRPD sessions. One purpose of this capstone project was to examine teachers' perceptions of their experiences in a site-based TRPD workshop and to specifically explore their perceptions of the program's impact on technology integration and student engagement in a middle school context. A secondary purpose was to explore the ways in which teachers use the IWB and the CRS in their specific content areas after attending TRPD sessions. To reach these objectives, I employed a qualitative methodology to gather detailed data about teachers' reflections, perceptions, experiences, and integrations regarding the IWB and the CRS, both of which are used to engage students. Data collection included classroom observations, interviews, reflection logs, and lesson plan artifacts. Based on the results of the design, I intend to create school-wide, site-based staff development workshops that are effective with

teachers and serve as customizable resources for other technology specialists across the county.

# CHAPTER 1
# INTRODUCTION

Chapter 1 provides an introduction of the capstone; it includes the background of the problem, statement of the problem, purpose of the capstone, conceptual framework, and significance of the study. Chapter 1 concludes with an overview of the capstone.

The 21st century, marked by a competitive, technological, and global economy, makes it necessary for students to acquire new skills in order to learn and succeed (Burkhardt et al., 2003; Cuban, 2001). Literacy is an important 21st century skill, and to be literate in today's growing and dynamic world, students must be able to think critically and creatively, as well as process large amounts of information and solve complex problems. Literacy encompasses more than reading and writing—it includes the ability to use new forms of technology and to analyze the information presented through higher order thinking, inquisitiveness, creativity, and elasticity (Rakes, Fields, & Cox, 2006; Rakow, 2007). According to the National Council of Teachers of English (NCTE, 2008), components of 21st century literacy include proficiently using technological tools, solving problems, and critically analyzing and evaluating multimedia information.

Conceptual knowledge of subject matter is important. Student learning of content should involve the application of conceptual knowledge to reasoning and problem solving (Cass, Cates, Smith, & Jackson, 2003). Educational technology can enhance student learning in ways that deeply engage students in content matter and its relevance to the real world, thereby increasing higher order thinking skills, such as problem solving and decision making (Rakes et al., 2006). Educational technology is also critically important for preparing students for the future by teaching them 21st century skills, such as content literacy (Shaunessy, 2005). Due to the value of

educational technology, the No Child Left Behind Act (NCLB, 2002) and the U.S. Department of Education (ED, 2004) have raised the bar on technology proficiency expectations for all students. These school reform initiatives require more accountability by schools to increase all students' academic and technology proficiency levels in order to meet the demands of the 21st century. These national initiatives have led to a focus on increasing skills beyond basic reading and writing, to include problem solving, critical thinking, and communication (Wagner, 2008). Twenty-first century skills are also supported by organizations, such as the International Society for Technology in Education (ISTE, 2008), which have implemented technology standards (National Educational Technology Standards [NETS]) that encompass and emphasize the importance of problem solving, collaboration, communication, and critical thinking.

Technology helps engage students with meaningful, relevant, and personalized learning that can further their academic progress (North Central Regional Educational Library [NCREL], 2001). The school district in which I work provides funds to supply and maintain technology in its schools. The interactive whiteboard (IWB) is one technological tool that is commonly used throughout these schools. IWBs exist in many classrooms throughout the United States (Blanchette, 2009), including the school in which this study was conducted. Studies on IWB usage in the classroom demonstrate increased student involvement in learning (Painter, Whiting, & Wolters, 2005). In many cases, however, IWBs are used only as visual aids to support teacher-centered or traditional approaches to instruction (Glover, Miller, Averis, & Door, 2007). When IWBs are used interactively, they target varying learning styles, such as those responsive to verbal, kinesthetic, and visual stimuli (Glover et al., 2007), and they lead to student

engagement. Effective use of IWBs also allows for interactive learning (Mildenhall, Swan, Northcote, & Marshall, 2008).

Another technological tool used by my school district is the classroom response system (CRS). The CRS is used to provide formative and summative assessments that promote higher learning and prepare students for the rigors of standardized testing (Cotner, Fall, Wick, Walker, & Baepler, 2008; Kenwright, 2009; Koenig, 2010; Penuel, Boscardin, Masyn, & Crawford, 2007; Salemi, 2009). Teachers use the CRS as a tool to help increase student engagement, provide immediate feedback, and encourage higher levels of thinking (Blood & Nell, 2008; Cotner et al., 2008).

The IWB and the CRS are emerging tools used in schools to equip students with 21st century skills by promoting higher levels of cognition and improving student engagement. They also satisfy federal initiatives calling for technology use in the classroom. Before teachers can successfully implement technology in the classroom, however, they must learn how to integrate educational technology skills into their existing curricula in order to teach new skills to their students. Many factors lead to technology-rich curricula, and the amount of time a teacher practices with technology is possibly the most influential factor (Hew & Brush, 2007). Although the use of technology alone is not sufficient, the effective use of technology focused on a content area is important (Flick & Bell, 2000; Garofalo, Drier, Harper, Timmerman, & Shockey, 2000; Mason et al., 2000); therefore, TRPD sessions correlated with content areas are needed for teachers.

The pressure on teachers in my school district to better engage students and increase conceptual knowledge of content matter has increased with the requirements

of the newly implemented teacher evaluation rubric. School administrators and teachers have increasingly turned toward technological tools, such as the IWB and the CRS, as a means of accomplishing student engagement that promotes not only higher learning, but also 21st century skills. This study probes teachers' perceptions of the extent to which the instructional practices in their classrooms changed following their TRPD experiences.

## Problem Statement

Teachers engage in professional development (PD) sessions every year, but participation is limited due to a variety of reasons, such as the frequency of on-site TRPD offerings and the effectiveness of implemented TRPD sessions (Klingner, Ahwee, Piloneita, & Menendez, 2002). Teachers may need to learn new methods, and fragmented PD sessions do not serve this need (Johnson, 2006). If contextual material only addresses few and sparse topics, which are of little interest to participating teachers, teachers are not likely to attend sessions (National Research Council, 2000).

Failure to account for teachers' prior experiences is another limitation of traditional PD. For instance, a highly skilled teacher might attend the same workshop as a teacher not skilled in the same areas (Hirsh & Killion, 2009). Moreover, traditional methods of PD tend to be one-size-fits-all approaches, which often fail to provide teachers with the proper amount of experiences to implement workshop information in their classrooms (Desimone, Smith, & Ueno, 2006).

The main reason traditional methods do not work is because they fail to include ongoing on-the-job support or feedback for teachers (Desimone et al., 2006). Lockwood, McCombs, and Marsh (2010) reported that only a small percentage of teachers (less than 15%) generalized their learning from traditional sessions into their

classrooms. Furthermore, traditional PD sessions generally include only 1 to 2 days of workshops that often occur off-site, on teacher planning days or weekends, and with little or no sustained support, such as a follow-up contact with facilitators and fellow participants (Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009).

Other problems with traditional PD sessions include a failure to focus on the needs of teachers and a lack of consideration regarding varying content matter taught by teachers (Engstrom & Danielson, 2006; Guskey, 2002).

The frequency of TRPD sessions in schools and the effectiveness of those implemented are limited. Current TRPD sessions also follow a traditional PD model and, thus, endure similar limitations. In addition, traditional TRPD sessions tend to focus on technological tools rather than the processes of integrating technology in classrooms. Little attention has been placed on the pedagogy of integrating technology in classrooms (Earle, 2002). Technology on its own does not improve learning. Technology integration encompasses both tools and content, and it involves effective and sound teaching practices. It also involves using technological tools to deliver content and practices, and it focuses on curriculum and learning. TRPD sessions should not focus on the type of technological tools and the amount of use, but on how and why the tools are used (Earle, 2002). Second-order barriers are intrinsic to the teacher and are evident by way of teacher beliefs and pedagogies (Ertmer, 1999). These barriers could yield counterproductive effects on workshops because teachers might do the minimum to satisfy requirements for a project; furthermore, teachers' skills will never fully develop if they are not monitored thereafter.

The initial need for this study stemmed from an informal and brief survey I conducted at the end of the 2010-2011 school year. A majority (80%) of teachers stated that existing TRPD sessions were not meeting their professional learning needs. They expressed the desire for on-site support to provide technological troubleshooting while they implemented technological tools in their classrooms. Another impetus for this study was the request from local teachers for opportunities to participate in effective PD sessions offering instruction in the proper use of the technology available at their schools. According to these teachers, PD sessions were ineffective in developing necessary knowledge and skills for using technology, teaching with technology, or both. TRPD sessions in my school district were not meeting teachers' needs because the sessions were offered off-site, occurred in just 1 day, provided no support, and were not related to the teachers' content areas. This study focused on the problem of teachers reporting that workshops do not provide the necessary skills and follow-up support to allow them to confidently use technology in their classrooms.

The content, context, and design of PD sessions are the key ingredients that create (or do not create) a substantial impact (Wei et al., 2009). In relation to these three dimensions, research indicates that PD sessions should focus on practical activities or hands-on work to increase content knowledge and teaching skills (Desimone, Porter, Garet, Yoon, & Birman, 2002). In addition, PD sessions must extend beyond the traditional duration of 1 to 2 days (Darling-Hammond, 1998; Garet, Porter, Desimone, Birman, & Yoon, 2001). The focus of PD sessions should be on the best practices that promote learning (Association for Supervision and Curriculum Development, 2009). Furthermore, current forms of PD sessions need to follow the

National Staff Development Council guidelines (NSDC, 2011b), which are intended to provide a connection between PD sessions and teacher learning, to include collaboration, ongoing support, and feedback. Essentially, teachers are able to transfer their knowledge and skills to their classrooms when their PD needs are met (Mouza, 2002/2003).

Finally, one can note that traditional PD sessions support a behaviorist learning theory (i.e., a direct instructional format) and a student-learning approach, instead of a constructivist learning theory, a constructivist teaching approach, and adult-learning principles. Since the success of PD sessions is influenced by how well teachers implement them in their classrooms (Southerland, Smith, Sowell, & Kittelson, 2007), it is important to design PD sessions based on constructivist and adult learning principles.

## Purpose Statement

The purpose of this study was two-fold: to examine the perceptions of middle school teachers' experiences after participating in site-based TRPD sessions with the IWB and the CRS and to explore the ways in which teachers transferred what they learned from TRPD into their classrooms after participating in the sessions. Teachers are change agents within the school system, and they are tasked with improving student learning. It is important, therefore, to assess teachers' perceptions of TRPD in order to create successful sessions (Anderson, 2002). Perceptions may vary among teachers, depending on their instructional methodologies and pedagogies (Southerland et al., 2007), and this makes it necessary to determine teachers' views regarding current TRPD offerings and the transfer of the knowledge and skills that occur in their classrooms as a result of the sessions. It is also imperative that teachers share whether their learning affects their perceptions of change in their classrooms.

## Conceptual Framework

Use of 21st century technology to support academic learning involves higher order processing skills, such as critical thinking and problem solving. These skills are embedded in the constructivist theoretical framework (Rakes et al., 2006; Shaunessy, 2005), which involves a pedagogical thought process (Molebash & Fisher, 2003). Constructivist theory centers on the individual's ability to construct his or her own meaning and knowledge of subject material and, consequently, to manage this newly constructed information. According to this theory, based on the works of researchers such as Piaget, Dienes, and Brunet (Lynn & Wheelock, 1997), previous knowledge is combined with new learning and experiences that lead to construction of new knowledge. Its central tenets state that humans learn by actively constructing and reconstructing their knowledge. In other words, individuals create knowledge out of new information by constructing new relationships with their learning in order to accommodate new knowledge (Lynn & Wheelock, 1997).

In the constructivist approach, learners participate in activities that foster communication during and after learning development. These activities provide the opportunities for individuals to collaborate and share in the process of forming their ideas (Lunenburg, 1998). This collaborative process allows learners to develop a shared understanding of the topic (Richardson, 2003). Self-reflection is a key element in this process, allowing learners to develop a meta-awareness of their own understandings and learning, which further assists in the retention of knowledge.

Andragogy is an adult learning theory suggesting that learning activities should focus on adult needs and should allow adult input in sessions. If teacher input is taken into consideration when designing TRPD sessions, teachers will be more motivated to

engage in lesson activities; thus, teachers should be given opportunities to provide input on the content and information they are going to learn. This process allows them to carry over the knowledge gained in the sessions into their classrooms. Adult learning theories, such as andragogy and the constructivist approach, should be taken into consideration when designing TRPD sessions in order to be benefit teachers. Teachers are more likely to commit to the learning activities if the objectives are important and relevant. The daily activities of TRPD sessions must be in line with and relevant to teachers' needs and wants. The premise of andragogy is that learners need concrete and specific experiences they can apply to authentic settings (Knowles, 1980). TRPD sessions must be structured in a manner that provides the support adult learners need. Teachers should have the option of participating in small group activities to prepare them for applying in their classrooms their knowledge and skills. Preferably, TRPD sessions should be designed based on andragogy and the constructivist theory.

This aim of this study was to contribute to the existing body of knowledge by examining how TRPD sessions grounded in constructivist learning approaches; andragogy; and effective, research-based components impact changes in teachers' experiences of TRPD and integration of the IWB and the CRS to influence student engagement of content material.

The two research questions that were explored in this study were:

- What are the perceptions of middle school teachers of the site-based IWB and CRS PD?
- How do middle school teachers use IWB and CRS tools after participating in a site-based PD opportunity?

## Significance of the Study

This study will make a significant contribution to the educational technology field because it provides from the participants' perspectives a deeper understanding of what makes TRPD effective. This contribution to TRPD research will aid future teacher workshop initiatives designed to affect the instructional practices of teachers, especially in the area of technology integration. This contribution is vital because today's teachers need proper PD sessions focusing on the use and implementation of technological tools in their classrooms (Keller, Bonk, & Hew, 2005; Lawless & Pelligrino, 2007; Sandholtz, Ringerstaff, & Dwyer, 1997). The goals for effective TRPD include encouraging leadership, promoting collaborative learning, providing adequate time for application in the classroom, focusing on content knowledge, and including resources and support (e.g., an on-site technology support representative). Technological tools, such as technical and collegial support coupled with TRPD, can transform educational practices, especially in the area of conceptual knowledge.

The TRPD activities used in this study follow corresponding literature review (Chapter 2) of the six principles of best practices in TRPD. These include adult learning principles, content-specific topics, ongoing facilitator support and feedback, focus on peer collaboration, standards-based lesson development, and reflection. It is important for TRPD in schools to focus not only on the IWB and the CRS, but also on effective teaching practices using technology. In general, more workshops are needed in order for teachers to use technology effectively in their classrooms (Zevenbergen & Lerman, 2007).

Based on teacher input via lesson plans, interviews, reflection logs, and classroom observations, this qualitative study experience provided implications and

recommendations for the future design of effective TRPD sessions at school sites and in the county. The purpose of using this research design was to understand what changes occurred in classrooms when teachers participated in site-based TRPD sessions featuring the IWB and the CRS and to understand teachers' perceptions of their experiences as a result of the participation. The qualitative methodology (Creswell, 2003; Yin, 2009) also yielded detailed information used to assemble rich descriptions of behaviors and teachers' direct experiences.

The sample population consisted of five teachers from the same school. Data was gathered during and after TRPD sessions via semi-structured, open-ended interviews; classrooms observations; and artifacts from teaching, such as lesson plans and reflection logs (Shaunessy, 2005), to examine the impact of the sessions and to add strength to the study's reliability (Yin, 2009). The results of the study will provide designers of staff development workshops with the variables that should be considered in the planning of TRPD programs, at least with similar populations.

## Organization of the Capstone

This capstone is organized into six chapters. Chapter 1 includes the introduction, problem statement, purpose statement, and significance of the study. Chapter 2 features a review of the literature, which addresses PD, TRPD best practices, technology integration, and student outcomes as a result of technology integration. Chapter 3 describes the TRPD and explains the procedures used to gather data. Chapter 4 details the methodology and limitations of the study. Chapter 5 highlights the results of the study, and the capstone concludes with Chapter 6, which describes implications for future studies.

# CHAPTER 2
# LITERATURE REVIEW

Much research has been conducted on PD and its impact on teacher learning (Guskey, 2003b; Vontz & Lemig, 2006; Wei et al., 2009). Despite challenges in implementing effective PD, such as time and money restrictions, PD sessions can positively influence student achievement if they are designed using effective, research-based components. According to research conducted by Detert, Louis, and Schroeder (2001), teacher PD is not a priority at many schools, and, consequently, teachers are left to pursue their own staff development opportunities at other locations. Effective PD sessions can generate profound changes in classroom instruction, though, and as a result, can bolster student achievement (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; NSDC, 2011a).

Federal legislation continues to shift greater accountability to the teacher's role in the classroom. At the same time, federal government standards and recent reform initiatives have concentrated on technology as a way to engage and prepare students for the 21st century (ISTE, 2007; NCTE, 2008; Partnership for 21st Century Skills Framework, 2009). Reforms, in turn, guide the constant changes in standards and assessments and drive the focus of PD sessions. The purposes of this literature review are to examine the importance and impact of PD and to explore the effective components of TRPD. This review summarizes current research on the components of PD necessary for effective technology use in the classroom and the potential impact of technology use on overall teacher instructional practices and student performance. The following topics will be discussed: professional development, technology reform

initiatives, technology integration, TRPD, the IWB, the CRS, student outcomes as a result of technology integration, and best practices of TRPD.

## Professional Development

The purpose of PD is to help build and expand upon work-related knowledge, skills, and behaviors (Guskey, 2003b; Wei et al., 2009). Due to recent changes influenced by national reforms and standards, teachers require continuing education so they can develop as professionals and improve the quality of their teaching (Desimone et al., 2006; Lawless & Pelligrino, 2007). Teachers are vehicles of change, and they need innovative skills and adequate knowledge to meet the needs of students in the information age (Lock, 2006). Effective PD leads to teachers learning new skills and influencing changes in classroom practices, which can increase student achievement (Darling-Hammond et al., 2009; Mundry & Loucks-Horsley, 1999) by supporting the implementation of curricula (Penuel, Fishman, Yamaguchi, & Gallagher, 2007). According to the NSDC (2011a), the goal of staff development workshops is to increase student achievement via teacher continuing education. Accordingly, the NSDC has created standards to help guide PD programs, which benefit students by preparing teachers with the skills and knowledge necessary for effective 21st century classroom learning. Requirements include that PD should be results driven, standards based, and job embedded (Lauer, Stoutemeyer, & Van Buhler, 2005; NSDC, 2011b). Results-driven PD involves examining student data and student outcomes that result from professional development sessions. Standards-based PD requires that all professional development sessions focus on standards and objectives for accountability purposes (Sparks & Hirsh, 2000). Job-embedded PD allows teachers to engage in learning opportunities during the school day and on site (Sparks & Hirsh, 2000).

## Effective Design Components of 21st Century Professional Development

Given the significant amount of research conducted on teacher workshops over the past 10 years, it is clear that there are many factors to consider when designing an effective PD experience (Loucks-Horsley, Love, Stiles, Mundry, & Hewson, 2003). There are many existing models, structures, and concentrations for PD; however, the type of PD targeted is not as important as the level at which teachers are actively involved (Garet et al., 2001). Among other factors, effective PD must be ongoing (Bryan, 2000; Desimone et al., 2006; Hawley & Valli, 1999; Hirsh, Mizell, & Aviss-Spedding, 2005; Lock, 2006; Salpeter, 2003; Slavit, Sawyer, & Curley, 2003; Williams & Kingham, 2003) and must provide support (Berry, Hoke, & Hirsh, 2004; Lock, 2006) and follow-up (Salpeter, 2003). With ongoing sessions that are sustained and site based, teachers have ample time to implement learned strategies in their classrooms (Culp, Honey, & Spielvogel, 1999; Lock, 2006) and can offer input to increase the sessions' relevance to learning (Wagner, 2008). Ongoing support is necessary for teachers to apply learned skills into their curricula and classrooms (Lock, 2006). Classroom assistance is necessary, especially when attempting to develop and implement innovative teaching strategies. Advantages of site-based, job-embedded workshops are that they occur during teachers' workdays, and teachers can immediately apply in their own environments what they learn (Lock, 2006; Loucks-Horsley, 1995), allowing for increased relevancy to their own contexts. If PD sessions are site based and sustained over time, PD can be effective and of high quality (Haar, 2001; Linek, Fleener, Fazio, Raine, & Klakump, 2003; Salpeter, 2003).

For PD to be durable and effective in transforming teacher practices, it should also be aimed toward improving student outcomes and collaboration (Hawley & Valli, 1999;

Salpeter, 2003; Slavit et al., 2003) and offering resource availability for assistance when needed (Desimone et al., 2002; Friesen & Clifford, 2003; Lieberman, 1995). Desimone et al. (2006) analyzed teacher surveys and noted that the components of PD that influenced changes in teacher practices and increased student outcomes included support, options to participate in active engagement, focus on content matter, and teacher collaboration with similar grades and subject areas.

Collaborative teaching involves teachers participating in the same school, department, or grade level (Darling-Hammond et al., 2009; Desimone et al., 2006). Teachers are more prone to work toward students' needs and learning styles when they share with colleagues immediately after the sessions the concepts and knowledge obtained from PD sessions (Elmore, 2002; Slavit et al., 2003). Teachers often seek opportunities for exchange with one other (Guskey, 2003b; Lock, 2006; Penuel, Fishman, et al., 2007), and this sometimes leads to personal and professional learning communities (PLCs), which further advance teacher learning (Borko, 2004). Collaboration and relationship building are important because they lead to mutual benefits in terms of peer learning (Guskey, 2003a; Wei et al., 2009), and they also motivate teachers to become active participants in their own learning. Lauer et al.'s (2005) study demonstrated that with time to collaborate, teachers improved their instructional practices. According to Bolam (2000), PD sessions are research-based courses of action that allow teachers to learn as individuals and collaborate with one another in environments that hold teachers professionally accountable. When PD sessions are designed to include collegiality, teachers have opportunities to observe others' practices, leading to a constructivist orientation (Lock, 2006). This innovative

method allows teachers to construct meaning via collaboration and experience. If PD sessions are sustained and are offered over a long period of time, there is a greater chance that teachers will successfully implement learned strategies (Sparks & Hirsh, 2000). Windschitl and Sahl (2002) studied the ways in which teachers learned to use their laptop computers to support instruction. The researchers found that teachers who engaged more often in informal conversations and collaborative lesson planning integrated technology in more innovative ways than those who collaborated less. Thus, the interaction that occurs among teachers is necessary in supporting the meaningful use of technology integration. Joyce and Showers' (2002) research supports the importance of teacher interaction for facilitating the transfer of new skills learned from PD into classroom practice. Collegial support was found to be the most effective component of PD. Teachers who participated in PD using the constructivist model reported a 95% gain in knowledge, mastery of new skills, and ability to transfer these skills into their classrooms (Joyce & Showers, 2002).

Penuel, Fishman, et al. (2007) conducted a study of 454 teachers of varying backgrounds and experiences. The researchers investigated the results of various components of PD on teachers' knowledge of concepts and mastery of skills taught during sessions. The study found that on-site PD intensifies teachers' connections to existing practices and is more likely aligned with teachers' goals of increased learning for students. The researchers reported that given the opportunity for immediate classroom application, teachers saw the direct results of workshops and shared information for enhanced follow-up and support—a positive feedback loop that increased the value and meaning of what teachers learned during workshops.

Another component of effective PD is the matching of current skills and needs of participants to the objectives and goals of the sessions. Considering the participants' needs when designing PD sessions leads to an increased likelihood of teachers implementing the strategies presented in the sessions (Dexter, Anderson, & Ronnkvist, 2002; Joyce & Showers, 2002; Keller et al., 2005; Lawless & Pelligrino, 2007). According to Ingvarson, Meiers, and Beavis (2005), when teachers find PD sessions valuable, meaningful, and relevant to their own needs, PD is often deemed very effective.

The most crucial aspect of PD is the focus on increasing teachers' understanding of how specific tools can boost student achievement. Studies conducted by Garet, et al. (2001) and Loucks-Horsley (1995) support the importance of tying into the classroom context the relevancy of instructional strategies and the delivery within PD sessions. Loucks-Horsley explained that content-based PD helps foster a focus on students' background knowledge and learning styles via active engagement. In a quantitative, longitudinal study, Garet et al. found that teachers with increased knowledge and skills reported that changes in their teaching practices were beneficial for student learning outcomes. The success of PD is dependent on sessions that are designed with a focus on teachers' prior knowledge and skills.

When developing PD sessions for teachers, it is important to consider the needs of the teacher-learner (Becker & Riel, 2000; Vannatta & Fordham, 2004; Wozney, Venkatesh, & Abrami, 2006). With respect to this interdependence of instruction and learning, constructivist and adult learning theories offer a relevant and highly attuned framework for focusing PD on student-centered instructional needs (Williams &

Kingham, 2003). In a constructivist framework, PD includes an instructional goal that makes educators focus on curricula first, then on how specific tools can be integrated into existing curricula (Pitler, 2006). An approach that focuses on how teachers learn and contextualize this learning is based on Knowles' (1980) factors of andragogy.

Adults learn differently than children because they have different learning needs. Andragogy, an adult learning theory that focuses on motivational factors and needs evaluation, is applied to technology use and other barriers associated with teachers (Knowles, Holton, & Swanson, 1998). According to andragogy, adults are self-directed, intrinsically motivated problem solvers (Knowles, 1980). Adults use their previous personal experiences to immediately apply new knowledge. Adults construct meaning from new experiences, so PD sessions should involve engaging activities. Adults are more likely to use technology if they are able to make direct links with their existing classroom environments and their existing barriers. Additionally, adults prefer to participate in small group activities in order to apply and synthesize new knowledge (Speck & Knipe, 2005). Allowing opportunities for follow-up and support helps adults put new knowledge into practice (Cohen, 1995; Speck & Knipe, 2005). According to McKenzie (2001), focusing on adult learning theories when designing PD sessions meets teachers' interests and needs when teachers are given options. Teachers should, therefore, be involved in the PD planning process. Since adults are self-directed, activities should be tied closely to real-life situations.

**Impact of Professional Development**

Results from several years of studies (Darling-Hammond et al., 2009) on the quality and effectiveness of PD point to the ineffectiveness of the existing structure of teacher workshop programs; specifically, sessions taught outside the classroom setting

over the course of 1 to 2 days fail to intertwine pedagogy, curriculum, and the skills and tools therein. When research-based components of PD are not considered during the design process, teachers are isolated and feel content is not integrated into existing curricula; it is, instead, simply supplementary (Lock, 2006). This is the case for several reasons. Many sessions occur in 1 day, with little or no follow-up (Desimone et al., 2006; Slavit et al., 2003; Williams & Kingham, 2003), and because workshops tend to be taught off site, many criticize PD as superficial and fragmented (Ball & Cohen, 1999; Darling-Hammond, 1998; Darling-Hammond et al., 2009; Lock, 2006; NSDC, 2011a). Desimone et al. (2006) and Darling-Hammond et al. (2009) found that new and veteran teachers encounter difficulty applying innovative strategies learned in one-shot PD sessions without support or collaboration. Lauer et al. (2005) established that one-time workshops were not as helpful as sustained workshops. In addition, Slavit et al. (2003) found that workshops taught in 1 to 2 days did little to influence teaching practice. Scotchmer, McGrath, and Coder (2005) determined that fewer than half of public school educators receive more than 8 hours of PD every year. Darling-Hammond et al. (2009) noted that most PD sessions last from about 5 to 14 hours, which is not conducive to a substantial increase in teacher learning. As a result, the current and traditional format of PD sessions often does not lead to constructive learning for teachers (Birman, Desimone, Porter, & Garet, 2000).

When results-driven, standards-based, and job-embedded PD is implemented, teachers are more likely to employ concepts, skills, and knowledge learned during workshops; however, teachers traditionally receive limited opportunities to participate in effective PD sessions (Scotchmer et al., 2005). Extensive research demonstrates that

effective components of PD include the incorporation of curriculum standards, adult learning theories, and school contexts that are ongoing, collaborative, and reflective; however, these elements remain absent in most PD designs (Guskey, 2003b). Incorporating these elements within PD programs can lead to educator effectiveness in ways that resonate with students in each classroom and, eventually, with students in the entire school (Lawless & Pelligrino, 2007). Effective PD can impact teachers' existing instructional practices (Dexter et al., 2002; Keller et al., 2005; Mouza, 2002/2003) in a manner that changes teachers' classroom practices and increases student outcomes (Darling-Hammond et al., 2009). Standards-based, content-focused PD sessions are the key influences for transforming teacher practices and impacting student achievement (Desimone et al., 2006). According to Darling-Hammond et al. (2009), limited studies indicate that PD sessions lasting for more than 14 hours had a positive effect on teacher pedagogy and led to student gains in achievement.

## Technology Initiatives in K-12 Education

Teachers must learn how to use existing and emerging technology and to adapt to unforeseen technological issues in order to prepare students for the 21st century. *A Nation at Risk* (National Commission on Excellence on Education, 1983), a national report that initiated the changing roles for teachers, placed a greater focus on PD with its attempt to improve student achievement. Policymakers and administrators have recognized the importance of technology in K-12 classrooms, as demonstrated by proposed standards designed specifically for meeting the goals of technology literacy and use (Shaunessy, 2005). The United States government, along with reform advocates and educational leaders, has devised initiatives based on studies that demonstrate the influence of technology on education (Culp, Honey, & Mandinach,

2003; ED, 2004). The federal government created several frameworks to increase technology-infused teaching and learning, such as NCLB (2002) and the National Education Technology Plan (ED, 2010), both of which share a goal of raising technology-assisted student achievement. Achieving this goal requires an increase in the quality of PD centered on technology integration in classrooms (Guskey, 2003a).

Educators have had an interest in technology's impact on education since as early as the invention of motion pictures (Hew & Brush, 2007). Since the 1960s, computer use in education has been linked to an improvement in student-learning scores (Bransford, Brown, & Cocking, 2000). In response to technology's positive impact on school instruction, policymakers have spent large amounts of money on technological resources and equipment. For instance, for past 10 years, the United States has spent more than $66 billion to improve technology in schools (Quality Education Data, 2004). When significant sums of money are spent on technology, policymakers demand assurances of effective technology use (Ringstaff & Kelley, 2002). Funding helps obtain technological equipment and train teachers to meet technological goals; however, current funding is primarily used to buy equipment, rather than invest in the staff development of teachers (Williams & Kingham, 2003). The Enhancing Education Through Technology Act of 2001 (ED, 2001) allocated more than $700 million toward improving student learning through technology use, and 25% of that budget was reserved for PD focused on technology integration. With funding provided for initiatives supporting ongoing, sustained, high-quality PD, teachers receive workshops on how to use technological tools to increase student achievement. According to the Web-Based Education Commission (2000), at least 40% of funds support teacher development.

Despite these expenditures, Oppenheimer (2004) and Wetzel (2001) showed that technology's impact on students' overall learning remains insignificant. Lawless and Pelligrino (2007) also found that technology use has not produced the skills necessary for student success. Perhaps the reason for technology's insignificant impact on student learning is the failure to train teachers to properly use technology in the classroom.

ISTE (2008) created standards for students, teachers, and administrators in 1993 in order to prepare educators to increase the use of technology in the classroom and ensure school improvement in these areas. Later modified in 2007 to focus on increasing 21st century skills and student achievement (ISTE, 2007), the standards now prioritize the teacher's role in assisting students with technology use (Porter, Garet, Desimone, & Birman, 2003). According to ISTE's NETS (ISTE, 2007), technology integration involves using technology as a tool to improve learning in an interdisciplinary setting. NETS also emphasized goals for students, teachers, and administrators that involved developing appropriate skills required to be technologically literate (Judson, 2006; Swain & Pearson, 2003). Because administrators and school leaders expect teachers to use technology more often in classrooms to improve student learning and outcomes (Shaunessy, 2005), technology use has become more pertinent and important.

When former President George W. Bush introduced the NCLB Act of 2001 (2002), the initiative included a required guideline for technology integration in schools nationwide. The specific technology goal of NCLB was Title II, Part D—Enhancing Education Through Technology (EETT), which required that all students attain

technology literacy by eighth grade (Boyle, 2005). This goal specified classroom technology integration, fostered student achievement, and acknowledged the requirement for high-quality and effective PD in support of technology integration (ED, 2001). In addition, the ED founded the Office of Educational Technology (OET) to support NCLB's goals by assigning the office the role of policy writing and enactment for the use of educational technology nationwide (ED, 2007). This decision reflects the importance of educational technology in today's educational system. The National Education Technology Plan (ED, 2010) was later created by the OET to increase funding for technology and to improve teacher PD sessions for effective technology integration in support of NCLB goals (ED, 2004).

One of the steps toward realizing the goals of the National Education Technology Plan and emphasizing many of the OET reports is to increase the frequency of teacher workshops in order to improve teachers' technology literacy, knowledge, and skills, all of which are crucial for increasing student achievement and other goals for the 21st century and beyond. Within the context of the National Educational Technology Plan, it was found that while nearly all schools had access to the Internet and an increasing number of technology resources, the use of resources for education remained ineffective. The main reason for this lack of efficacy was insufficient educator staff development (ED, 2004). In addition, the National Science and Technology Council (NSTC) Work Group on Advanced Technologies for Education and Training identified tools and applications for technology learning in the classrooms (ED, 2010). The Partnership for 21st Century Skills (2009) framework also created skills, outcomes, and knowledge categories to ensure that students possess the abilities required to become effective citizens.

## Technology Integration

Technology integration has several definitions. According to Okojie, Olinzock, and Okojie-Boulder (2006), technology integration entails managing and coordinating available instructional tools and resources, including the use of electronic media for purposes of enhancing learning. Painter's (2001) definition of technology integration involves combining technology with teachers' philosophies of pedagogies and their students' learning styles. For successful content integration to occur, teachers must work toward integrating technology with existing content matter (Ireh, 2006).

Considerable debate exists about the success of technology integration within the classroom (Cuban, 2001), and there is only one consensus—simply having technology on hand is insufficient (Williams & Kingham, 2003). Teachers might have access to an abundance of technology resources, but access alone does not necessarily improve instruction. Teachers' ineffectiveness at integrating technology stems from the structure and situation of the environments in which the actual technology is utilized (Byrom & Bingham, 2001).

Integrating technology into the classroom is an essential part of successful teaching in the contemporary classroom (Shoffner, 2009). The proper integration of technology in classroom teaching affects both classroom structure and function (Becker, 2001). The benefits of technology integration include providing in-depth content knowledge, preparing students for the 21st century, enhancing higher level thinking skills, and increasing students' motivation for active learning, which leads to heightened student interest in content matter (Dockstader, 1999).

Technology integration involves more than teachers simply lecturing from PowerPoint presentations or using document cameras to display notes (Beaver &

Moore, 2004). Effective technology integration involves teaching with a combination of content knowledge and theories of learning and instruction (Ertmer & Ottenbreit-Leftwich, 2010). Technology integration is also a process, and it should not be misconstrued as a single-occurring event. As a process, it serves as a constructivist tool that can assist students with active learning and higher order thinking skills, such as synthesis, inference, analysis, and prediction.

According to Chee (2002) and Mellon (1999), teachers are slowly introducing technology into their existing curricula without a conscious intention to do so. One barrier to technology integration is the lack of effective PD. The need for technology-related PD arises when teachers lack the knowledge and skills for integrating technology (Ely, 1999). According to Earle (2002), successful technology integration is prevented when there are inadequate resources, when there is a lack of time and support, and when PD is ineffective. John and Sutherland (2004) studied the ways in which teachers integrate tools into existing pedagogies, and these researchers discovered that merely having technology resources in place is insufficient and will not directly improve teaching or learning; thus, PD may help overcome technology-related barriers for teachers (Mills & Tincher, 2003).

## Technology-Related Professional Development

The literature on TRPD highlighted in this section is related to the previously mentioned information regarding PD. General PD best-practices literature relates to TRPD best practices in several ways. TRPD sessions may help teachers and students across the nation; however, the sessions must incorporate several features in order to effectively transform teaching and learning (Darling-Hammond, 1998). One important feature is an ample amount of time for teachers to practice using technological tools

(ED, 2005). Also, teachers must be given opportunities to use technological tools within specific content areas in order to meet their needs and students' needs and to increase ownership of the tools (Lawless & Pelligrino, 2007). Collaboration helps teachers reflect on skills and knowledge and build confidence in using technology in their classrooms (Lawless & Pelligrino, 2007). Chee (2002) showed that teacher pedagogy, not a particularly new advance in technology, primarily impacts students' learning of 21st century skills via active engagement. In their review of prior research, Matzen and Edmunds (2007) found that the type of TRPD—face-to-face, blended, or online—and the amount of time to practice what was taught in the TRPD sessions increased teachers' use of technology in their classrooms. When TRPD sessions were tailored to focus on content and teaching styles, teachers learned to use technological tools much more effectively (Williams & Kingham, 2003). Such effectiveness can be achieved by allowing teachers opportunities to practice incorporating technology within their existing pedagogies, teaching styles, and content-related standards (Koehler, Mishra, Hershey, & Peruski, 2004; Rosaen, Hobson, & Khan, 2003).

### Factors That Facilitate the Application of Technology-Related Professional Development

Effective TRPD sessions require workshops that prioritize content and technology and their integration with one another (Garet et al., 2001) and offer follow-up support (Mouza, 2006). In addition, if TRPD includes hands-on, interactive activities with accompanied technology support, there is a greater likelihood that teachers will generalize into their classrooms (Lieberman, 1995; Ludwig & Taymans, 2005; Wood & McQuarrie, 1999). TRPD sessions are more effective if they do not primarily consist of lectures and when they focus more on hands-on implementation and practice (Darling-

Hammond, 1998), which permits teachers to implement and practice technology in more authentic settings (Wursta, Brown-DuPaul, & Segatti, 2004). Teachers should be given time to focus on their existing curricula and on how technological tools can be included, not on how their curricula fits into using tools in their classrooms. McCabe and Emery (2003) showed that the need for on-site technology support and assistance, as well as the design of TRPD, are crucial components of successful classroom technology integration. Teachers, therefore, must be educated and supported accordingly (Mills & Tincher, 2003). Many teachers, despite having access to a multitude of technology resources, do not possess the skills to make effective use of technology for instruction (Becker, 1994; Pedersen & Yerrick, 2000). Teachers need technology skills and a well-developed pedagogical grasp of the content matter they are teaching. It is the process and manner in which technology is integrated into a curriculum that has an effect on overall student learning (Mishra & Koehler, 2006). Chee (2002) emphasized that TRPD's focus should be on pedagogy. Still, existing PD programs tend to center on teaching with the technological tools and not on pedagogy.

Teachers need time to experiment with and practice strategies learned in TRPD before feeling comfortable with implementing them in their instruction (ED, 2005). In order for teachers to understand and fully implement new strategies, they must experience the strategies from their students' points of view (NSDC, 2011a). Lawless and Pellegrino (2007) conducted a meta-analysis study of TRPD sessions. They noted that the most common designs of TRPD included sessions with sustained follow-up, and they found that offering opportunities to learn technology while meeting needs led to increased confidence and a greater likelihood of transfer in the classroom. Options to

reflect on session knowledge and collegial support to assist with teacher needs also led to increased confidence in utilizing tools in the classroom. Lawless and Pellegrino concluded from the literature that teachers who participated in TRPD reported greater confidence in using technology and an improved ability to integrate technology in their classrooms.

Mouza (2009) investigated whether TRPD built on research-based practices would produce a change in the technology integration practices of teachers and concluded that when workshops were based on TRPD best practices, teacher learning improved, and, subsequently, teacher practice was positively influenced. This 3-year longitudinal study revealed not only short-term changes in teacher technology integration practice, but also evidence of increased capacity for continued learning. Garet et al. (2001) found that PD is effective when a change in teachers' knowledge and practices are evident. They reviewed the structural features of PD and found that (a) opportunities for active, hands-on learning focused on specific learning goals were provided; (b) options offered for collective participation of a group of teachers from the same school, same grade, or same subject were required; and (c) participation in PD sessions was extended beyond 2 days in length. These features led to increased opportunities for in-depth communication and collaboration related to implementation successes and challenges. When teachers from the same school, same grade, or same subject worked with similar students, there were increased opportunities to discuss how implementation of PD content in their classrooms affected student learning (Garet et al., 2001). In conjunction with collegial support, sustained TRPD is also needed if teachers

are expected to transfer knowledge and learned skills from the TRPD sessions into their classrooms.

**Ineffective Factors of Existing Technology-Related Professional Development**

The primary mission of educational technology in NCLB's Part D—EETT of 2001 (NCLB, 2002) is to enhance and advance the academic performance of each student. Many current TRPD sessions are not consistent with existing literature on TRPD best practices. As much as teachers may want to utilize available technology, they need more concrete directions, support, and collaboration (Charp, 2003). The lack of quality TRPD results from initiatives geared toward spending money on resource acquisition rather than on teacher workshops (Mouza, 2002/2003). Although a lot of focus and importance is placed on TRPD for teachers, research continues to show that existing teacher TRPD is ineffective (Ansell & Park, 2003; CEO Forum on Education and Technology, 1999; Lawless & Pellegrino, 2007). According to Williams and Kingham (2003), the most cited reasons teachers provide for not using technology are a lack of effective TRPD and a lack of support, particularly for teachers who have limited technology knowledge. When teachers don't know how to implement technology, their opportunities for integrating technology in their classrooms are limited (Kotrlik & Redmann, 2009); thus, quality TRPD is the key to integrating technology effectively.

One major barrier to effective technology integration is ineffective TRPD because teachers are not, nor do they feel, fully prepared to integrate technology. Workshops on technology do exist, but since they tend to focus solely on hardware and software, rather than the process of using technological tools, quality workshops are rare (Diaz & Bontenbal, 2000).

Research indicates that little or none of what is taught in TRPD workshops generalizes to the classroom because the knowledge is neither contextualized to, nor meaningful in, the classroom (Ball & Cohen, 1999; Friesen & Clifford, 2003). Furthermore, existing workshops are ineffective because they are not built upon best practices; they do not occur at the school site, they are not relevant to the classroom, they do not include follow-up support, and they fail at addressing teachers' learning needs (Fullan, 1991; Joyce & Showers, 2002; Mouza 2002/2003).

## Technology-Related Professional Development and Successful Technology Integration

Quality TRPD can aid teachers by providing the technical knowledge and skills to allow them to integrate and effectively apply technology in their classrooms (Gningue, 2003; Mouza, 2009; Wenglinsky, 1998). Consider, for instance, a study conducted by Penuel, Fishman, et al. (2007) in which teachers attended a TRPD session developed from research findings that specified the components of effective PD; this study showed that participating teachers employed a greater variety of technological tools more frequently and on a more continual basis in their classrooms compared to teachers who only participated in traditional PD. Clearly, effective teacher PD is necessary to aid teachers in the development of proper knowledge and skills to integrate technology into their curricula. Unfortunately, simply possessing basic technology skills and knowledge are insufficient (Liu & Velasquez-Bryant, 2003). The amount of time teachers spend in rigorous TRPD positively correlates with the effectiveness of using technology in their classrooms (Baylor & Ritchie, 2002; Becker, 2001; Reynolds & Morgan, 2001); therefore, TRPD is necessary to aid teachers in the development of proper knowledge and skills to integrate technology into their existing curricula. Teachers are at varying

levels of technology integration, and PD designers who understand this can better consider teachers' abilities and levels. Apple Classrooms of Tomorrow (ACOT) is one of the earliest studies conducted on the distinct types of PD teachers need (Sandholtz et al., 1997). In the ACOT study, researchers categorized teachers into five stages in terms of development: entry, adoption, adaptation, appropriation, and invention (Sandholtz et al., 1997). The first and second stages, entry and adoption, involved teachers using technology at the basic level and fitting it into the physical structure of their classrooms. For teachers at these stages to effectively integrate technology into their classrooms and move into advanced stages, they had to develop the necessary skills to be in the entry and adoption categories. The third stage, adaptation, involved teachers using technology in basic classroom practices. In the fourth stage, appropriation, teachers were comfortable using technology as part of regular classroom activities. The fifth and final stage, invention, entailed teachers exploring innovative ways to implement technology in their existing curricula (Sandholtz et al., 1997).

## Interactive Whiteboards

Many studies (Ball, 2003; Beeland, 2002; Bush, Priest, Coe, & Evershed, 2004; Cogill, 2003; Glover et al., 2007; Kent, 2006) have been conducted on IWBs and their effect on student motivation, engagement, and academic achievement. Beeland (2002) conducted an action study involving 10 middle school teachers and focusing on utilizing the IWB as a learning tool to increase student engagement. The study's results showed that both teachers and students strongly preferred the use of the IWB in the classroom. According to Beeland's (2002) results, the use of the IWB increased student engagement due to a correlation with the visual aspect of using the whiteboard. According to the survey data, students gained a deeper understanding of IWB lessons

and were able to apply the skills and knowledge to different situations when utilizing IWB features. Teachers found it most beneficial that IWB lessons could be saved for future access to build on students' prior knowledge (Haldane, 2007). Although using IWBs as an interactive tool was shown to have a positive impact in classrooms, student learning is more greatly impacted when IWBs are used with effective teaching practices (Murcia, 2008). Gerard and Widener (1999) researched the use of IWBs in foreign language classrooms. The goal of their study was to determine how IWBs facilitate teaching from the teachers' perspectives and learning from the students' perspectives. The researchers concluded that IWBs support teaching in at least three ways—they improve interaction and increased conversation in the classroom, they aid in presenting new and linguistic components, and they enable teachers to be more organized. IWBs also support the learning process in at least three ways—they provide opportunities to support oral skills, they support the cognitive process, and they increase motivation and emulation. Also, IWBs bring 21st century learning into classrooms and make information available to all students without the need for a computer or mobile device for every student.

## Classroom Response Systems

Educators have used the CRS as an alternative means of promoting interactivity and student engagement in order to boost academic achievement (Cotner et al., 2008). Student engagement and academic achievement depend on the quality of the interactions among and between students and teachers. Interactive classrooms provide students with frequent opportunities to receive constructive feedback about the success of their efforts. The CRS has shown promise in providing interactive engagement (Draper & Brown, 2004; Smialek & Boburka, 2006) by allowing for active interaction

between the teachers and students. Teachers can check student understanding by periodically posing multiple-choice questions or problems, and students can submit their answers using the CRS. The range of student responses are immediately summarized and displayed on the whiteboard, facilitating further cognitive intervention (Draper & Brown, 2004). Resnick (1987) and Rosenshine and Stevens (1986) noted that increased engagement predicts improved achievement and is a hallmark of a productive classroom, a venue that is provided by the CRS.

Guthrie and Carlin (2004) studied students' perceptions of the value added to the classroom by the CRS. In their study, two different instructors used the CRS to enhance instruction. One class used it to answer questions during the lecture, and the other class used it to answer questions presented at the end of the lecture. Guthrie and Carlin found that when the CRS was used, student participation averaged nearly 95%. They also concluded that 40% of the students in the first class believed they learned more compared to 8% in the second class, where questions were presented at the end of the lecture. More than 60% of the students in the first class indicated they preferred courses that used the CRS, compared to 15% of students in the second class.

In a study conducted by Hall, Collier, Thomas, and Hilgers (2005), the CRS was used both during the lecture and to quiz students on material they were to have read before class. The researchers found that students were more engaged and motivated in the learning process and showed a more significant improvement in grades compared to the previous year. Ward, Reeves, and Heath (2003) found evidence that students were more attentive and exhibited fewer off-task behaviors in classrooms where the CRS was used. Those same students also reported that they enjoyed using

the CRS during instruction and preferred the CRS to traditional types of instruction. It was also noted that when the CRS was used with well-designed questions, nearly 100% of students responded. Classroom discussion on various topics also increased as a result of using the CRS during instruction.

### Student Outcomes as a Result of Technology Integration

The process of integrating technology builds 21st century skills and enhances student achievement in core subjects such as reading, writing, math, and science (ISTE, 2008). When technology is used in teaching and learning, critical thinking improves as students are given opportunities that focus on solving authentic real-world problems (Roblyer & Edwards, 2000). As students use technology to locate information and apply it in meaningful ways, 21st century skills are enhanced (Dockstader, 1999). Integrating technology increases student engagement in learning. Because technology affords new ways to communicate with others beyond classroom spaces, students are able to share their new understandings with an audience (ISTE, 2008). As a result, students learn more, and they become more engaged and interested in the content (Dockstader, 1999).

The Center for Applied Research in Educational Technology (2005) has shown that technology improves student performance in three main areas—content area achievement, critical thinking, and workplace preparation. Cradler and Cradler (1999) also found remarkable improvements on standard achievement tests from technology integration. Other studies have also found improvement in student learning in certain content areas, such as mathematics and social studies, after utilizing software programs (Hillel, Kieran, & Gurtner, 1989; McCoy, 1996). Technological tools used in application of 21st century skills, such as research skills and real-world applications, increased

student interest in content areas and strengthened student organizational skills (Cradler & Cradler, 1999). Students exposed to technology by well-trained teachers scored higher on standardized tests, exhibited keener aptitudes in the areas of literacy (e.g., reading comprehension), and interacted more frequently with each other than their counterparts whose teachers did not receive the TRPD (Baker, Gearhart, & Herman, 1994; White, Ringstaff, & Kelley, 2002). Eighth-graders showed increases in math scores and on U.S. history assessments after teachers had participated in TRPD sessions based on TRPD best practices (Wenglinsky, 2006). Even as measured by standardized and conventional tests, when technology was used appropriately, children learned more (Wenglinsky, 1998, 2006).

Simply providing teachers with technological tools and resources alone has not significantly affected student learning (Oppenheimer, 2004; Trotter, 1999; Wetzel, 2001). Technology instruction should include knowledge of and proficiency in technology integration roles. Marzano (2003) reported that it's possible to identify effective schools by analyzing data to determine if students are acquiring knowledge and skills. Despite previous evidence of technology's impact on student achievement, different variables contribute to effective teaching, and determining TRPD's direct effect on student achievement is often difficult, although understanding teachers' perceptions can help. Obtaining a higher level of knowledge is much more facile and effective for students if technology is used (Sandholtz & Reilly, 2004), but there has not been much systematic research on the effects of PD in teacher instruction and student outcomes (Garet et al., 2001). Other variables, such as content matter and technology application, can also affect student achievement (Guskey & Sparks, 1996);

nevertheless, TRPD should focus on enhancing existing technology integration to affect student achievement and learning as profoundly as possible (Chee, 2002).

Overall, studies show that student outcomes rise when PD focuses on teacher awareness of student learning needs and styles (Holland, 2005). For instance, Linek et al. (2003) found in a 5-year study that effective PD can affect student outcomes indirectly, and high-quality PD based on best practices led to collaboration, autonomy, and opportunities for teachers, which then transferred to their classrooms. In the study, students' scores increased significantly by 13.3%, 14.7%, and 8.3% in reading and 13.1%, 28.8%, and 16.5% in math, in each of the three grade levels, respectively. Several studies linked increased student achievement amid instructional technology use to teacher commitment to TRPD workshops (Dick, 2005; Hew & Brush, 2007; Lei & Zhao, 2007; Matzen & Edmunds, 2007).

At the middle school level, Sivin-Kachala (1998) reviewed more than 200 studies on all subjects and grade levels regarding the effects of technology on learning outcomes. This researcher found that technology increased achievement in core subject scores (i.e., regular and special education) and improved students' overall attitudes. Another study conducted by ACOT (Baker et al., 1994) involved five schools over the course of 5 years. The researchers found that improved technology integration and access increased student attitudes and higher order thinking skills but had insignificant effects on standardized test scores in vocabulary, reading, and math. Wenglinsky (1998) found, however, that students performed higher than grade level in math when teachers used computers to increase levels of application. No positive

effects of technology were found when technology was used for drill and practice in the classroom; thus, technology use improved student learning at deeper and higher levels.

Driscoll (2007) found that technology addresses various needs of students by allowing for collaboration, higher order thinking, application, and communication. Since student learning is directly influenced by teacher learning, the more effective PD sessions are, the greater the effect they have on increased student achievement (Berry et al., 2004; Haar, 2001; Hirsh et al., 2005; Reid, 2002). According to Speck and Knipe (2005), PD design should aim to improve student achievement because the ultimate goal of educators is to learn innovative ways to apply content knowledge in order to engage, motivate, and help students learn the content and skills mandated by standards and curricula. Students' needs inherently vary, and with societal and generational changes, it is important for teachers to stay current on students' changing needs and to understand how students learn so that students can gain 21st century skills.

## Best Practices of Technology-Related Professional Development

If teachers are expected to integrate technology efficiently into their curricula, high-quality TRPD is necessary. According to Silvernail and Lane (2004), teachers' current skill levels should be the primary consideration when designing and delivering staff development opportunities. Furthermore, teachers are more likely to build upon new instructional strategies and learn from ongoing TRPD when their existing knowledge and main concerns are acknowledged and linked to their learning environments (Darling-Hammond, 1998; Desimone et al., 2002; Fullan, 1991; Lieberman, 1995; Slavit et al., 2003; Swain & Pearson, 2003). By allowing teachers time to learn actively and by designing TRPD sessions around adult learning theories (Lewis, 1998), workshops can be constructed in sync with teachers' current skill levels and, thus, can offer teachers a

more penetrating understanding of how to implement strategies learned in workshops. Teachers' time and learning need to be factored into the staff development process. Existing workshops focused on traditional forms of PD fail to include this crucial component. With ongoing training, access to technology, time to experience the technology, and support from mentors and other teachers, teachers develop positive feelings toward attaining and implementing technology skills in their classrooms (Milbreth & Mable, 2000; Swain & Pearson, 2003). Thus, I planned and designed a site-based TRPD program based on these best practices after initially determining teachers' current skill levels. The TRPD, as discussed in further detail in Chapter 3, focused on adult learning and constructivist principles and included support, feedback, collaboration, and reflection time. The TRPD was also ongoing in nature.

## Summary

As policymakers and administrators look to reform the efficacy of teaching methods, teacher training and development are being pushed to the forefront to raise student test scores. TRPD workshops offer a ready, comprehensive, and flexible means to successfully integrate technology in the classroom. Revamping TRPD is critical in order to significantly influence teacher and student learning because existing TRPD does not focus on authentic environments and teacher needs. There are numerous reasons that existing TRPD sessions based on traditional forms are ineffective; namely, they occur off-site, have little or no support, and do not focus on the needs of participants. Findings from this literature review conclude that it is possible to promote the design of a site-based TRPD program consisting of effective, research-based components; integrate the general principles of constructivist and adult learning;

and provide a context that supports student-centered pedagogy. An attempt at creating such a program, as well as an examination of its impact, is presented in Chapter 3.

# CHAPTER 3
# DESCRIPTION OF TECHNOLOGY-RELATED PROFESSIONAL DEVELOPMENT

Effective TRPD occurs when existing instructional practices are targeted (Keller et al., 2005), sustainable (Desimone et al., 2006), and site based (Lock, 2006; Penuel, Fishman, et al., 2007). Having technology resources at their disposal is not enough for teachers—without effective TRPD, they will not possess the skills to effectively use technology in their curricula. Teachers require training to effectively use technological tools. Obtaining knowledge pertinent to their profession aids in skill enhancement. TRPD sessions should allow teachers time to meet and collaborate with colleagues to build knowledge and skills and to examine teaching methodology (Sparks, 2002); therefore, a site-based TRPD program based on effective, researched-based components was created to provide teachers with the technology skills necessary to use the tools. As described in the Problem Statement section of Chapter 1, the TRPD design included input from teachers in the initial needs assessment. The framework used to design this TRPD was influenced by the constructivist theory and adult learning theory (Birman et al., 2000; Lock, 2006; Yin, 2009). Active involvement on the part of the learner is a crucial principle of both theories (McKenzie, 2001). Allowing teachers to construct meaning through authentic and contextual settings is important for effective PD.

## Needs Assessment: Prior to the Technology-Related Professional Development Sessions

At the end of the 2010-2011 school year, I implemented an informal needs assessment to learn from teachers what they wanted and in what areas they needed assistance. This assessment was conducted via individual e-mails with prompted questions (Appendix A). Teachers expressed the desire to utilize rarely used, on-site

technological tools, such as the IWB and the CRS, and to have an on-site facilitator to provide troubleshooting and technical help when needed. In addition, all respondents expressed a desire for increased student participation and engagement with technological tools. This desire arose from the highly emphasized domains of their newly implemented evaluation rubric. At the beginning of the 2011-2012 school year, a school technology plan was developed between the school administrators and the technology leadership team. Taking into account the informal needs assessment, the technology plan focused on both the school improvement goals and the county teacher evaluation rubric (Danielson, 2007). PD for technology use was a vital part of the school improvement plan due to the recent increased emphasis on technology use as determined by the county evaluation rubric domains. PD was considered a critical component for using technology to improve teaching and learning, and it also targeted the domains in the evaluation rubric. The evaluation rubric, based on the Danielson (2007) framework, focused primarily on (a) demonstrating knowledge of resources and technology, (b) coordinating knowledge of content with technology resources to actively engage students in significant learning, and (c) using questioning and discussion techniques by increasing student participation. The TRPD session was designed to target these domains, and it incorporated components from the literature review, adult learning principles, and best practices of technology strategies specific to the IWB and the CRS.

### Purpose and Goals of Technology-Related Professional Development

The sessions' goals and objectives focused on prominent instructional domains evaluated by the teachers on the county evaluation rubric (Danielson, 2007). For the purpose of this study, the emphasized domains were translated into goals and

objectives specific to the IWB and the CRS. The rubric emphasizes that teachers use a variety or series of questions or prompts to cognitively challenge students, advance high-level thinking and discourse, and promote metacognition. In addition, it was important that students be encouraged to formulate questions, initiate topics, and make unsolicited contributions. Students should also be engaged in the learning process. In order for teachers to attain exemplary points, they should plan their lessons/units by using the following practices focusing on annual student achievement goals: (a) identifying the content standards their students will master in each unit, (b) articulating well-designed essential questions for each unit, (c) employing backward design in structuring units (McTighe & Wiggins, 2004), and (d) allocating an instructionally appropriate amount of time for each unit. The four sessions allowed time for teachers to design coherent instruction and practice integrating technology; thus, the purpose for this TRPD program was to assist teachers in accomplishing these domain areas by utilizing the IWB and the CRS in alignment with research-based, best-practice strategies in achieving 21st century learning. The goals of TRPD stemmed from the rubric domains, as well as from the needs and wants of the teachers gathered from the informal needs assessment. The goals for this TRPD were:

- Teachers will learn effective, best-practice strategies to create engaging lesson plans that integrate the IWB, the CRS, and content standards as they relate to their curricula.
- Teachers will increase their awareness of the IWB, the CRS, and strategies to create effective question and discussion techniques within their lesson plans in order to increase higher order thinking while also enhancing student participation within their classrooms.

The TRPD was developed from a combination of IWB and CRS pedagogy strategies and a reflection of needs at the school level derived from a technology plan

developed at the beginning of the 2011-2012 school year. The TRPD was designed to assist teachers in following a methodological approach to meet standards and using planning time efficiently while creating classroom materials that increase students' understanding of content knowledge via active engagement in the construction of higher order thinking and conceptual knowledge. The goals and objectives for each session were designed in correlation with the context and need for instruction and the instructional domains found in the county teacher evaluation standards rubric (Danielson, 2007). The sessions focused on the ability to use the IWB and the CRS in existing curricula to enhance active student learning.

## Technology-Related Professional Development Sessions

The TRPD program consisted of four facilitator-led sessions with peer collaboration, follow-up activities, practices and reflections in the classrooms, and on-site support. The sessions, led by me, took place on early-release days over the course of a 5-week time span. Sessions included informal discussions and collaborative work among the participants, and they were conducted in a face-to-face format to increase rapport with the participants. The TRPD sessions, which lasted for about two to three hours, took place once per week in an on-site computer lab.

### Development of Session

The TRPD created for this capstone study consisted of six research-based components identified in the literature review, along with a site-based foundational component. The six components are as follows: (a) The TRPD was based on adult learning principles, (b) it was content specific, (c) there was ongoing facilitator support and feedback, (d) there was a focus on peer collaboration, (e) the program was standards driven, and (f) the process was reflective. Principles for this TRPD model

were based on studies conducted by PD experts, including Darling-Hammond (1998), Lawless and Pelligrino (2007), and Guskey (2003b). Based on effective, research-based best practices, this TRPD was site based (situated on site to allow for observation and interaction); collaborative (allowed teachers to work with others for support and to reduce isolation); constructivist (facilitative and provided hands-on practice); reflective (individualized to teacher needs, content, and pedagogy); and supportive (provided a resource person devoted to follow-up and assistance). Figure 3-1 illustrates the six components of the TRPD.

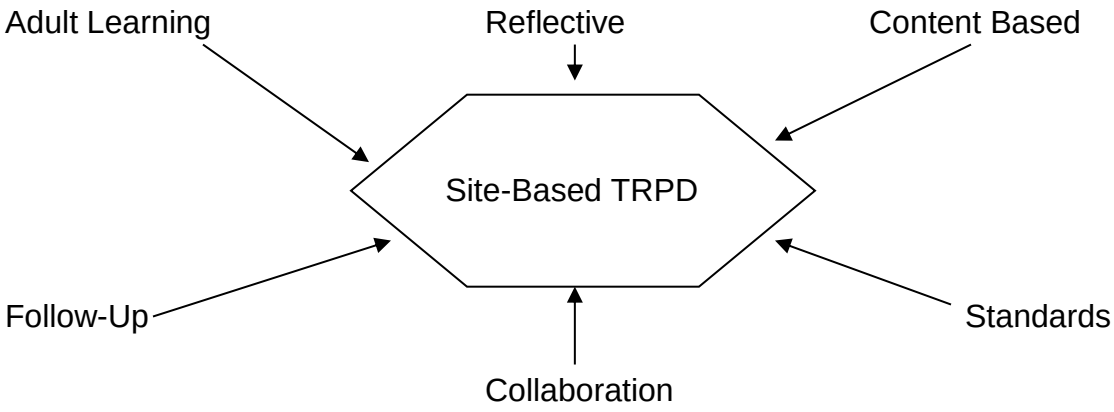


Figure 3-1. Influence in the design of TRPD

The four TRPD sessions described in detail below were designed to meet the needs and wants of teachers and to reflect adult learning principles and best practices of TRPD as highlighted in the Chapter 2 literature review. Each session focused on how teachers can use IWB and CRS tools to increase student understanding of content and to enhance teacher instruction. Research-based IWB and CRS best practices were introduced and demonstrated to teachers to model how the tools can be utilized to enhance active, rather than passive, student learning in the classroom. The activities provided in each session were intended to assist teachers in meeting the standards of

their evaluation rubrics and curricula by developing skills gained in the TRPD sessions via practicing and experimenting with the IWB and the CRS. The model lessons and strategies focused on keeping students actively engaged via collaborative learning, a key component of 21st century learning, while learning content matter. In addition, the design of the sessions aligned with andragogy principles in meeting teachers' needs, specifically in terms of learning the skills to engage students while also enhancing their technology skills and knowledge within the particular content area. The strategies utilized were teachers' reflections on current instructional practices and needs, introduction and sample uses of the IWB and the CRS, and opportunities to practice the application of IWB and CRS strategies in the teachers' content areas with flexible timing as some teachers needed more practice than others. Allowing time to practice and share hands-on ideas allowed teachers to feel more comfortable transferring learned skills into their classrooms. Also, time for peer review, sharing, and dissemination were included. Teachers shared ideas independently, in pairs, and in groups regarding the methods they used to apply their existing and modified knowledge and skills in their respective content areas.

The TRPD session objectives and activities were based on the goals of the TRPD as detailed above. Table 3-1 outlines each session and its corresponding objectives. The objectives were aligned with the goals, and the activities were designed to meet the objectives.

Table 3-1. Overview of sessions

| Session | Objective |
|---|---|
| Orientation/Overview | Using a concept from their specific content areas, teachers will design goals and explain ways in which the IWB and the CRS can be used in their content areas to actively engage students. |
| Session 1: IWB Lesson Content | Teachers will learn and utilize features of the IWB after enhanced understanding of the dialogic instruction of lessons. |
| Session 2: IWB Lesson Content | Teachers will create an IWB lesson for the purpose of interaction and engagement of students using the dialogic instruction method. |
| Session 3: CRS Lesson Content | Teachers will learn and utilize the features of the clickers (CRS) after gaining a deep understanding of the peer instruction approach. |
| Session 4: CRS Lesson Content | Teachers will create multiple-choice questions to implement the CRS into new or existing lesson plans using the peer instruction approach. |

**Session Activities**

The four sessions focused on utilizing the IWB and the CRS to equip teachers with the skills and knowledge necessary to engage students, increase student participation, and enhance curriculum knowledge. The activities gave teachers opportunities to acquire the confidence and skills to use the tools by appealing to real-world relevance tasks and allowing teachers to put into practice knowledge and skills on topics related to their specific content areas. Dialogic and peer instruction strategies were selected because they increase student participation, encourage dialogue between students and teachers, and increase conceptual knowledge of content matter. Each session included connections to teachers' prior knowledge, opportunities to learn through practice, and time to collaborate and share the knowledge the teachers gained. Each of the sessions followed a similar format. The breakdown of sessions included demonstration and

explanation of the simple uses of IWB and CRS techniques, collaboration and lesson plan development, and hands-on sessions with options for working independently or in pairs to gain experience with the IWB and the CRS.

The IWB and the CRS were introduced to teachers using best practices in order to incorporate them into lesson plans and to engage students. Each session began with a description of the objectives of the session and a discussion of desired skills. Using lesson activities from the sessions, teachers worked in pairs and in groups to brainstorm topics and ways in which the tools could help instruct students on those topics. The model lessons shown were based on constructivist practices. Teachers were given time to create their own technology integration lessons using the lesson plan framework (Appendix B), which I created using components from the Danielson (2007) framework. Teachers had opportunities to engage in weekly collaboration within the TRPD sessions.

### Demonstration and Explanation of Interactive Whiteboard and Classroom Response System Methods and Research-Based Strategies for Implementing the Tools Into Instruction

Each session began with a demonstration of techniques and methods for introducing the IWB and the CRS into the classroom. The first two sessions focused on the IWB, and the final two sessions focused on the CRS. The introduction of the IWB and the CRS also included a reflection of current teacher practices and sample uses of the IWB and the CRS to increase knowledge of content by actively engaging students. The research-based strategies used in teaching the IWB and the CRS included dialogic teaching (Alexander, 2008; Armstrong et al., 2005) and peer instruction (Fies & Marshall, 2006; Mazur, 1997). Each of these strategies targeted using the IWB and the CRS to actively engage students and increase student participation. For instance,

dialogic teaching (Alexander, 2008; Armstrong et al., 2005) increases teacher-student interactivity because the teacher integrates the IWB into the objectives of each day's lesson. Each student plays an active role by discussing lesson objectives with the teacher and engaging in discussions by sharing alternative viewpoints and constructing and building knowledge to create the lessons' final learning product (Smith, Hardman, & Higgins, 2006). The constant questioning that occurs during this process increases the interactivity and active construction of knowledge by the students. Using dialogic instruction is an essential part of IWB instruction (Higgins, Beauchamp, & Millen, 2007). Peer instruction (Fies & Marshall, 2006; Mazur, 1997), presented to teachers in the third session, involved students in their own learning. In such learning, conceptual, multiple-choice questions are embedded within existing or new lecture presentations. Students are given 1 to 2 minutes to answer the questions, then 2 to 3 minutes for a follow-up discussion about their responses—this occurs with groups of three to four students before they attempt to answer questions again using the CRS. Best practice involves including two to three questions per hour of teaching (Beatty, Gerace, Leonard, & Defresne, 2006).

Although research shows best practices using dialogic teaching with the IWB and peer instruction with CRS, strategies to combine both tools and strategies were initiated as a discussion topic among participants in the fourth session for teachers who chose to utilize in the same lesson plan both the IWB and the CRS. Additionally, research and strategies were shared with the participants (Appendix C).

### Collaboration and Lesson Plan Development

Each session allowed time for participants to meet collaboratively to share their experiences of creating ideas for a lesson plan that could integrate the IWB or the CRS.

Each session gave teachers time to work in pairs to create lesson plans and to share ideas. Following the Danielson (2007) framework and evaluation rubric, teachers were given time to identify objectives and standards they wished for their students to master. Teachers were asked to articulate essential questions for the unit, and using the backward design (McTighe & Wiggins, 2004), they created lesson plans to implement the dialogic and peer instruction strategies. Individual assistance was provided as needed for teachers during their planning times and sometimes after school at the request of the teachers. As a facilitator, I provided assistance in planning lessons, providing feedback, answering questions, and giving technology assistance either through e-mail or by classroom demonstrations. This support was provided until 3 weeks after the TRPD instructional sessions.

## Hands-On Sessions for Practice

At the end of each session, teachers were given the opportunity to model and practice using the IWB and the CRS before actually implementing the tools in their classrooms. On-site support was provided as needed. The IWB and the CRS were utilized during the sessions to model and demonstrate the manner in which the tools could be used. On a weekly basis, teachers discussed implementation challenges and possible successes. I served as a technology resource guide, troubleshooter, and technical assistant when needed. Sessions were broken down into manageable parts.

### Orientation/Overview

The objective and activity description for the Orientation/Overview session are highlighted below.

**Objective**

Using a concept from their specific content areas, teachers will design goals and explain ways in which the IWB and the CRS can be used in their content areas to actively engage students.

**Brief activity description:** After selecting teachers to participate in the study and receiving letters of consent (Appendix D), I scheduled the first session to take place on an early-release day. At the session, teachers were given a reflection log (Appendix E) and were asked to keep notes about their perceptions and experiences throughout the study. Then, I facilitated a discussion about technological tools and how they are used in teaching. Teachers were randomly placed in pairs to discuss their goals for using technology in their classrooms. Goals included active student engagement, assessment, and application to 21st century skills using their evaluation rubrics.

**Sessions 1 and 2: IWB Lesson Content**

The objectives and activity description for Sessions 1 and 2 are highlighted below.

**Objectives**

- Teachers will learn and utilize features of the IWB after enhanced understanding of dialogic instruction of lessons.
- Teachers will create an IWB lesson for the purpose of interaction and engagement of students using the dialogic instruction method.

**Brief activity description:** Teachers were asked prior to the first session to bring their assigned school laptops with wireless connections and previously installed SMART board notebook software so they could have a hands-on experience. Teachers evaluated their own levels of IWB expertise and identified current and future session goals via a K-W-L chart, which tracks what a student knows (K), wants to know (W), and has learned (L) about a topic. Teachers took turns sharing their experiences in a group

discussion. IWB model lessons based on constructivist practices and dialogic strategies were presented to teachers using a SMART board notebook lesson available via SMART Exchange. Lessons included different activities that could be used in each subject area. Examples of successful uses in different content areas were shown to all participants. While I offered input, teachers were prompted to discuss the different ways in which they could use these tools in their specific content areas and to identify possible advantages and disadvantages. Teachers brainstormed content topics and discussed how the IWB could be used to instruct students on those topics. Teachers were given time to develop their IWB content lesson utilizing SMART notebook software. Features of the software taught during the first session included drag and drop (objects on the board can be moved around), hide and reveal (objects placed over others can be removed), highlighting (transparent color can be placed over writing or other objects), animation (objects can be rotated, enlarged, and set to move along a specified path), storage and quick retrieval of material, and feedback (when a particular object is touched, a visual or aural response is generated). The specific types of dialogic IWB strategies presented to the participants were (a) encouraging a diversity of views and extended turns, (b) adapting to emerging circumstances, (c) building cumulatively on shared experiences, and (d) discussing topic areas to construct new knowledge via the whole class or in pairs. Best practices of dialogic teaching (Alexander, 2008; Armstrong et al., 2005; Mercer, Littleton, & Wegerif, 2004) included discussion of learning objectives and alternative viewpoints; reasoning, generating, justifying and evaluating ideas; responsively and cumulatively building on others' ideas;

co-constructing new meanings and interpretations; and transitioning from passive lecturing to interactive lecturing.

Teachers had one-on-one assistance from me, and I provided ongoing feedback to teachers throughout the lesson design stage during the week prior to the second session. The second session featured a review of the first session, more practice, and time for teachers to create lessons and share with peer feedback. Teachers were randomly paired and given time to demonstrate their lessons while their assigned partners provided input and suggestions.

**Sessions 3 and 4: CRS Lesson Content**

The objectives and activity description for Sessions 3 and 4 are highlighted below.

**Objectives**

- Teachers will learn and utilize the features of the clickers (CRS) after gaining a deep understanding of the peer instruction approach.
- Teachers will create multiple-choice questions to implement the CRS into new or existing lesson plans using the peer instruction approach.

**Brief activity description:** Teachers were introduced to the CRS by participating in a model lesson, and they were asked questions to assess prior knowledge regarding the CRS and the peer instruction approach. Then, the basic features of the CRS were taught to the teachers. The peer instruction strategy was taught by engaging the teachers in the process. The purposes of the peer instruction strategy shared with the participants were to increase student engagement, increase learning of content, continue instant feedback, and increase knowledge. Best practices of peer instruction strategy (Fies & Marshall, 2006; Mazur, 1997) shared with the participants included (a) a cooperative learning activity to probe student understanding of lecture content; (b) questions written to measure learning objectives that involve

students discussing, debating, and defending; and (c) differentiation between jargon and understanding of concepts to clear up misconceptions. Wrong answers that seemed plausible or logical were developed and were used as distracters in multiple-choice questions. Answer choices were limited to five. Teachers worked in their specific content areas to generate lists of questions and to demonstrate their ideas to the group during presentations of their lessons. Questioning occurred before introducing a concept to assess prior knowledge, throughout a lecture to build conceptual knowledge, and after coverage to assess learning. During the fourth session, participants discussed ways in which they could combine both the dialogic and the peer instruction methods into one lesson to utilize the IWB and the CRS together and to model the lesson for the group before implementing it in the classroom. This strategy was introduced in order to target multiple domains of the rubric at once and to combine interactive lectures and discussions into one lesson using the IWB and the CRS.

**Support and Mentoring**

Individual sessions occurred on an as-needed basis during teacher planning meetings and sometimes after school at the request of the teachers. Teacher-initiated meetings took place at least once per week. As a facilitator, I provided assistance by helping plan lessons, providing feedback, answering questions, and offering technology assistance either through written and verbal explanations or by demonstrations.

## Summary

The TRPD sessions focusing on the IWB and the CRS provided teachers with opportunities to participate in on-site PD and to become familiar with the IWB and the CRS using research-based practices of dialogic teaching and peer instruction. The

TRPD was based on adult learning theory principles and on the six components highlighted in Chapter 2 to be best practices. The sessions focused on using these technological tools to enhance students' conceptual knowledge of subject matter, which increases engagement.

# CHAPTER 4
# METHODOLOGY

This study employed a qualitative approach in order to provide a detailed account of middle school teachers' perceptions and classroom applications of the IWB and the CRS as a result of their participation in a site-based TRPD program featuring these tools. The goal of this study was to generate a descriptive account of middle school teachers' perceptions and applications so that others can better understand the components and factors reflected in the teachers' experiences. As such, the research questions for this study were as follows:

- What are the perceptions of middle school teachers of the site-based IWB and CRS PD?
- How do middle school teachers use IWB and CRS tools after participating in a site-based PD opportunity?

In order to answer these research questions, I collected data from multiple sources to allow for an in-depth analysis of the TRPD. Chapter 4 features an explanation of sampling procedures and criteria, instruments for data collection, limitations of the study, and data collection and analysis procedures.

## Research Design

I chose a qualitative research design method (Rossman & Rallis, 2012) because qualitative research is suitable for allowing participants to assign meaning to the events, situations, experiences, and actions with which they are involved and engaged (Maxwell, 2004). Qualitative research plays an important role in developing an "understanding of patterns of practice in classrooms where teachers are trying to enact reform" (Spillane & Zeuli, 1999, p. 20). The purpose of qualitative research is to

describe and seek an understanding of the settings being studied. According to Patton (2002), a qualitative study method is comprehensive, exploratory, and detailed.

To understand how TRPD can affect instructional practices of teachers, researchers must investigate the effects within its naturally occurring setting. Studying participants in real-world settings allows one to interpret phenomena based on the meanings individuals attach to certain events (Creswell, 2003; Patton, 2002). According to Burstein et al. (1995), "some aspects of curricular practice simply cannot be measured without actually going into the classroom and observing the interactions between teachers and students" (p. 7). I used qualitative methods to address the research questions because I wanted to understand the impact of sustained, site-based sessions on changes in teacher practice and student outcomes via teacher perceptions and behaviors. The purpose of this study was two-fold: to examine the perceptions of middle school teachers' experiences after participating in a site-based IWB and CRS TRPD and to explore the ways in which teachers transferred what they learned in the TRPD to their classrooms after actively participating in the sessions. I used a qualitative research methodology to examine teacher perceptions of TRPD sessions and to examine the influence on technology integration.

In this case, I attempted to explain how a site-based TRPD experience affects middle school teachers. For this qualitative methodology, I sought to gather information about teachers' perspectives and to interpret how teachers used in their classrooms the information gained in the TRPD; therefore, this study's design was focused first on gathering information about teachers' perspectives and then on interpreting the application in the context of the classroom. This research method makes

generalizations to an entire population impossible, but it has utility as a guide for developers of teacher programs and as an example for further research.

Qualitative research allowed for the opportunity to include a variety of data sources, including observations, in-depth interviews, and lesson plans (Glesne, 2006; Rossman & Rallis, 2012), leading to an increase in credible data. In-depth interviews were used to gather and examine teacher accounts. Classroom artifacts, such as lesson plans and teacher reflection logs, provided more in-depth information than a survey could provide (Borko, Stecher, Alonzo, Moncure, & McClam, 2005).

To address the previously stated research questions, I selected a qualitative methodology as a research design, and I analyzed specific statements and themes to search for possible meanings and common themes. The findings of this study will inform educational practices and suggest strategies that are more likely to be implemented in TRPDs.

## Participants and Sample

The population of this study consisted of certified middle school teachers at a suburban school in Tampa, Florida, who attended the IWB and CRS site-based TRPD in Spring 2012. The teachers came from various disciplines, and they were selected based on their willingness to engage in all activities of the TRPD. The number of participants selected was limited to six to ensure that I, the researcher, would have sufficient time to interact with and assist participants as needed in order to maintain motivation and avoid frustration during the technological tool practice and implementation of lessons in the classroom. I served as instructor and facilitator of the sessions, and I also provided instructional and technical support.

I used purposeful sampling, without regard to teaching experience, gender, age, or ethnic background of the participant, to select the teachers from this population. Purposeful selection is grounded in the idea that in order to gain insight into a situation or event, a sample from which one can learn the most is selected (Creswell, 2003). Purposeful sampling was used because the teachers were readily willing to participate. While there is no definitive rule regarding sample size in qualitative studies, I believed that 10 participants was a sufficient number to reflect the range of the population under investigation. I expected that teaching expertise and the extent of technology use in the curriculum would vary. I sent a letter of invitation to 10 teachers who, via electronic communication in Summer 2011, showed interest in participating in a TRPD.

All 10 teachers who expressed interest in participating in a June 2011 TRPD workshop were invited via e-mail to attend the initial meeting (i.e., orientation). In the e-mail, I explained the proposed research to the selected participants by providing them with a description of the proposed study's purpose, time restrictions, and activities (Appendix F), and I reviewed the documentation needed to complete the study. At the initial meeting, teachers were informed that the research project was focused on a limited number of individuals. The teachers, if they agreed to participate in the study, were asked to sign a letter of informed consent (Appendix D) approved by the Institutional Review Board (IRB) and my school district's Department of Accountability and Assessment. Teachers were given permission to attend the TRPD if they opted out of participating in the study. In my study, I wanted to learn what teachers thought about site-based TRPD and how the actual components of TRPD influenced their decisions concerning effective technology integration in their classrooms, with the goal of

increasing 21st century skills and conceptual knowledge among students. Accordingly, I needed to study teachers who chose to engage in TRPD.

Of the six participants who opted into the study, five were female, and one was male. Of the participants, three held bachelor's degrees, and three held master's degrees. The participants' mean total years of teaching experience was 16; mean total years of teaching in the state of Florida was 8. The individualistic and diverse primary subject areas of the participants were U.S. history, science, Spanish, medial skills, reading, and mathematics. One female participant dropped out of the study due to personal reasons. This goal of this study was to explore the perceptions of participants in the site-based TRPD.

## Context of Study

This study took place at Palms Middle School, which was my place of employment. This middle school serves a multi-ethnic school population consisting of about 1,050 students. At the time of study, the Palms Middle School ethnic breakdown was 43.4% Hispanic, 37.6% White, 8.1% Black, 8.1% Multi-Racial, 2.8% Asian, and .1% American Indian. In addition, 11.9% were English Language Learners. More than half of the student population (64.9%) participated in the free and reduced lunch program, which resulted in the school holding a Title 1 status for the 2011-2012 school year.

Palms Middle School had copious amounts of technology resources, including hardware and software available to teachers a majority of the time, some of which are permanently accessible in each classroom. Resources included, but were not limited to, mobile laptop carts, desktop computer labs, IWBs, projectors, interactive tablets, the CRS, and document cameras. Resources were purchased when the school was initially built in order to provide up-to-date technology tools to teachers for the purpose of

technology integration. Additionally, during the 2011-2012 school year, IWB and CRS tools were purchased with Title 1 funds for each subject area. Despite the availability of technology, however, TRPD was only offered through the district about 25 miles from the school at an off-site location. Another issue was that the district TRPD sessions focused on learning how to use technology tools and software, rather than on teacher pedagogy and specific content areas.

## Data Collection

Data collection took a variety of forms in order to ensure reliability through triangulation of sources (Rossman & Rallis, 2012). Data collection consisted of lesson plans; reflection logs; classroom observations; and structured, open-ended interviews. Each research question was aligned with corresponding data collection and analysis methods (Table 4-1). Each data collection technique and instrument is described in detail below.

Table 4-1. Alignment of research questions with data collection and analysis methods

| Research question | Data collection | Data analysis |
|---|---|---|
| What are the perceptions of middle school teachers of the site-based IWB and CRS PD? | Classroom observation in combination with the lesson plans (created within the TRPD sessions) | Type and organize observation notes immediately by creating tables to record and store data |
| How do middle school teachers use IWB and CRS tools after participating in a site-based TRPD opportunity? | Post-TRPD interview and reflection log | Transcribe interviews and categorize by using the constant comparative method to refine and contrast categories |

### Question 1: Perceptions

Prior to the interviews, I made a conscious effort to build a rapport with the teachers to ensure they knew I was available to assist. Participants were anonymous in

the data collection and analysis process. Data were initially gathered through e-mail correspondence before the TRPD session was implemented. As noted in Table 4-1, I administered interviews and collected reflection journals to address the research question, "What are the perceptions of middle school teachers of the site-based IWB and CRS PD?" Because one of the purposes of this study was to examine the participants' perceptions of the TRPD, I chose a structured, open-ended interview format. Structured, open-ended interviews focusing on teachers' perceptions and experiences are an appropriate method for gathering data (Rossman & Rallis, 2012). I asked teachers to keep a reflection log (Appendix E) while participating in the sessions. The reflection logs were gathered from individual participants at the time the interviews were conducted.

**Interview**

The purpose of the individual interviews was to gather information about participants' experiences and perspectives of their TRPD participation (Rossman & Rallis, 2012). The questions were created to allow for descriptive, open, and detailed responses. Structured, open-ended interview questions (Appendix G) were developed based on components of the TRPD, and interviews were conducted near the end of the implementation of the TRPD sessions to gather information gained from teachers regarding their perceptions of the TRPD on their instructional practices and potential student learning and engagement. Open-ended interview questions were created and were used to yield perceptions and experiences of teachers (Patton, 2002). The interview protocol included 10 fixed questions and was administered post-TRPD implementation to each participant in the same order. The interviews lasted for about 30 to 45 minutes.

All interviews were conducted in teachers' classrooms and were audio recorded for accuracy. This allowed me the opportunity to replay interviews to ensure accurate transcription and analysis of the data (Merriam, 2002). After completing the interviews and prior to analyzing the data, I transcribed and typed the recordings for each teacher to review for accuracy.

**Reflection logs**

The purpose of the reflection logs was to allow the participants to process and report their perceptions of each of the sessions. As referenced in Chapter 2, participants need the opportunity to engage in reflection in order for PD sessions to be successful (Joyce & Showers, 2002). Reflection is a key component of quality PD (Loucks-Horsley et al., 2003). Furthermore, writing reflection journals aids in the participants' abilities to reflect critically on what is taught (Hiemstra, 2001). Each participant was asked to keep a reflection journal, which included prompted questions. Prompts for the journal entries were given within the journal pages (Appendix E), and participants were given opportunities at the end of each session to discuss their journal entries with each other. Participants were asked to respond to the prompts, which guided their entries, and they were required to write one entry per session. Participants were given the opportunity to complete their prompts electronically via word processing software and to submit them to me by e-mail. Participants kept journals of their perceptions and thoughts of the TRPD activities, and they recorded dates, activities, and perceptions of activities. The journals were kept private and were only shared with me after all TRPD sessions were completed. Giving participants time to jot down thoughts in their reflection logs allowed them to construct meaning from their experiences and to record their understandings of concepts (Patton, 2002).

### Question 2: Technology Applications

After teachers became familiar and comfortable with the technological tools in the four TRPD sessions, 45-minute scheduled observations occurred. Observations were scheduled at the teacher's request within 2 weeks of the final session. Before the scheduled observation, I visited classrooms on a weekly basis to observe, provide support, and troubleshoot technology-related issues. As noted in Table 4-1, I conducted classroom observations and collected lesson plans to address the research question, "How do middle school teachers use IWB and CRS tools after participating in a site-based TRPD opportunity?" The other purpose of this study was to explore how teachers applied their learning in their classrooms after the sessions. Classroom observations are conducted to understand the context and learning actions in the natural setting (Rossman & Rallis, 2012).

Lesson plans were collected for technology integration analysis and feedback. Data collected from observations presented a first-hand representation (Merriam, 2002) used in conjunction with the lesson plan analysis.

### Classroom observation

The purpose of the observation was to collect a first-hand account of the teacher integration of technology occurring in the classroom as a result of participation in the TRPD. The design of the observation protocol, derived from ISTE's ICOT tool (ISTE, 2007), featured categories and observation checklist items regarding technological tools used in teacher instruction. The ICOT classroom observation tool was developed by the Education Leadership Department from ISTE and is used to identify features of technology integration. The format of the observation protocol included a chart to record observations and reflections in order to gather data and information regarding

the use of the IWB, the CRS, and the strategies that were used during the PD sessions (Glesne, 2006). Field notes were taken on the focus points of the research-based strategies used (i.e., dialogic or peer instruction), student engagement, conceptual knowledge of content, and the ways in which teachers were utilizing the IWB and the CRS in their classrooms. The field notes were taken during the observation to help organize the observation and collection of data, including specific details of technology usage and student engagement. Field notes capture detailed information about the interactions that take place within the classroom. Description of the classroom environment and reflection were also included in the protocol (Patton, 2002). Classroom observations occurred once during the study using a constructed protocol (Appendix H). The length of the observations corresponded with the length of each instructional class period to get the full description and understanding of the events occurring in the classroom (Glesne, 2006). The data derived from direct classroom observations consisted of detailed descriptions of teachers' activities, behaviors, and actions (Patton, 2002); thus, one way to evaluate teachers' levels of technology integration is to determine whether the participants are able to apply the new learning to the context of their classrooms. Classroom observations formed a detailed picture of the events that occur in the classroom and give a holistic, detailed account of interactions and teaching methods. They provide insight on how teachers used the IWB and CRS tools; thus, the focus of the observations was on how the tools were being used during the instruction.

**Lesson plan framework**

The lesson plan helped gauge teachers' applications of the IWB and CRS tools as a result of the TRPD. It provided the evidence of intended technology usage for

student engagement and increased conceptual knowledge of the content matter. The lesson plans were developed during the TRPD sessions and were implemented in the classroom when the observation occurred. I developed the lesson plan framework using the Danielson (2007) framework as a foundation. The lesson plan was used as supplementary evidence to technology integration, with standards allowing for an analysis of how technology was incorporated into the specific content areas. Lesson plans related to the observed classroom practices. Collecting one lesson plan from each teacher at the beginning of the classroom observations provided me with a perspective from which I compared my own observations of the settings and enhanced my understanding (Rossman & Rallis, 2012). It gave me an opportunity to view how teachers apply their learning; it represented a residual piece of learning.

**Researcher reflective journal**

During the study, I kept a reflective journal, which included a detailed record of participant interactions during sessions and classroom observations to obtain reflexivity (Patton, 2002). Reflexivity involves acquiring ownership of a perspective and allows for ongoing analysis. Complete objectivity is impossible, but having a reflective journal allowed me to record my thoughts and gain clarity. For every visit, I wrote my notes in a spiral notebook, logging location, date, and time. During this process, I explored my own viewpoints, assumptions, observations, reactions, and biases to reduce subjectivity (Rossman & Rallis, 2012).

Table 4.2 summarizes the timeframe for each phase of data collection and analysis.

Table 4-2. Timeframe for each phase of data collection and analysis

| Task | Begin | End |
|---|---|---|
| Recruit participants based on survey and e-mail | July 2011 | December 2011 |
| Administer TRPD | April 2012 | May 2012 |
| Conduct and transcribe interviews and observations | May 2012 | June 2012 |
| Collect and analyze reflection logs and lesson plans | May 2012 | June 2012 |
| Contact participants for member checking | May 2012 | June 2012 |
| Conduct data analysis | May 2012 | July 2012 |

## Data Analysis

Data analysis was an ongoing process that involved continual reflection. The data were analyzed using the following five steps: (1) organize the data, (2) familiarize the data, (3) identify categories and generate themes, (4) code the data, and (5) interpret the data (Creswell, 2003; Rossman & Rallis, 2012).

### Organize the Data

The first step involved using Microsoft Word to transcribe the five interviews and observations with field notes in the right side of the margin. This allowed for data reduction because I could eliminate extraneous statements that did not contribute to the research questions. Member checking was used after the transcription of the interview. Member checking involves having the participants review their own statements for accuracy, confirmation, and generation of additional data if needed (Creswell, 2003; Rossman & Rallis, 2012). It also allows for participants to correct any errors that might have existed.

**Familiarize the Data**

Several times, I separately read over the data from both the interviews and observations to create meaning from the gathered data. I added notes to the margins for reflection, and after reading and reviewing the data, I identified trends and patterns that connected with the TRPD components, dialogic and peer instruction strategies, and integration of the IWB and the CRS.

**Identify Categories and Generate Themes**

The third step involved identifying consistent patterns or categories that emerged from reading and rereading the gathered data, which addressed each of the research questions and the conceptual framework (Creswell, 2003; Rossman & Rallis, 2012). I created a concept map for each research question to develop categories and generate themes. The themes were generated from categories, and these themes led to the development of further categories. The themes described the findings and also added layers of additional analysis. I separately reviewed data from each participant, and as themes emerged, I compared them across the interviews and observations, re-examining them to note how they addressed the research questions. I looked for possible patterns or similarities among the data that emerged across the data of each participant.

**Code the Data**

Once themes were determined, I coded the data to show the relationships to the themes. Coding was a detailed process, which involved examining the data and organizing it into chunks that allowed for a new understanding of the data as seen in varied relationships. A peer reviewer helped me validate the connections made by the research. The wide margins on the right side of the transcriptions in Microsoft Word

was where I coded the data by bracketing chunks and using the highlighting feature to document words or phrases representing a category. Further themes were generated from locating codes and subcodes and categorizing those codes (Glesne, 2006; Rossman & Rallis, 2012). The constant comparative method was used to identify, refine, and contrast categories with the interviews and reflection logs to describe teachers' perceptions of the site-based IWB and CRS PD sessions. The codes were grouped based on patterns (Glesne, 2006; Rossman & Rallis, 2012), and the categorizing of codes led to the development of new themes. Triangulation was used with the reflection logs and lesson plans, which were not coded but were a source of evaluation information. The findings were compared across multiple data types.

**Interpret the Data**

The final step involved making meaning of the data. Once coding was complete, I looked for consistent patterns that allowed the data to be synthesized into meaning. I read and reread the transcription to compare the findings and to answer my research questions. The data were studied to determine teachers' perceptions of the TRPD as well as the applications of the IWB and the CRS in the classrooms.

## Researcher Subjectivity, Trustworthiness/Validity, and Limitations of the Study

I began my work as a middle school educator for the county in 2004 in the discipline of social studies. My interest in the integration of technology led to my service on the school's technology committee for 4 consecutive years and my eventual appointment to head its technology initiatives. I meet with the committee monthly to discuss how technology can improve the efficiency and effectiveness of assessing teaching practices and student learning, while also supporting strategies to obtain funding and resources. As a middle school technology resource specialist, I assist in

the implementation of technology for instruction across different subject areas, and I address methods for advancing student learning that responds to an evolving set of skill demands in the 21st century. In addition, I facilitate the design of on-site TRPD.

I understand, as a researcher, that my role as a technology resource specialist at the school site provided a favorable position with respect to implementing this study, but it also led to potential problems, such as bias. As a researcher, my attention is focused on creating meaningful TRPD, while also conducting research. A completely unbiased qualitative study with valid data is nearly impossible (Merriam, 2002; Rossman & Rallis, 2012). By recognizing my own biases and preferences, I was honest with myself in order to seek them out. To avoid such issues, I used verbatim recordings whenever possible. Because I observed, interviewed, and facilitated the TRPD sessions during the entire project, some participants may have been less open to expressing themselves and could have answered in ways they thought I preferred. The fact that I have an existing working relationship with each teacher brought bias to each observation based on prior knowledge of each teacher's performance. Likewise, teachers may have brought bias to the interviews and reflection logs based on previously established relationships with me.

Another limitation of this study relates to sample size. Resource limits contribute to the lack of breadth available for conducting this research. Because depth was the priority for me, only one school was chosen to participate in this research project. The findings of this study will likely not generalize to other contexts because of sample size and because the unique experiences of participants cannot be replicated exactly. The results, however, will help determine whether TRPD sessions based on research-based

principles can impact teachers' technology integration, at least with the middle school teachers at the site. A further limitation is that the interview questions I created were not validated by an external source; they were created with the research questions and goals of the study in mind.

To increase the trustworthiness and limit researcher bias of the study (Glesne, 2006), I aimed for objectivity by assessing my interpretations of the data collected. This was accomplished by having participants review notes taken during the interview and in the classroom observations I conducted. Open-ended questions were formed to address the study to avoid leading participants (Patton, 2002; Rossman & Rallis, 2012) and to allow for other questions to arise during each individual interview. Participants reviewed audio-recorded interviews to confirm validity (Patton, 2002). Multiple data sources, such as interviews, observations, lessons plans, and reflections logs, were used to confirm data collected and analyzed.

These limitations are mitigated by the fact that these results will be from a qualitative research study in TRPD of teachers with a variety of backgrounds. They provide important findings for designing and implementing site-based TRPD experiences for teachers.

## Summary

Chapter 4 provided an overview of methodology for this qualitative research study conducted at a middle school in Tampa, Florida. It also addressed the two research questions examined. Chapter 4 described the methodology, instruments used, criteria for participant selection, overview of data collection and analysis techniques, and subjectivity and limitations of the study.

# CHAPTER 5
# RESULTS

This chapter includes the findings generated from the data analysis of interviews, observations, and artifacts, such as reflection logs and lesson plans. Analysis was conducted to address the following two research questions:

- What are the perceptions of middle school teachers of the site-based IWB and CRS PD?
- How do middle school teachers use IWB and CRS tools after participating in a site-based PD opportunity?

This chapter describes the participants' perceptions of the TRPD and their applications of the IWB and the CRS in their classrooms after participation in the TRPD.

After the completion of the last TRPD session, I conducted audio-recorded interviews with the five participating teachers. In addition to participating in the interviews, all five teachers completed and turn in reflection logs for each of the sessions attended. Participants were given the option to turn in reflection logs electronically, but all five submitted them by paper submission. Participants also turned in completed lesson plans from the TRPD sessions prior to the scheduled classroom observations. Classroom observations were conducted after the TRPD sessions.

## Question 1: Perceptions

I administered the interview and collection of reflection logs for the research question, "What are the perceptions of middle school teachers of the site-based IWB and CRS PD?" The interview included questions designed to assess the perceptions of different components and design of the TRPD, including suggestions for future TRPD sessions. The reflection log was an open format with questions specifically designed to probe participants' perceptions of each session. Findings from interviews and reflection

logs show that the participants, in general, perceived the TRPD to be a positive experience.

I categorized the data from the interviews using the constant comparative method to refine and contrast categories that were relevant to the first research question. For analysis, I transcribed the audio-recorded interviews into Microsoft Word, and the participants checked for accuracies and omissions. After transcribing the interviews, I reread each transcription several times. While reading each transcript, I wrote notes in the right margin in brackets and highlighted key words and phrases. The process also included developing codes by highlighting each section and narrowing them to represent the research question (Rossman & Rallis, 2012). As stated in Chapter 4, I created concept maps to categorize the codes and themes to answer each research question. Figure 5-1 displays an example of coding using a concept map for the research question regarding perceptions.

As I color coded each interview into sections and identified codes, four specific coded themes emerged. They were Effective Components of TRPD, Negative Perceptions/Barriers of TRPD, Teacher Perceptions of Student Effects, and Modifications/Suggestions for TRPD.

Participants were asked to fill out a reflection log after each session, and they were invited to submit electronically or by paper in a folder provided to them with prompted questions (Appendix E). The purpose of this data collection was to allow the participants the opportunity to reflect on their practice and to document perceptions of teachers. I coded the reflection logs in the same manner as I coded the interviews after

typing out the reflection logs in Microsoft Word. The themes that emerged in the interviews were compared with those in the reflection logs.

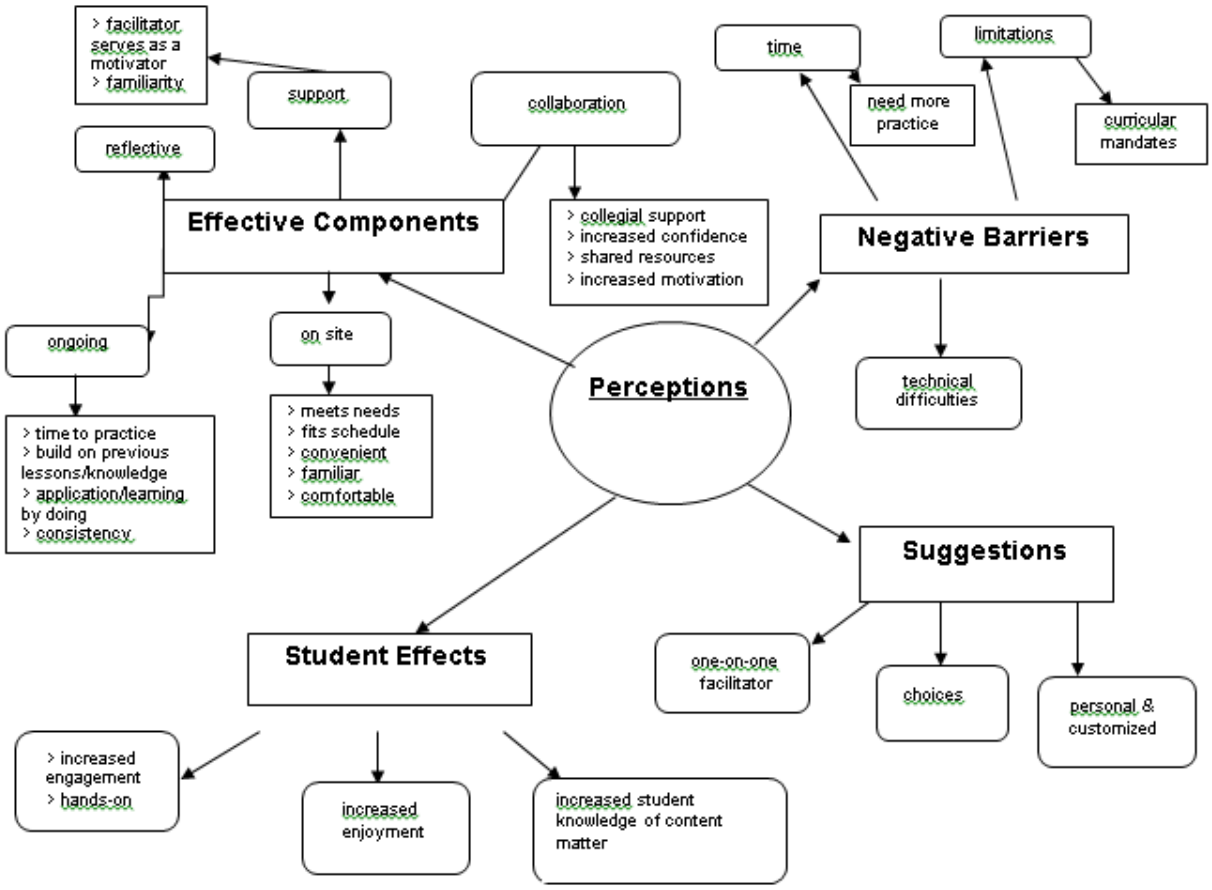


Figure 5-1. Perceptions concept map

**Effective Components of Technology-Related Professional Development**

During the interviews, participants were asked to reflect upon the specific components of the TRPD that influenced their learning. It became apparent that certain components of the TRPD had a bigger impact than others. The most common theme that emerged from the analysis of the interviews and reflection logs was Effective Components (i.e., features participants found to be beneficial to the TRPD sessions).

The five codes that emerged from this theme were on site, ongoing, reflective, support, and collaboration.

**On site**

Holding the sessions on site in the place of the participants' employment provided participants with convenience, familiarity, and comfort. Participants found this component beneficial to the sessions as it allowed colleagues from the same school to meet outside of regularly scheduled meetings. For instance, Participant E (interview, June 2, 2012) stated, "I lacked the opportunity to get together with people because we were all in our little areas from different schools and backgrounds and it is hard to coordinate to meet in one spot to share ideas with colleagues." Participant A (interview, May 31, 2012), when asked about the format about the session, also noted that she found the on-site component to be valuable:

> I also like that it was on site so I didn't need to travel and felt more comfortable to have an instructor I knew and colleagues as my classmates so there were no unfamiliar faces. I liked the fact that sessions took place on campus because on early release days when teachers are let out early, they are required to stay on campus.

The participants shared that meeting in a convenient and familiar surrounding contributed to the success of the sessions. Participants are more likely to attend easily accessible sessions. Having other individuals and a facilitator they know helps them feel comfortable engaging in open communications and discussions. When participants from the same site meet, there is a sense of familiarity and comfort, which builds rapport and leads to increased intrinsic motivation to attend sessions.

**Ongoing**

Meeting on a continual schedule that was longer than a one-shot session was another benefit mentioned regarding the on-site sessions. When participants meet on

an ongoing schedule, it builds a habit that becomes part of a schedule. It also allows participants to continue practicing the knowledge and skills gained from the sessions. As with any newly learned skill, practice and repetition are necessary in order for the skill to be retained. For instance, Participant E (reflection log, May 7, 2012) shared that knowledge was deepened because she had time to interact with the content and skills presented in the sessions and to experience the activities personally: “Throughout the guided and continual practice, retention occurred and the comfort level increased. My previous lack of knowledge had prevented technology integration. It takes repetition to become efficient and proficient.” Participant E (interview, June 2, 2012) stated, “I believe that the ongoing sessions was the most useful to me because I was able to see other teachers do the same tool and strategies on a weekly basis.”

Meeting on a consistent basis was mentioned as an important factor in becoming more familiar with technological tools and strategies on a continual basis before using them in the classroom. Participant A (interview, May 31, 2012) said, “I liked the fact that the sessions were held consistently on the same day.” The immediate opportunity to consistently apply and implement the knowledge and skills learned was seen as an important component of the TRPD design. It provided the participants time to carry over into their classrooms what they learned during the same week. Holding the sessions weekly gave the participants opportunity to revisit and reinforce what they learned from week to week.

**Reflective**

Allowing time for practice and including reflective activities met adult learning needs. Activities that permitted teachers to actively engage with the IWB and the CRS were discussed as the most influential. While all five participants described these types

of activities as the most beneficial, it was demonstrated by Participant D (reflection log, April 9, 2012) that “it is important to have plenty of practice using the smartboard prior to using it in the classroom. Not knowing how to do so will definitely slow down the classroom instruction.” This participant also shared, “This was another great opportunity to practice including the standards of our curriculum as a lesson. I needed the practice. This time was very beneficial.”

During the interviews, participants commented on how the time to practice provided opportunities to explore the IWB and the CRS. Learning by doing, like having time for practice, permitted the participants to actively engage with the IWB and the CRS and led them to describe this activity as one of the most influential. For instance, Participant B (reflection log, April 23, 2012) noted, “I can see that a huge amount of time like I previously thought is not needed but a mere consensus to transfer existing material to adapt to use technology tools.” Participant C (reflection log, April 9, 2012) also supported this notion: “Today was another great opportunity to practice including the standards in the smartboard notebook as a lesson. I needed the practice on how to develop lessons in smartboard . . . this time was very beneficial.”

Participants expressed their need for time to practice developing their skills and knowledge. Participants also discussed their increased understanding of strategies and their eagerness to use the strategies as a result of the opportunities to engage in hands-on application in the session. The participants indicated that a combination of hands-on application of tools and strategies and opportunities to reflect both in their journals and via discussion with colleagues assisted in the success of carrying over into their classroom applications. Participant E (interview, June 2, 2012) stated,

> I am more likely to integrate smartboard and e-response clickers in my classroom as a result of these sessions because anything that makes me more reflective about my teaching makes me better in the classroom. I have to think about what I did; how I did it, what the responses were, how I can anticipate the next time being better than that.

Time for reflection during sessions also contributed to the success of the TRPD. Journaling, in addition to the hands-on activities, was a method participants found useful. Participants were able to process their thoughts and ideas from previous sessions as they continued in the TRPD. Participant C (interview, June 1, 2012) reported that she gained a deeper understanding of the importance of reflection via journaling:

> I liked having journals where we could also write about ideas. It's also about writing your own thoughts and ideas down. What I really liked about the journals was being able to understand my own thought process. I thought this was very valuable.

Participant A (reflection log, April 9, 2012) found value in actively engaging in activities so she could solidify the learning for herself; she reflected that she felt more confident using the tools and that the hands-on manner made it more applicable to the classroom: "Guided practice provided reinforcement and increased my comfort level." Allowing one to practice newly learned skills increases the confidence in the application of the tools. The reflective component was a channel to process the participants' thoughts and activities. The participants clearly believed that activities provided in the sessions were reflective and included hands-on practice, which led the activities to be perceived as effective.

**Support**

In addition to the benefit of sessions being held on site, several participants noted as an effective TRPD component the familiarity and comfort of attending an on-site

TRPD with a facilitator they knew and colleagues with whom they were comfortable. This was an asset that fit their adult learning needs. For instance, Participant E (interview, June 2, 2012) noted,

> I know the facilitator well since she works at my school. Having her assist and come to my classroom for informal observation is a little less intimidating than someone you don't, telling you how you should do this. I am able to ask you questions that I might feel intimidated to ask when I am in a big group where I don't know anyone.

The comfort level that results from working with individuals who are familiar leads to participants feeling further supported; they find comfort in knowing others are in a similar situation, and this support increases their confidence and motivation to learn new knowledge and skills. The increase in communication and availability also tie into this type of support; having an individual familiar with the surroundings and available for support and follow-up contributed to the success of the TRPD. Participant D (interview, May 29, 2012) said,

> I think sometimes teachers need a catalyst to want to use and learn how to use technology tools. For this, you were my catalyst because I never thought of using technology that way. I feel with the technical support provided by you as well as the modeling and practice we had in the classrooms. Ask instructor for questions and on-site support an important part of my learning curve and improving of skills. The open communication and the fact that you were always available when I needed you for support and follow-up to the sessions allowed me to identify what would work and not work with my other classes.

The support that was available fulfilled the participants' needs as adult learners. Participant B (reflection log, May 7, 2012) also reflected on the benefit of having an on-site facilitator: "Given time with what I deem as an expert my comfort zone with these tools—used to feel frustrated has been alleviated."

Participants felt an increased sense of confidence in their knowledge of IWB and CRS tools, and they felt equipped with research-based strategies they could use in the

classroom during the time allotted to create lesson plans. It was also stated that participants preferred the small group of colleagues, which allowed each participant ample time to practice and receive support from the facilitator.

**Collaboration**

A common code under this theme was collaboration and the opportunity to interact with fellow peers through the sharing of ideas and resources and practicing with the IWB and the CRS through different modeled lessons. All five participants found value in the opportunity to collaborate with each other. The collaboration helped them develop innovative new ideas, but one participant found that having the opportunity to work alone also contributed to the success. Participant D (reflection log, May 7, 2012) noted, “Seeing other teachers do the same tool and strategies and having the support of a facilitator helps a lot with support, extra pair of hands to assist with lessons.”

Increased confidence and motivation arose from collaboration because working with familiar peers allowed participants to discuss best-practice strategies, which led to increased knowledge and skills. This motivated the participants to further seek out additional resources outside the sessions. Several participants noted that the site-based collaboration contributed to the effectiveness of the TRPD sessions. There were numerous activities implemented to incorporate collaboration among the participants. The majority of them were weekly discussions. Based on the field notes I collected, the participants were observed sharing ideas and materials during the weekly sessions. The collaboration that occurred provided the opportunity for teachers to learn from each other. While the majority of participants described these types of activities as the most beneficial for them, it was demonstrated by one participant that she preferred the option

to work individually since she would rather work with an individual who taught the same subject matter.

In addition, excitement about regularly using technology with research-based strategies was also noted. Participants reported that they felt increased motivation and confidence as a result of collaboration and application of the skills. In coding this data, I found that participants were excited and eager to use the technologies with strategies in instruction. In addition, the participants' data showed that available technology assistance increased this motivation. Participant B (reflection log, April 9, 2012) supported this by noting, "I had my own thinking changed by finding out how to use the smartboard and realize the possibilities with the cooperation of my fellow teachers." Participants found value in being able to work with colleagues and exchange ideas with one another. For instance, Participant E (interview, June 2, 2012) stated, "I think I learn a lot from other people doing the same thing and I feel from other profession developments I have attended, it wasn't the same." Participants realized the value of peer collaboration and identified it as a benefit to this TRPD. Due to their positive experiences with collaboration, the participants found value that they previously did not. Participant A (interview, May 31, 2012) expressed, "We had constant communication during the days between classes about ideas we had, to use the tools even though we taught different subject areas." Opportunities to interact frequently with other colleagues helped form mutually beneficial relationships. Participant C (interview, June 1, 2012) also believed the benefits of learning required the support of others: "It was about the quality time that we had with each other. I am able to work collaboratively

from the same school and get more ideas central to our SIP plan and gain better things out if it."

Participants seemed to value the collaboration and support from colleagues. Collaborating helped the participants to feel more involved and less isolated, and they were able to learn from one another.

**Negative Perceptions/Barriers of Technology-Related Professional Development**

Although the data analysis findings show that the participants had an overall positive perception of the TRPD sessions, some of the five participants acknowledged that the TRPD sessions were lacking in some areas; it was revealed that there was a need for more time, resources, and flexibility with curricular mandates. Three negative codes emerged in the data analysis, and they centered primarily on technical difficulties, as well as on time and limitations.

**Technical difficulties**

The participants' main concern centered on technical difficulties experienced while installing software during the sessions or while troubleshooting. They noted that a one-on-one facilitator would be helpful to assist when difficulties arose. Their main concern was a break in the lesson due to technical difficulties, and they shared that having an individual available at all times for support would be helpful. For example, Participant D (reflection log, May 7, 2012) reported a "feeling of frustration with lack of troubleshooting skills" and shared that "more preparation time is needed for training and exploring the tools." Participant C (reflection log, April 2, 2012) also expressed this frustration:

> My frustration was due to the program not responding when downloading the lessons. The instructor had to reboot a different way so that I could work with the lesson in the smart notebook. The process was time consuming and took a lot of trial and effort to determine how to resolve the issue.

Without the availability of an on-site individual to support these technical issues, teachers would have been unable to proceed with the technical lessons they planned, leading to a learning barrier.

One of the biggest barriers was the lack of administrative privileges to install the software. Participants were also frustrated by their own limited technical abilities and skills compared to others in the group of colleagues. Participant B (interview, May 31, 2012) noted, "I also felt that I was learning at a slower pace due to my limited technical skills compared to others in the session." This emphasized the importance of taking participants' technical skills and abilities into consideration when designing TRPD sessions.

These examples of experiences and barriers teachers faced when attempting to implement technologies in the classroom emphasize the importance of having an on-site facilitator available at all times to help with troubleshooting issues.

**Time and limitations**

While some of the participants expressed their own frustrations with technical issues as being a barrier to using the technological tools effectively, negative perceptions included frustrations with limited time to practice and limits set forth by curriculum mandates. Participants repeatedly named time as their biggest barrier. Limitations to effectively integrating technology into their curricula included constrictions of standards, pressure to teach all standards prior to standardized assessments, and pressure to stay aligned with the district pacing guide. Participant B (interview, May 31, 2012) emphasized being constricted by the district-mandated curriculum:

> I am limited by my structured curriculum (reading and literacy) and that also limits my time and ability to practice. My experiences with past professional development has been limited to the context of my curriculum at the district

> level . . . I am currently in charge of my subject area and I spend most of my free time working with teachers in my department to enhance their skills with curriculum when I have time. The time constraints limited my ability to practice the skills and knowledge taught in the sessions.

Lack of time was viewed as a barrier to technology use and application in the classroom. Participants revealed they needed more time to learn technology well enough to feel comfortable to using it with their students. Participant A (interview, May 31, 2012) said, "I realize [it] is difficult with the time and resources allotted by the district and schools."

District and school administrators must take into consideration the limiting factors placed on teachers that impede technology integration. Lack of support at the district level impeded the participants' time to devote to implementing new skills and strategies in the classroom. While the TRPD sessions were designed to provide participants with intensive workshops with support inside and outside of the classroom so they could immediately practice what they learned, the short time span was not enough time for teachers to feel comfortable implementing what they learned in their classrooms.

**Teacher Perception of Student Effects**

The results from the study indicate that the participants had a positive perception of the effects on students in terms of application of the technological tools and strategies learned from the TRPD. When asked about their perceptions about student effects, a majority of the participants stated that they believed technology would increase student enjoyment and engagement in the content matter, thereby increasing the desire and ability to gain knowledge. The most common codes representing this theme included perception of increased student engagement and enjoyment and knowledge of content matter. Participants believed that the hands-on capabilities of the

IWB and the CRS would lead to an increase in knowledge at a higher level of thinking for students.

**Student engagement and enjoyment**

The knowledge obtained by each participant regarding the potential uses of technology tools led to student engagement, and each participant found that their own enthusiasm carried over for their students as well. For instance, Participant A (reflection log, May 7, 2012) found that students were more engaged with their work because of the technology tools and strategies learned in the TRPD sessions: “Research-based strategies with clickers is a great way to keep students engaged and assess learning during the lesson.” Participant A (reflection log, April 2, 2012) noted, “Allowing the students to use the smartboard will keep them engaged in the lesson. Students can come up to the whiteboard to highlight and circle answers—interactive technique.”

The tactical and hands-on features of the tools were seen as student-engaging factors. In addition, offering participants the opportunity to provide students with ongoing assessment led to student engagement. Two other participants agreed that using technological tools had an effect on increasing student engagement. Participant C (interview, June 1, 2012) stated, “Students will be able to learn more hands-on. They will get instant gratification because using smartboards and eresponse is more instantaneous.” Participant E (interview, June 2, 2012) stated that the IWB has potential for student learning because the tool was student friendly and provided another form of differentiated instruction for visual learners: “Students will be able to see visuals and manipulatives. It will not only tap into different learning styles but it is also a way to engage all students.”

Addressing various students' needs and skill levels with the technological tools and strategies was seen as a potential to engage students. The technological tools provided variation and enhancement to existing teaching practices. Participant B (interview, May 31, 2012) stated, "I think my students will enjoy these tools and strategies because it's more hands-on than we were normally doing in my day to day classroom lesson plans." Participants felt that the tools and strategies learned in the session would lead to an increase in student engagement. Teachers also perceived that student enjoyment and engagement would lead to an increase in knowledge of subject matter as a result of the implementation of tools and strategies in the classroom. As Participant D (reflection log, May 7, 2012) noted, "Students today are growing up in a world surrounded by technology so using something they enjoy while learning is an important way to increase students' understanding of material while keeping them engaged." Participant D (interview, May 29, 2012) stated,

> . . . I have learned two new strategies that I can utilize with not only the clickers but with the other technology software I learned this past summer, Dyknow, in my curriculum that I believe will not only engage and interest my students but in doing so, will pique their interest further in the subject matter.

Participant E (reflection log, April 9, 2012) shared, "Teaching Spanish with fun activities in smart exchange on the smartboard will help students enjoy and learn the lesson and these activities are a simple way to actively involve the students in the learning process."

**Knowledge of content matter**

Participants perceived overall that the use of the tools would increase student knowledge and would also increase understanding of the material. This led to participants feeling more motivated to use the tools and strategies in their content

areas. Participant A (interview, May 31, 2012) explained the impact of the TRPD on students:

> I am more motivated to use it as an influencer for instruction and student learning, as well as different forms of assessment to enhance my existing lesson plans in U.S. History and enhance my students' knowledge of the content matter.

Participant D (interview, May 29, 2012) added,

> I found that strategies taught in the sessions could engage my students via interaction with each other at a much higher cognitive level . . . The strategies I learned in the sessions will help my students develop higher learning skills thereby increasing their knowledge.

Participants expressed satisfaction that through the use of the technological tools, they could increase engagement and interaction with students at a level that would engage their ability to process conceptual knowledge of the content matter at a higher level beyond factual retention. The hands-on features of the technological tools were seen as beneficial for students, who could connect to the content areas and establish inquiry-based learning. Participant B (interview, May 31, 2012) shared, "The mere fact using these tools and strategies will be more hands-on for my students . . . this way, my students can get more content matter understanding in that manner."

All five participants stated that they found an increased value in using the IWB and the CRS in conjunction with strategies to provide students with a conceptual understanding of content matter.

**Modifications/Suggestions for Technology-Related Professional Development**

The last theme that emerged from the interview coding analysis was participants' suggestions related to TRPD modifications. Recognizing that there were areas of improvement for the site-designed TRPD, participants were asked whether they had suggestions for future TRPD development. Participants provided suggestions to modify

the TRPD to further benefit from the sessions' goals and objectives. Suggestions offered were mainly related to the barriers and negative perceptions the participants faced. The themes that emerged from these suggestions included personalizing and customizing sessions to each individual's goals and offering a one-on-one facilitator. Furthermore, participants noted that they were aware that time and resources were barriers to having a one-on-one facilitator; still, they felt that having an on-site technical support person would alleviate frustrations felt during the TRPD. Participants noted it would be beneficial to have ongoing follow-up with the same collegial support system throughout the school year.

**Personal and customized sessions**

Since every individual learns differently, participants noted the benefits of having an individualized approach for TRPD sessions. Participant A (interview, May 31, 2012) stated,

> I would like to have sessions more customized to each individual teachers' goals . . . I think that goals are very specific so I would say to provide a very personal, customized session where I could choose what I wanted to do to benefit my students' learning further after implementing the tools in my classroom already.

Participants noted the importance of a customized approach for future development of TRPD. They expressed that they want the option to work collaboratively, but they also want to explore individual subject areas and work independently as needed. Participant E (interview, June 2, 2012) explained, "To have someone from the subject area in my class . . . I know sometimes this is hard with everyone's schedule but it would assist me."

The participants recognized the need for support to incorporate strategies into their curricula, as well as to modify curricular demands. Participant D (interview, May

29, 2012) stated, “I would really like to do more with my current lessons in my curriculum with connection [to] certain instructional district mandates.” Due to constraints, participants felt that from the district to the individual school, it is important to acknowledge an individual’s areas of needs.

**One-on-one facilitator**

Having the opportunity to work with a one-on-one facilitator was suggested by two of the participants, who believe that further support and individual assistance is needed to enhance the transfer of TRPD content and skills into the classroom. Participant C (interview, June 1, 2012) noted, “I would say have the facilitator come to my classroom and actually conduct a demonstration of it before actual implementation.” Having a facilitator available at times was a need that was also expressed by Participant D (interview, May 29, 2012): “I would have the sessions meet continually on monthly basis throughout the school year with more facilitators available for each teacher to help with technical assistance and troubleshooting when needed.”

The comfort and familiarity that surrounds having a one-on-one facilitator also assists participants by having an expert on hand when needed, especially when facing technical issues.

## Question 2: Technology Applications

The classroom observation and lesson plans completed by the participants provided data for the research question, “How do middle school teachers use IWB and CRS tools after participating in a site-based TRPD opportunity?” The observed data indicated a technology proficiency in participants’ abilities to transfer knowledge to a lesson plan for research-based strategies from the TRPD sessions.

Observations, which ranged in duration from 40 to 50 minutes, allowed me to see how teachers used technology tools to enhance student learning.

In addition to the lesson plan, I used the observation protocol to guide my analysis to help answer the research question. The observation included observations notes, data, and reflections. Figure 5-2 serves as an example of the coding process.

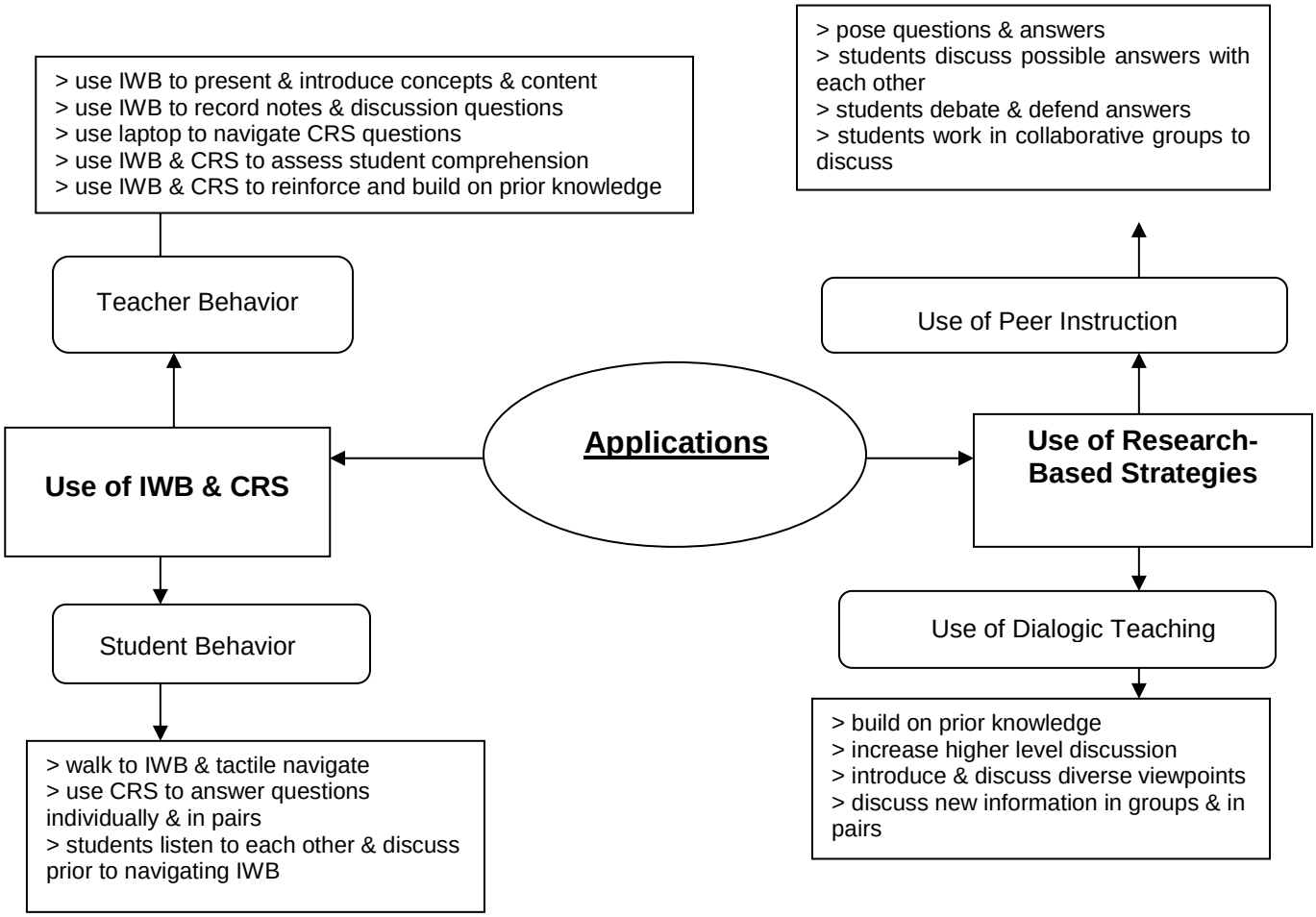


Figure 5-2. Applications concept map

During the data analysis, two common themes—Use of Technologies and Use of Research-Based Strategies—emerged among participants in terms of technology applications. As shown in Figure 5-2, a concept map for the research question, I coded the observation protocol, which included looking for recurring patterns. I removed codes

that did not relate to the research question and reworded themes and codes to appropriately represent the observation notes. I looked at relationships among codes to develop themes. The lesson plan was not coded but was used to constantly compare and contrast recurring codes and patterns to the coded observation protocol. The field notes were coded, as described in Chapter 4, and I created concept maps for the research question, developed codes and subcodes, and narrowed the data analysis process (Rossman & Rallis, 2012). As I coded the observations, I developed themes among the codes. The data showed that participants did use the IWB and the CRS for instruction, and they used researched-based strategies, such as peer instruction and dialogic teaching. During the observation, participations asked for my assistance at times, primarily to help with technical troubleshooting.

Due to the key features present in the observation tool, two main themes emerged during the data analysis under which I categorized the codes. The most common theme that emerged was Use of Technologies, which included codes involving both teachers' and students' use of the IWB and the CRS to introduce and reinforce content through lectures, facilitations, discussions, and modeling of content matter and skills. The participants presented information, graphic organizers, questions, graphs, simulations, and games on the IWB, and one teacher simultaneously used the CRS with the IWB as an interactive display board using both the peer and dialogic instructional strategies. Using the components of the observation protocol, the coding analysis was relevant to these distinct areas.

**Use of Technologies**

All five participants adopted and adapted at least one of the two technologies—IWB and CRS—and the components they learned in the TRPD sessions by transferring

specific activities or assignments they created during their sessions. Three of the participants chose to use the CRS to display questions created as a review for a formal assessment. Three participants chose to use the IWB in the classroom to support problem- and project-based activities through individual student research and online research. This led to observations of students using higher level skills. For instance, both participants and students were involved in using the IWB and the CRS for instruction, discussion, and interaction. Teachers used the IWB to present, introduce, reinforce, and build upon prior knowledge concepts and skills while students used them interactively by coming up to the board. Examples of codes relevant to this theme are Teacher Behavior and Student Behavior.

**Teacher behavior**

Teacher behavior involved using the IWB to present and introduce concepts and content. For instance, Participant E used the IWB to incorporate Hispanic family and cultural values into her lesson for Spanish class. She explained concepts thoroughly by navigating the presentation she displayed on the IWB. Teacher Behavior also involved using the IWB to assess student comprehension to reinforce and build knowledge. Participant E used various graphic organizers displayed on the IWB to demonstrate and assess students' knowledge. She wrote on the IWB to reinforce compare and contrast concepts. Participant B was observed using the IWB to assess comprehension, interpretation, and evaluation of various reading passages, which were portrayed on the board via the LCD projector. She assessed students' knowledge and drew on prior knowledge by involving them in highlighting and tactile procedures on the IWB.

Teacher Behavior also involved using the IWB to record notes and discussion questions. In addition, I observed participants using their mobile devices to navigate

CRS questions and also using the CRS to assess student comprehension to reinforce and build knowledge. For instance, Participant A was observed utilizing both the IWB and the CRS. He had previously inserted questions in a lecture-style presentation, and the questions were designed in a multiple-choice format. The questions were projected on the IWB via LCD projector. Before beginning the lesson, I observed him passing out the CRS and instructing students to ensure the clickers worked before beginning the lesson/lecture. Participant D also utilized the CRS and used her laptop to project questions on the board. The participant displayed a timer and provided 5 to 10 minutes for students to make their responses. The teacher clicked ahead to reveal the answers shown with bar graphs and percentages of student responses. Participant E used one to three questions every 15 minutes to allow students to discuss with each other and then the whole class. She projected the questions on the board and facilitated discussions, and she retaught any concepts that students did not understand. Participants assigned each student with a numbered CRS and took very little time to teach the process of using the CRS for the review activity. I observed the teacher reading the question that was projected on the large screen in the front of the classroom. The question had four possible responses (i.e., A, B, C, or D), and the teacher verbally instructed the students to press the response of the key they believed to be the correct answer. The responses were collected electronically from a signal released from the students' clickers to a receiver connected to the teacher's tablet.

**Student behavior**

Student Behavior involved students walking up to the IWB and tactile navigating the IWB. This was observed in all three classrooms where the IWB was utilized. Participant A had students walk up to the board twice to move concepts into the

appropriate areas of a branches-of-government diagram. Student anticipation level was high as students looked eager to approach the IWB and use the interactive features. Participant B instructed students every few minutes to navigate through various compare-and-contrast graphic organizers. Students were able to discuss whether the information presented was fact, opinion, or propaganda. Students used the research to learn at a higher level in relationship to higher order questioning, in which students were observed analyzing and synthesizing information. Students demonstrated high interest, and Participant B had students sit in groups and called on a volunteer from each group to represent group findings on textual reading comprehension by highlighting key features and using markers to note them. During the observations and during the analyzing of lesson plans, students used the interactive tools on the IWB during the lessons. This allowed students to use the editing feature on the IWB. For instance, students were observed highlighting, underlining, and making corrections to the paragraphs by writing the correct answers using the IWB markers. Students were observed using their fingers to touch a word on the IWB and then dragging the word into the appropriate box and/or sentence. Incorrect answers were shown to students by way of software that jumped word choices back into place if they were placed incorrectly.

Student Behavior also involved students using the CRS to answer questions individually or in pairs. All three observed classrooms where the CRS was utilized involved students actively using the CRS to answer questions; students waited on the teachers to project the question, and after the teacher instructed them that they had a certain number of minutes or seconds to answer the questions, the students pressed the appropriate letter on their clickers. In the classrooms where students worked in

pairs or groups, I observed the students listening to each other and discussing prior to answering questions on the CRS or walking up to the IWB and navigating concepts or words. During all the observations, students had opportunities to work in either pairs or small groups using either the IWB or the CRS. Students were actively engaged in conversations with their peers on how to approach the problem-solving process and were overheard discussing variations of approaches and answers. I was aware of the energy in the classroom. The students looked engaged and enthused.

**Use of Research-Based Strategies**

The common codes developed from the observation using research-based strategies were Use of Peer Instruction and use of Dialogic Teaching.

**Use of peer instruction**

Peer Instruction involved monitoring student progress by displaying data and discussing responses with students, providing feedback, and explaining incorrect answers using the CRS. To use the peer strategies, teachers displayed student responses either in bar or pie-chart format with anonymous names to display questions to which students responded. Students discussed and responded to questions using the CRS. A few classes had students discuss in pairs while others had them grouped together. Results were discussed to clear up any misconceptions and to provide feedback and accurate information to students. Subcodes that emerged during the coding analysis for the use of dialogic teaching used open-ended questioning techniques that led students into discussions and higher level thinking that built on prior knowledge. For example, Participant C displayed questions in order of difficulty level as the lesson progressed. She navigated through the questions based on students' understanding of the material. When paired students answered incorrectly, they were

re-paired with those who answered the question correctly so that the student who answered correctly could explain the answer to the other student. Participant D designed questions to start a discussion or, at times, to promote peer-to-peer conversation in her health science class. Some of the questions were worded in terms of statements with which students could agree or disagree. She also spaced the questions 15 minutes apart to allow students time to discuss answers with each other and to allow the teachers the chance to reteach and peers the chance to communicate with each other the correct answer.

**Use of dialogic teaching**

To demonstrate the dialogic instruction, teachers used the IWB to discuss the objectives of the lessons, and diverse viewpoints were introduced and discussed. Throughout the observations, I noted that teachers and students discussed methods for using the IWB and the CRS. Teachers took breaks throughout the lesson to instruct students on the steps to take with the tools while students answered, responded, and discussed among each other. At times, this led to whole-class discussions and debates, which led to higher level thinking; this was the case when Participant A utilized both the IWB and the CRS. He designed questions for the CRS related to the day's lesson objectives as stated in the lesson plan; these questions were embedded throughout the lecture presentation. Participant B used the dialogic teaching strategy to complete web-based activities and practice concepts and vocabulary, and she also worked on reading comprehension with the students. She did so by opening each activity with a prompt for students to discuss as a group and then as a class. These prompts were designed to access prior knowledge and evaluate texts projected on the IWB. Participant B correlated the standards in her presentation on the IWB. She

stopped frequently to check for student understanding of the concepts being taught. She used the ELMO and LCD projector to create a big book that all students could view while the students followed along. The teacher periodically asked questions to check students' comprehension. Participant E used the IWB and dialogic teaching by explaining concepts thoroughly and having students actively involved as a class and having them individually come up to the IWB. The conversations that occurred were at a class level with high levels of discussions and engagement between both the students and teacher.

## Summary

Data findings and results from the data collection and analysis helped demonstrate teachers' perceptions of a site-based TRPD and their applications of the IWB and the CRS and peer instruction and dialogic teaching into their classrooms for the purpose of student engagement and enhancement of content matter. The findings show that teachers had an overall positive perception to the TRPD, and they applied their learning in their classrooms. Chapter 6 features a discussion of the data's implication for future work and research.

# CHAPTER 6
# DISCUSSION AND IMPLICATIONS

Chapter 6 includes a summary of the study, a discussion of the results, additional outcomes, implications of the study, and conclusions for both research questions. Additionally, implications for future research are discussed.

## Summary of the Study

Existing TRPD sessions offered to teachers in my district were not meeting teachers' professional needs. Teachers expressed a desire to participate in effective TRPD sessions and to utilize on-site technological troubleshooting support. The purpose of this study was to develop workshops in order to teach technological tools, strategies, and skills to teachers who could then transfer their knowledge to their classrooms. Follow-up support and time for practice were key in the implementation of these workshops.

Obtaining technological knowledge and skills related to one's profession aids in enhancing skills. In addition, my school district's teachers have greater pressure to engage students and increase content matter knowledge with the requirements set by the district's evaluation rubric (Danielson, 2007). Therefore, I created a site-based TRPD for this particular need based on the six effective, research-based components (Darling-Hammond, 1998; Guskey, 2003a; Lawless & Pelligrino, 2007) and principles from the adult learning theory (Birman et al., 2000; Knowles, 1980; Lock, 2006) to provide teachers with the skills necessary for using the available on-site technological tools, such as the IWB and the CRS. I also incorporated factors from the school technology plan and the county's evaluation rubric (Danielson, 2007).

Despite a substantial amount of funding spent on technological tools at my school, few teachers were utilizing the tools in their classrooms. The TRPD I created provided five participants with four on-site, ongoing sessions held on early-release Mondays and conducted over a 5-week period. These face-to-face sessions consisted of instructor support, peer collaboration, follow-up activities, practice, reflection time, and ongoing support. Each session focused on the demonstration and explanation of the uses of the IWB and the CRS with a focus on collaboration, lesson plan development, and hands-on activities. Participants were given the option to work individually or in pairs to practice the tools.

The purpose of this study was two-fold: to examine the perceptions of middle school teachers' experiences after participating in a site-based TRPD session on the IWB and the CRS and to explore the ways in which teachers transferred what they learned in the TRPD into their classrooms after participating in the session. To determine teacher perceptions and technology applications of the TRPD, I used a qualitative research method design for data collection and analysis. The research questions for this study were:

- What are the perceptions of middle school teachers of the site-based IWB and CRS PD?
- How do middle school teachers use IWB and CRS tools after participating in a site-based TRPD opportunity?

To address the first research question, I collected data by conducting semi-structured individual interviews and collecting reflection logs. To address the second research question, I observed each participant's classroom during the implementation of a lesson plan that was created during the TRPD session. This lesson plan was also collected for data collection and analysis pertinent to the technology applications

research question. The qualitative methods used for this study were based on the research question and data collection methods.

The interview questions were created to allow for descriptive responses (Patton, 2002). The questions were developed based on the TRPD components. Question prompts were provided in the reflection logs, allowing teachers to construct meaning from their experiences (Patton, 2002; Shaunessy, 2005). I conducted interviews and collected reflection logs immediately after the TRPD sessions were completed. The design of the observation protocol included categories derived from ISTE's ICOT tool (ISTE, 2007) and included an area to include field notes to record detailed descriptions of teacher and student activities (Patton, 2002). The lesson plan framework utilized by the participants was developed using the Danielson (2007) framework as a foundation. Lesson plans were collected and used in conjunction with the lesson observed in the classroom.

## Discussion of Results

Data results helped determine teachers' perceptions of the site-based TRPD and their applications of the knowledge and skills learned in the TRPD to their classrooms. The results showed that TRPD was effective due to teachers' positive perceptions and observed increased use of the IWB and the CRS, as well as the dialogic and peer instruction methods demonstrated in their classrooms. For the first research question (i.e., "What were the perceptions of middle school teachers of the site-based IWB and CRS PD?"), the data regarding teachers' perceptions indicated that the participants had an overall positive reaction to the TRPD sessions. They also started foreseeing a positive reaction among their students once learning was applied to their curricula. They cited several effective components on which the TRPD was based, and they

reported that the sessions were designed to meet their needs. Participants provided few suggestions for future TRPD based on their individual experiences.

For the second research question (i.e., “How do middle school teachers use IWB and CRS tools after participating in a site-based TRPD opportunity?”), teachers displayed learned technology applications and strategies from the TRPD sessions by applying them to the classroom context and, thereby, increasing student engagement. The use of the IWB and CRS tools and dialogic and peer instruction were observed throughout the five participants’ classrooms in various manners. During the observations, there was evidence of technology application in all five classrooms, but I found that while some teachers used the strategies and tools in similar manners, different pedagogies and student engagement strategies were used. For instance, in the classrooms where the CRS was utilized, there were situations in which students worked in pairs or groups. In one case, pairs of students were switched throughout the class based on understanding of a concept—a student who answered a question correctly, for example, was re-paired with a student who answered it incorrectly. In another case, after students responded to questions, the questions were discussed as a whole class for 15 minutes rather than moving on to the next question. One teacher changed the order of the questions based on the students’ overall understanding of questions, slowly building to higher level questions. In addition, one teacher embedded CRS questions in a lecture-style format instead of spending the entire class time on continual CRS engagement. In the classrooms where the IWB was used, the manner in which teachers asked students to navigate the IWB varied. One teacher used an approach in which students were called on individually to walk to the IWB and discuss

the results with the whole class. Another teacher placed students in groups and had each student from a group take turns walking up to the board to teach the rest of the class. The teacher who utilized both the IWB and the CRS made minimal requests for students to come to the board; the main focus was on the teacher directing and navigating on the IWB while students spent more time engaged on the CRS.

The conclusions presented below for each research question are based on the data findings from each question. The findings for the question, "What are the perceptions of middle school teachers of the site-based IWB and CRS PD?" showed that teachers' overall perceptions of the TRPD sessions were positive in terms of the following codes: on site, ongoing, collaboration, support, and reflection. These five components are related to the six research-based components from the literature (Darling-Hammond, 1998; Guskey, 2003a; Lawless & Pelligrino, 2007) and adult learning principles (Birman et al., 2000; Lock, 2006; Yin, 2003) on which the TRPD sessions were designed and upon which they were focused. Therefore, the data results show that participants' perceptions did indeed correlate with the TRPD design and with the research-based best practices found in Chapter 2's literature review.

As found through this study and in the literature (Birman et al., 2000; Garet et al., 2001), teachers must be actively involved in their own learning if a modification to instructional practice is to be continued and carried over into the classroom. All five participants either stated or reflected that actively participating in the sessions led to a desire to adopt the knowledge and strategies. The on-site and ongoing components refer to the length and sustainability of the PD. Research has also supported that PD that is sustained over time will affect instructional practices (Darling-Hammond et al.,

2009; Garet et al., 2001). Desimone (2009) noted that longer hours and follow-up provided over a span of time are most effective. The participants in this study met with each other for 10 to 15 hours, and they also spent other time in the study. Vannata and Fordham (2004) found that time is essential to technology integration. This ongoing TRPD experience allowed the participants more time to become active participants in their learning. They met for 5 days, which allowed them time to revisit the learning from previous sessions and receive assistance from colleagues and from me.

There was enough evidence from the data analysis and findings to suggest opportunities for the participants to collaborate and share ideas regarding tools and strategies to engage students and enhance content knowledge in relation to the county rubric. There were certain participants who cited that the collaboration component would be much more beneficial if it aligned with similar content areas. Collaboration refers to the extent to which teachers from the same school site, department, or district participate in the same activities. Collaboration allows for interaction and discourse to occur, and it can promote changes in instructional practices (Baker et al., 1994; Ball & Cohen, 1999; Desimone, 2009; Loucks-Horsley et al., 2003; Penuel, Fishman, et al., 2007). Also, participant perceptions regarding the effects the tools and strategies would have on their students matched the need expressed by the teachers, with the emphasis on 21st century learning, and with the county evaluation rubric. Technological tools, such as the IWB and the CRS, have the ability to increase student learning in ways that deeply engage students in content matter, thereby increasing higher order thinking skills, such as problem solving and decision making (Rakes et al., 2006). Such technology is also important for preparing students for the future and teaching them 21st

century skills, such as content literacy (Shaunessy, 2005). Technological tools are a means to help engage students with meaningful, relevant, and personalized learning that can further their understanding (NCREL, 2001). The IWB and the CRS are two tools that can assist students with the skills needed in the 21st century by promoting higher levels of cognition, improving student engagement, and satisfying federal initiatives calling for technology use in the classroom. Taking into consideration participants' suggestions for modifications for future TRPD sessions would, therefore, create more opportunities in their subject areas to fulfill this need and their desire; essentially, it would be more effective for teachers' adult learning needs.

Among the negative perceptions that were noted, recurring themes were the need for more time to practice and plan for lessons and the need for collaboration with similar content areas. Teachers perceived time to be the biggest barrier to technology implementation. Teachers stated that another barrier was the number of standards they were required to teach. Time issues can be addressed at the administrative school level and at the district level by sharing the positive findings of the study.

Data finding from the research question, "How do middle school teachers use IWB and CRS tools after participating in a site-based TRPD opportunity?" showed that teachers were able to apply their learning and knowledge from the TRPD sessions into their classrooms via their applications of lesson plans and their effective incorporation of research-based strategies, such as dialogic teaching (Alexander, 2008; Armstrong et al., 2005) and peer instruction (Fies & Marshall, 2006; Mazur, 1997) via the IWB and the CRS. During my classroom observations and analyses of the lesson plans, I noted the use of these strategies with the IWB and the CRS to actively engage students and

increase student participation. For example, dialogic teaching (Alexander, 2008; Armstrong et al., 2005) increased teacher-student interactivity because the teacher integrated the IWB into the objectives of each day's lesson. During the classroom observations where the IWB was utilized, each student played an active role by discussing lesson objectives with the teacher and engaging in discussions by sharing alternative viewpoints and constructing and building knowledge to create the lesson's final learning product (Smith et al., 2006). In peer instruction (Fies & Marshall, 2006; Mazur, 1997), students were involved in their own learning. Conceptual, multiple-choice questions were embedded within existing or new lecture presentations (Beatty et al., 2006). In one of the observations I conducted, a participant included a lecture-based, PowerPoint presentation using the IWB and integrated questions into the software that aligned with the county evaluation rubric, his curriculum, and both dialogic and peer instruction strategies. The pacing of the questions within the lecture and the planned usage of both tools allowed the teacher to clarify misunderstandings and correct answers (Beatty et al., 2006). Using the CRS has been shown to prepare students with standardized testing (Cotner et al., 2008; Penuel, Fishman, et al., 2007). The presentation had content displayed on the IWB as precursors to the questions answered via the CRS, and the teachers were able to assess each student's comprehension of the content matter displayed via charting features before further progression in the lesson.

Another example of teachers' learning and application of technological tools and strategies was observed when teachers paced one to two questions every 15 minutes (Fies & Marshall, 2006; Mazur, 1997). The engagement and discussion among the

students was prevalent as they discussed among themselves via the peer instruction method (Fies & Marshall, 2006; Mazur, 1997). The lesson included questions that motivated students to think about and create objectives for the upcoming assessments. Studies on the IWB show that this process increases student involvement in learning (Painter et al., 2005).

Activities involving teachers creating lesson plans in the TRPD sessions and taking the time to practice with each other with the assistance of a facilitator greatly assisted teachers with implementation and with the carrying over of skills and knowledge into their classrooms. This real-world relevance (Knowles, 1980) helped them construct meaning and gain confidence, and their reflection logs helped them reflect on their learning and thoughts.

Research-based components of the TRPD sessions were found to be effective for developing future TRPD sessions, and suggestions were made by the participants for modifications to meet their adult learning needs. The continued, ongoing, supportive collaboration outside of the sessions increased confidence and comfort—these were key features for making the TRPD a positive experience. Reviewing teacher perceptions is one way to gauge the effectiveness of TRPD and the effectiveness of application into the classroom.

## Additional Outcomes

During the data collection and analysis process, findings unrelated to the research questions guiding the study were revealed. The interviews and reflection logs noted the teachers' desire for individualized TRPD sessions involving a one-on-one facilitator. This topic surfaced when teachers were asked to elaborate on modifications and suggestions that would make the TRPD sessions much more effective. A one-on-one

facilitator would require more funding and time, which was also mentioned as a barrier to the TRPD by the participants. I believe that having a familiar facilitator with whom participants had a rapport affected their positive perception of support. Being available on site increased comfort level because the participants had assistance as needed, and I spent a large amount of time helping them troubleshoot, offering suggestions, and answering questions (Desimone et al., 2006; Mouza, 2009), which led to an increase in positive perceptions of support during and after the sessions. In addition, support was available and seen as beneficial from colleagues (Desimone et al., 2006; Garet et al., 2001; Penuel, Fishman, et al., 2007).

## Implications

The results from this qualitative study have future research implications for PD providers and administrators. The findings have particular relevance for those who plan and provide PD. There are several key components that are necessary in planning and implementing a site-based TRPD (Desimone et al., 2006; Haar, 2001; Penuel, Fishman, et al., 2007). The findings of this study support the assertion that these are important to effective PD. Those who are PD providers should devote their initial efforts to determining the needs of the participants and designing the PD to take place over an extended amount of time so that teachers have a chance to work on content and applications (Joyce & Showers, 2002; Lawless & Pelligrino, 2007). Ertmer (1999) noted that if teachers introduced to technology have their immediate needs supported, increased confidence level and effective use of technology will result. PD providers and administrators would benefit from this information when teachers' desires and needs are taken into consideration when implementing TRPD. The needs assessment in this study showed teachers were not fully using available technology. This study

successfully implemented the site-based TRPD, and this design can be used in the future to instruct teachers on methods for truly integrating technology tools into their curricula based on standards and evaluation rubric components—and not just simply using technology for daily maintenance and routine tasks, such as grade recording.

Additionally, the integrated technological tools provided by the TRPD model in this study enhanced several classroom lessons by providing teachers opportunities to engage students with authentic tasks and skill sets. It has been shown that when technological tools are used in teaching, students' critical thinking improves. These tools allow students to focus on solving authentic, real-world tasks (Roblyer & Edwards, 2000). Essentially, students' learning outcomes increase when teachers attend TRPD sessions over time and when the sessions focus not only on technological skills, but on application to curriculum (Garet et al., 2001). The success of TRPD is dependent on standards-based and content-focused sessions (Desimone et al., 2006), which can transform teaching practices and impact student achievement. PD providers and administrators should focus on designing TRPD workshops by content area and providing PD that helps teachers incorporate technology tools into their existing teaching practices.

Teachers' TRPD perceptions are worth noting for future implementation of TRPD. For example, it is important to consider teachers' desires to work with like subjects or grade levels, and awareness of teachers' levels of technology expertise is critical when promoting collaboration. Utilizing one-on-one facilitators is also key (Desimone et al., 2006; Guskey, 2003b). In this study, teachers benefited from numerous opportunities to

share and engage in dialogue (Joyce & Showers, 2002). Also, teachers should be provided with assistance as they apply the learning.

The findings of the data analysis showed that an individualized TRPD was desired and needed by teachers. A small group of site-based individuals should continue to be the focus of future TRPD. In addition, an in-house, one-on-one facilitator available at all times is necessary to provide expertise, support, and technical troubleshooting (Lock, 2006). Teachers should be provided with more choices, and the TRPD should be tailored to individual needs with specific curricula rather than focusing on a whole group (Dexter et al., 2002; Guskey, 2003b; Lawless & Pelligrino, 2007).

**Small Group and Site Based**

I believe that one of the reasons the teachers in this study perceived the overall TRPD to be positive was due to the small cohort of on-site individuals. In order for the TRPD to bring change to instructional practices and be effective, it needs to be conducted in smaller groups (Birman et al., 2000). In this study, the sample consisted of five individuals and was initially limited to 10 participants. This allowed me, as a facilitator, to provide support and assistance to each individual participant. The participants felt comfortable due to the familiarity of the individuals from the same school. One of the components of the TRPD was built upon being site-based, which contributed to this success (Sparks & Hirsh, 2000). Another component was collaboration. The emphasis on collaboration and communicating with one another was assisted with face-to-face and ongoing sessions that were held on a weekly basis (Johnson, 2006; Lock, 2006). This also led to communication among teachers outside of the sessions. Participants were able to provide each other with support and share ideas that assisted with learning and the application of the IWB, the CRS, and research-

based strategies into their classrooms. I, as the facilitator, was able to provide enough time and support to the teachers due to the small number of individuals. This gave the participants an opportunity to collaborate with each other and provided them enough time to practice with the tools on their own schedules (Hew & Brush, 2007). As noted in the interviews and reflection logs, the time to practice increased teachers' motivation and confidence (Desimone et al., 2006). A future TRPD modification would be to continue forming small groups from similar subject areas and then to implement a train-the-trainer model with participants as experts. This would fulfill the suggestion of having more one-on-one facilitators and would save time and money for the district.

**One-on-One Facilitator and Support**

It was found that participants preferred an on-site facilitator rather than an outsider because this person provides familiarity and comfort while building rapport (Haar, 2001). This provides individuals with the opportunity to ask questions normally not asked and to feel comfortable asking for ongoing support (Salpeter, 2003). This also allows on-site facilitators to be available in classrooms as needed for additional support (Penuel, Fishman, et al., 2007). In addition, a facilitator from the same school can serve as a peer coach, who is fully aware of SIP plans, school environment structure, school and administrator policies, and evaluations conducted at the school and district levels—this arrangement can help all parties better understand each other. According to Joyce and Showers (2002), in order for PD to be effective, it should include a combination of theory, modeling, practice, feedback, and coaching. Content-focused peer coaching can help instructional coaches as they work with teachers to develop their technology-based content knowledge. Peer coaching is a component of PD sessions that can be further explored based on the additional findings in this study. It is important to offer

time for participants to work together and exchange ideas. If funds are available, participants can meet with each other and the facilitator during the day while substitute teachers fill their roles. Another method to use would be a train-the-teacher program or partnering a less experienced teacher with a more experienced teacher for observation and modeling.

**Choices and Time to Practice**

One observation I made during my reflections during the TRPD sessions and observations is that teachers were provided the choices to choose their strategies and tools, and they chose when to implement what was learned. Giving them this choice, as well as time to practice with support and assistance, increased the confidence among the teachers (Knowles, 1980; Lock, 2006). Participants must be given sufficient time and opportunity to practice the knowledge and skills they learn. Time is an important factor that must be addressed when designing PD (Hew & Brush, 2007). One participant suggested providing more time to practice and allowing teachers more time in sessions to make it longer throughout the year. This would provide the teachers with more confidence and would allow for follow-up sessions after formal implementation in the classroom, which would be a series of sessions instead of a few (Lawless & Pelligrino, 2007). This fulfills the adult learning principles of an active, authentic, and real-world learning environment (Knowles, 1980).

Workshops based on individualized learning rather than on the one-size-fits-all model would benefit teachers if related to specific content areas (Flick & Bell, 2000; Mason et al., 2000). This type of TRPD would benefit teachers as it provides strategies they could implement in their classrooms. I believe that allowing participants to choose

to collaborate with similar subject areas would enhance this feature; it would make it more authentic and meaningful (Knowles, 1980).

Lack of time was a common theme in participants' interviews and reflection logs. The need for additional time for teachers to practice, plan, and collaborate is clearly supported in the literature (Darling-Hammond et al., 2009; Garet et al., 2001; Lawless & Pelligrino, 2007).

**Recommendations for Future Sessions**

As mentioned above, TRPD sessions should remain at a small number, preferably at each subject area or grade level. Ultimately, teachers can bring this information to personal and professional learning communities to collaborate among each other individually on their own choice and time. It is important, however, to allow participants to choose to attend and to not make session attendance mandatory. Although observations and interviews would not occur with future perception evaluations of the TRPD sessions, results from this study can be used to create further ongoing, on-site TRPDs that are more extensive and focused on small groups of individuals. Data collection instruments, such as surveys, possibly online, and open-forum discussions can be implemented to provide continual feedback on the effect of the sessions on teachers' perceptions. Also, a group of students can be evaluated on the effect of technology use on their perceived skills and knowledge via survey construction and test assessments.

This study provides a PD model approach for identifying future initiatives for teacher perceptions and student effectiveness (Lawless & Pelligrino, 2007). For those interested in determining teacher perceptions and applications of their TRPD sessions, I recommend a pieced approach that begins with reviewing the school improvement and

current PD plans and rolling out the TRPD model in phases over one or more school years. This will allow for opportunities to address any issues or weaknesses that may arise and to modify them as needed. First, an individual should review the school improvement and current PD plans to look for weaknesses and to assess the needs in the design or implementation process using this study's model as a guide. The PD literature and learning theories should also be considered in this process. Most PD initiatives take place over several years, so it is important to carry out the PD sessions over at least one school year to determine overall effectiveness and impact. I recommend focusing on teacher and student perceptions initially because, as Guskey (2003) noted, these levels are important before determining the true impact and effectiveness of TRPD sessions on student achievement. Once the perceptions prove to be effective, I suggest measuring during the following year the TRPD's effect on student learning outcomes and achievement.

From the data analysis and findings, it is evident that TRPD sessions should include adult learning principles and research-based components found to be effective according to literature and previously used instructional design methods. Although time and cost are factors, a model approach can be used consistently among different schools in the same district, and evaluation can occur in order to implement at a district level since all schools use the same evaluation tools. Were I to repeat this study, I would define the types and levels of technology integration for teachers to reach, such as more active student-centered approaches. The data I collected and analyzed helped me reflect on how my PD sessions contributed to teachers' knowledge and skill levels using the IWB and the CRS for student engagement and led to an increase in content

and conceptual knowledge. This study has influenced my stance related to PD; going forward, I will create a more formalized PD session with increased collaboration from teachers to meet their individual needs—this will help improve my practice, as teachers need more collaboration so they can transfer their learning to authentic, real-world experiences (Knowles et al., 1998). Teachers need additional time to learn and practice various research-based strategies to engage students and meet their diverse learning styles. Further studies into the connection between use of teacher and student achievement would be useful. Another study could be a quantitative research study measuring the effects of teachers' use of tools on student academic performance on standardized tests. A qualitative research study examining whether students believe they learn more with technological tools in the classroom would provide insight and perspectives from the learners. Student perceptions would present teachers with data they could utilize to guide their lessons. For other districts and schools interested in determining students' perceptions and academic learning as a result of site-based TRPD, I recommend a similar approach that would last for about one to two school years and would involve a longitudinal analysis. It would enable teachers to evaluate pre- and post-student effectiveness. Future research is recommended to explore the use of the IWB and the CRS and dialogic teaching and peer instruction in the classroom. Further exploration can occur to examine the transfer and gain of knowledge among students. Further research in the form of a longitudinal study is needed to determine student effects as a result of TRPD implementation. Research is needed to study the role of school-level administration in defining and implementing technology integration. Questions to ask would include, "How does the attitude toward

technology integration affect teachers' use of technology?" and "What role does administration play in guiding teachers?"

Although not used for data in the study, the researcher reflective journal provided me with information that was helpful during the data analysis process. It included records of behavior and participant interaction observations during the sessions and within the classrooms, and it helped ensure reflectivity (Patton, 2002). Data collection in qualitative research occurs naturally in the setting of a reflective practitioner (Rossman & Rallis, 2012); thus, keeping a reflective journal helped me focus on how to modify sessions in the future to improve the overall effectiveness of the professional development. There were some limitations noted. While the participants and I established a rapport, which led to an increase in comfort and familiarity among the participants, it should be noted that the participants may have been hesitant to give constructive feedback or criticism in their interviews and reflection logs because I served as the professional developer and researcher. Another limitation of the study is that the instruments used were tailored to a particular district's evaluations and may not transfer to other districts. A limitation of the study is that the instruments used were tailored to a particular district's evaluations and may not transfer to other districts. The ultimate goal of this TRPD is to increase student academic learning, such that it can be evaluated by the impact of a TRPD over a sustained amount of time. Looking at pre- and post-comparison assessments for the whole year of the study can be made. Further research is needed to determine whether providing knowledge and skills though a well-designed TRPD would impact student learning.

## Conclusion

The conclusions of this study are significant for the school and district in which the study was conducted. This study found that teachers who participated in a site-based TRPD featuring effective PD practices and focused on research-based components were positively impacted by increasing levels of technological practice in the classroom and by engaging students. Findings from this study are aligned with the research on PD that states that successful sessions need to be on site (Penuel, Fishman, et al., 2007; Sparks & Hirsh, 2000), ongoing (Desimone et al., 2006; Lock, 2006), supportive (Berry et al., 2004; Lock, 2006), content based (Flick & Bell, 2000; Mason et al., 2000), and standards based (Guskey, 2003b). Over the past decade, many studies (Darling-Hammond, 1998; Guskey, 2003b; & Lawless & Pelligrino, 2007) have focused on improving teachers' pedagogical and technical knowledge to lead a change in instructional practice. This study's results support this assertion. All five participants addressed the impact of the session's content to changes that could be made to instructional practice.

Results from this study suggest modifications to this TRPD model to affect teacher change that takes into account teachers' attitudes and beliefs about their instructional practices. Teachers need to be committed to changes; otherwise, they will not devote the time necessary to see the impact on student learning. Using the current TRPD model, it is critical to continue focusing on changing teachers' personal attitudes and beliefs through activities that engage participants through sustainable sessions. It is necessary to include follow-up opportunities to observe, engage, and share ideas to overcome barriers. Support from each other is also important. Teachers should be provided with a significant amount of choice and variety among the PD sessions,

including sessions based on individual needs, choices, and provisions for individualized curriculum.

APPENDIX A
PROMPTED QUESTIONS

- In what ways have you integrated technological tools into your classroom to date?
- Were you able to connect standards to this content?
- What are some of the technological tools you currently use in the classroom?
- In your opinion, does the technology you currently use in your classroom influence student learning outcomes in terms of literacy and 21st century skills?
- If applicable, in what way do the technological tools you use in your classroom help students make a connection to the real world?
- Which of the tools mentioned at the orientation are you most interested in using for this study?

APPENDIX B
LESSON PLAN FRAMEWORK

What 21st century skill or concept is being addressed (brief description):

NETSS standards:

How will the skill/concept be demonstrated:

Materials/Location:

Subject area standard(s):

Objective:

Plan/Strategies:

Timeline:

Resources:

Student Assessment:

(Use additional space as needed.)

Danielson, C. (2007). *Enhancing professional practice: A framework for teaching.* Alexandria, VA: Association for Supervision and Curriculum Development.

APPENDIX C
PEER AND DIALOGIC INSTRUCTION STRATEGIES

**CRS Peer Instruction (Fies & Marshall, 2006; Mazur, 1997):**

- Pose a thought-provoking question (create a question to stimulate deep thought)
- Use the question to bring to light any misconceptions
- Give students an allotted amount of time to think individually about their responses; have students vote
- Review chart data
- Instruct students to discuss with partner; revote
- If class average is low, have students engage in a class-wide discussion
- Use cooperative learning activity to probe student understanding of lecture content discussing, debating, and defending
- Write questions to measure learning objectives
- Ensure that questions differentiate between jargon and understanding of concepts to clear misconceptions
- Develop wrong answers that seem plausible/logical to serve as multiple-choice distracters
- Limit answer choices to five

**IWB Dialogic Teaching (Alexander, 2008; Armstrong et al., 2005; Mercer, Littleton, & Wegerif, 2004)**

- Discuss learning objectives and alternative viewpoints
- Discuss reasoning: generating, justifying, and evaluating ideas
- Discuss responsively and cumulatively building on others' ideas
- Discuss co-constructing new meanings and interpretations
- Discuss transitioning passive lecturing to interactive lecturing
- Discuss encouraging a diversity of views
- Discuss encouraging extended turns

- Discuss adapting to emerging circumstances
- Discuss building cumulatively on shared experience
- Discuss building areas for discussion to construct new knowledge (whole class or pairs)

APPENDIX D
CONSENT FORM

You are invited to take part in a doctoral research study of a site-based, technology-related professional development (TRPD). The study is being conducted by Shreya Desai, a doctoral candidate at the University of Florida. You were chosen for the study because you indicated interest in the project at the beginning of the 2011-2012 school year, and you are a classroom teacher at Palms Middle School. The information gained from this research study may help design more effective professional development (PD) in the future. Please review the requirements of the project, and feel free to ask for any clarification before agreeing to be part of the study.

**Background Information:**
The purpose of this study is to examine teachers' perceptions of a site-based TRPD and its impact on integrating technology in the classroom to affect student engagement and 21st century learning.

**Procedures:**
If you agree to be in this study, you will be asked to

- keep a reflection log,
- participate in an interview lasting 45 minutes to 1 hour and agree to be audio recorded during this interview,
- participate in TRPD activities for about eight weeks and keep a journal throughout the activities,
- allow the researcher (Shreya Desai) to observe your classroom activities twice during the study, and
- create a lesson plan to integrate the technology in your classroom and create a reflection journal during this process.

**Voluntary Nature of the Study:**
Your participation in this study is completely voluntary. If you decide to join the study now, you can still change your mind later. If you feel stressed during the study, you may stop at any time. You may skip any questions you feel are too personal.

**Risks and Benefits of Participating in the Study:**
No risks are anticipated as a result of participation in the study. The expected benefits include the opportunity for professional and personal growth.

**Sharing Results of the Study:**
The results of this study will be shared with all stakeholders through print in the form of a doctoral study or in summary form as in a report of the findings. Your name will be protected.

**Compensation:**
You will receive six in-service credit points upon completing the whole study.

**Confidentiality:**
Any information you provide will be kept anonymous. The researcher will not use your information for any purposes outside of this research project. Also, the researcher will not include your name or any other identifying information in any reports of the study.

**Contacts and Questions:**
You may contact the researcher via e-mail at shreya.desai@sdhc.k12.fl.us at any time during the study regarding questions, concerns, etc. You may also contact her via phone at (813) 792-5125, ext. 231.

The researcher will give you a copy of this form to keep.

**Statement of Consent:**
I have read the above information. I have received answers to any questions I have at this time. I am 18 years of age or older, and I consent to participate in the study. Electronic signatures are regulated by the Uniform Electronic Transactions Act. Legally, an electronic signature can be the person's typed name, e-mail address, or any other identifying marker. An electronic signature is just as valid as a written signature as long as both parties have agreed to conduct the transaction electronically.

Participant's
Printed Name :
_____

Participant's Written or
Electronic* Signature:
_____

Researcher's Written or
Electronic* Signature:

_____

APPENDIX E
REFLECTION LOG/JOURNAL

**(**You can choose to submit this electronically using word processing software via e-mail to me.)**

**Please note the prompted questions at the end, as well as the short questionnaire.**

NAME: _____

DATE: _____

ACTIVITY/EVENT:
(Describe activities/lessons used):

_____

_____

_____

_____

_____

THOUGHTS:
Please describe your thoughts concerning today's session (i.e., what happened, what went well in your opinion, etc.)

_____

_____

_____

_____

_____

_____

Questions to guide reflection. Please respond accordingly below.

- What was your overall perception of today's PD?
- Which features, if any, of today's session did you find most effective? How so?

- Which features, if any, of today's session would hinder your learning?
- What did you learn as a result of today?
- What are possible outcomes of today's session?
- How does this connect with an aspect of your teaching practice?
- How does this activity meet your curricular and teaching goals?

| Today's session provided by Shreya Desai: | Strongly Agree | Agree | Disagree | Strongly Disagree |
|---|---|---|---|---|
| Incorporated research-based instructional practices | | | | |
| Contributed to my learning | | | | |
| Met my needs as a learner | | | | |
| Connected to my prior knowledge | | | | |
| Included useful and meaningful content | | | | |
| Gave time and opportunity to consider use of tools in my subject area | | | | |
| Included time for reflection and/or lesson development | | | | |
| Included discussion and/or collaboration | | | | |
| Was facilitated in a professional manner | | | | |
| Was conducted at a convenient time | | | | |
| Showed ways that students could be highly engaged | | | | |

Use additional space as needed.

Modified from:

Fuller, J. (2011). *An evaluation of professional development on using student response systems and interactive whiteboards for formative assessment in the middle schools of a southeastern school district* (Doctoral dissertation, University of Florida). Retrieved March 30, 2012, from http://etd.fcla.edu/UF/UFE0043254/fuller_j.pdf

## APPENDIX F
## INVITATION TO PARTICIPATE

You are invited to participate in doctoral-study research focused on professional development (PD). As demands on increasing teacher effectiveness continue from national reforms and our duty to prepare students for the 21st century, it is our responsibility to continually participate in PD to stay current on innovations to assist with teacher pedagogy. You will have the opportunity to engage and participate in technology-related professional development (TRPD) to address your current needs at our school. The study will last about eight weeks. In addition to attending and being an actively engaged participant in the sessions, you will plan a lesson integrating technology collaboratively and will keep a reflective journal. You will also observe while members in the group teach lessons, reflect on the observations, and offer suggestions as needed. You will also be observed once and will partake in a post-TRPD, open-ended interview. In doing so, you will gain valuable knowledge and skills that you can apply to your classroom and use for your new county evaluation rubric to score exemplary points. I would appreciate your serious consideration of becoming a research participant. You will receive six in-service credits and an opportunity to collaborate with colleagues and learn to implement technology tools in your curriculum as a result.

APPENDIX G
POST-TRPD INTERVIEW

Reflective:

1. Have you participated in similar TRPD sessions before this one?

2. Overall, how would you describe your experience with this PD?

3. Will you be more or less likely to use technology in your lessons as a result of this PD? Explain.

Collaboration:

4. Explain if and how your experience working with other teachers at your site through the PD sessions contributed to success of this PD.

Content-Based/Strands:

5. Do you believe that participating in this PD will help you use the IWB and the CRS more efficiently in your teaching in general? If so, how (cite a specific example)? If not, why not?

6. Do you feel that participating in this TRPD will enhance your students' learning? If so, please describe or give a specific example. If not, please specify why not.

Adult Learning:

7. Identify and explain the most useful learning component of this type of PD.

Follow-Up:

8. In what ways, if any, could I modify this PD to help you meet your goals?

Reflective

9. What changes if any, would you make to the PD sessions?

APPENDIX H
CLASSROOM OBSERVATION INSTRUMENT

**Setting**

Date: _____ School: _____

Teacher: _____ Grade: _____

Subject: _____ # of Students: _____

Observation Start Time: _____ Observation End Time: _____

**Room description and student characteristics:**

_____

_____

_____

_____

**Student groupings (check all observed during the period):**

_____ Individual student work _____Small groups

_____ Student pairs _____Whole class

_____ Other (please comment):

**Teacher roles (check all observed during the period):**

_____ Lecturing _____ Facilitating/Coaching

_____ Interactive direction _____ Modeling

_____ Discussion

_____ Other (please comment):

**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

**Strategies used:**

_____ Dialogic Instruction

_____ Peer teaching

_____ Other (please comment):

**How essential was technology to the teaching and learning activities?**

_____1. Not needed; other approaches would be <u>better</u>

_____2. Somewhat useful; other approaches would be as <u>effective</u>

_____3. Useful; other approaches would <u>not be as effective</u>

_____4. Essential; the lesson could not be done without it

**Technologies used and the amount of time spent using:**

| Tools | Teacher | Student |
|---|---|---|
| IWB | | |
| CRS | | |
| Other: | | |

**Focal points of observations:**

Type of research-based strategy used

Student engagement

Conceptual knowledge of content

Ways in which teachers are using IWB and CRS

| Observations | Reflections/Evidence |
|---|---|
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Shreya J. Desai earned her Bachelor of Arts in sociology from the University of Florida and her Master of Arts in Teaching in social sciences education from the University of South Florida. She has worked in public school education as a teacher and technology resource specialist. She also currently facilitates workshops for distance learning faculty development. In addition to researching faculty development, her research interests include blended learning environments, technologically innovative approaches, and data-driven instruction.