A CASE STUDY OF HOW AND IF A PROFESSIONAL DEVELOPMENT PROGRAM BUILDS TEACHERS' TPACK MODEL OF INSTRUCTION

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ABSTRACT

The purpose of this case study was to examine the technology professional development experiences of three teachers, to explore their decisions regarding the classroom integration of technology, and to determine if the technology integration met the TPACK model of instruction. The case study design utilized guided interviews, observations, documents, and fieldnotes. From this process, the researcher was able to gain a greater understanding of the decisions made by the teachers regarding technology integration into their classroom curriculum and lessons. The findings of the study indicated that two of the three teachers integrated technology into their classroom lessons meeting a TPACK model of instruction. The discussion reveals the decisions the study participants made regarding the inclusion of technology, their perceptions of professional development, and why they did or did not meet the TPACK model of instruction.

DEDICATION

I dedicate this dissertation to my family. My husband, Ronny, who was always there through thick and thin, encouraging me when I wanted to give up because it was just too hard and too much. I don't say it often enough, but he is my better half. My children, Craig and Connor, who can now finally have their Mom back. It definitely has not been easy to juggle at all, but you have endured more than any family should have to as I've seen this to the finish. Thank you for putting up with me. I hope that through this process you have seen how strongly I believe in education and that if you want something badly enough there is always a way to make it happen. My mom and dad, Anna and Lamar Hall, who have encouraged me and reminded me how strong willed "we Halls can be." I love you all very much!!!

In Memory

I would like to make a special dedication to my grandmother, Lois M. Hall. Being the first grandchild and the first girl in a long time, she placed me on a pedestal, but not one that would never topple. She was more than just a grandmother to me; she was my greatest champion. Our last conversation was in December 1998 before her stroke, and we talked about me reaching this goal. I just wish she could have seen me walk across the stage.

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As a wife, mother, and teacher, this journey has been a long and trying one. This journey has been one of ups and downs and many trials, but through perseverance and the help and support of many people I have completed the journey. I thank all of the following people who supported me along the way.

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CHAPTER 1

INTRODUCTION

Chapter Introduction

The majority of students enrolled in today's primary and secondary institutions of learning were born and raised in an age of technology. This indication is supported by the National Center for Education Statistics (NCES) who reported that children as young as three years old are computer users (Sutton, 2010; Wells & Lewis, 2006). NCES also indicates that computer usage continues to increase as students progress through school, with 97% of students in grades 9-12 using computers (Sutton 2010; Wells & Lewis, 2006). In 1998, statistics indicated student-to-computer ratio as 6:1. By the fall of 2008, the student-to-computer ratio had dropped to 3.1:1 (Aud, Hussar, Kena et al., 2011). Students are not just immersed in technology at school; much of their use of technology is beyond the brick and mortar of the school. The increase in the number of technologies and technological applications presented to students begs the necessity that they be guided in the proper uses of the technologies to help them analyze, synthesize, and interpret information. However, before guidance can be given to the students, teachers must become familiar with the technologies and technology tools so that they may best instruct the students. In order for this integration to happen, classroom teachers (in-service teachers) must continue their professional development training in the area of technology to achieve successful technology integration into their K-12 curricula.

Context for the Study

Approximately twenty years ago many schools did not have computer-based technologies and most student access to such technologies came through the medium of hand-held devices such as Texas Instrument calculators, desk-top computers, and other game-type devices. Within the past twenty years the growth of technologies in schools and for personal use has increased significantly. Many of today's students have personal devices such as smart phones, iPads, iPods, and home computers. The students that are being taught today are digital natives in that they have matured immersed in the language and use of technology (Prensky, 2001). These students learn very differently from their parents and the educational professionals who are their teachers. Prensky (2001) estimated that this generation of students play over 10,000 hours of video games and send over 200,000 emails and instant messages annually. They are spending more time reading books, for both educational and personal purposes, by way of electronic mediums (e.g., Nooks, Kindles, iPads). These students are unique to the education world and that is being recognized by the fact that a great deal of research is being conducted in the psychological field regarding how technology has rewired the brains of teenagers (Carr, 2011).

When technology was first introduced into the education curriculum, it was one-dimensional through programs such as Microsoft Word and PowerPoint, which limited students in scope of creativity and peer sharing. Now, technology is multidimensional. Students have unlimited creativity, and they are able to create and share in real-time through a plethora of web tools. Besides the use of web tools for creativity and sharing, computers provide students with the ability to analyze, synthesize, and interpret large amounts of information, opening up a vast array of educational possibilities (Partnership for 21st Century Skills, 2009).

Alvin Toffler has been credited with stating that "the illiterate of the twenty-first century won't be those who can't read and write, but those who can't learn, unlearn, and relearn" (Benko, 2011, para. 3). Twenty-first century pedagogical and educational delivery must be challenged and continuously improved to meet the needs and demands of the 21st century student expectations. Teachers can no longer just continue the traditional forms of instruction; they must find ways to integrate technology to engage students in expanding their intellectual curiosities and to provide them with the tools necessary to continue to learn on their own.

The fact that students are being taught for 21st century skills and for jobs that have yet to be created is a reiteration at many professional development offerings. There have been multiple studies that have stated teachers feel ill-prepared to adequately integrate technology into their lessons (Brzycki & Dudt, 2005; Darling-Hammond, Chung, & Frelow, 2002; Shoffner, Dias, & Thomas, 2001). At the same time there are numerous studies that suggest a crucial factor for successful integration of technologies into the classroom is the teacher (Bitner & Bitner, 2002; Loveless, DeVoogd, & Bohlin, 2001; Romano, 2003; Zhao & Cziko, 2001).

The instructional leader of the classroom is the teacher and often they are digital immigrants. They may lack the broad knowledge and comfort level with technologies in order to readily integrate them into the curriculum. The International Society for Technology in Education (ISTE) established performance indicators for students (NETS•S) and teachers (NETS•T) in 1998, and it is these standards which have influenced how technology integration has been directed (ISTE, 2008a; ISTE, 2008b). For teachers to integrate technology into the classroom curriculum, they must know how to use the technology. With the increased expectations of integrating technologies into the classroom there should be adequate professional

development for the teachers in order to provide them with the necessary skills to effectively use technology in the classroom.

Statement of the Problem

Research has shown that the use of technology in schools has the potential to improve student learning outcomes (Chapman, Masters, & Pedulla, 2010; Chen, 2008; Lei, 2009; Overbay, Mollette, & Vasu, 2011). However, teachers must possess the technical skills to implement the technologies into the classroom that will ensure this improvement takes place. Without sufficient skills, teachers cannot successfully integrate the technology into the classroom in the manner which will bring about educational gains. The problem lies in the perceived inadequacy in the TPACK knowledge of teachers and sustained professional development that would allow them to learn appropriate technologies and how to integrate them into the classroom curriculum using the TPACK model of instruction (Judson, 2006; Levin & Wadmany, 2006; Mishra & Koehler, 2006; Zhao & Frank, 2003). Teachers should learn the appropriate technologies, know how to properly integrate them, and be able to determine if the integration is happening. It is difficult, however, to imagine the integration of technology into the classroom when the old paradigms of pedagogy and professional development still exist.

Purpose of the Study

The purpose of this study was to explore the insights of the Master Technology Teacher (MTT) participants regarding their instructional practices following their technology professional development opportunities. Specifically, the assessment was focused on the degree to which the MTT participants have integrated the technology tools (introduced throughout the MTT Program) into their classroom curriculum practices. The goal of the assessment was to

determine if the participants had integrated technology in such a fashion that allowed them to converge technology with their content knowledge (CK) and pedagogical knowledge (PK), resulting in a TPACK (Technology, Pedagogy, and Content Knowledge) model of instruction as designed by Mishra and Koehler (2006). Two latent purposes of this study that developed as a result of the examination of the preeminent focus were (1) themes that could add to the body of knowledge about the types of professional development offered to teachers that would allow them to integrate or improve technology in their instructional practices, and (2) to determine if the study participants were forming communities of practices among themselves resulting from their professional development opportunities.

Research Questions

The educator of today has the daunting task of preparing students for a future in the global 21st century. Good 21st century educators are ones who are cognizant of the rapidly changing technology trends and are able to apply those trends to the educational setting to ensure that their students are not left behind in the wake of progress and have the necessary skills to compete in a global world (Partnership for 21st Century Skills, 2009). To do so, teachers must first possess the very same 21st century skills that they expect their students to exhibit.

The research literature recognizes that a good teacher is a crucial factor in student learning and that teacher quality outweighs the importance of standards, funding, and class size (Darling-Hammond & Berry, 1998; Geringer, 2003). Furthermore, the literature recognizes that professional development is just as crucial for improving the content and pedagogical knowledge of the teachers. While various programs address the content knowledge and pedagogical knowledge of the teacher, the MTT Program focuses on the use of technology to merge all three

(technology, pedagogy, and content) using the TPACK framework to provide the teachers with influential professional development experiences that will directly impact the way they approach the use of technology in the curriculum. To access and determine the components of professional development that allow the participants to move toward the TPACK model of instruction, this case study seeks to answer the following questions:

1. How has being a participant in the MTT Program influenced the teacher's integration of technology into the classroom curriculum?
2. What decisions were made in the area of content and pedagogy to facilitate the inclusion of technology?
3. Did the teachers integrate technology into the curriculum that met the TPACK Model of Instruction?

Significance of the Study

Too often teachers use technology for technology's sake and do not stop to take into consideration the reasons why they have chosen the technologies they use within the classroom. To achieve the utmost benefit, teachers must examine the reasoning behind their choices. They must examine their content and pedagogical choices and how they converge them with the choice of technology to achieve the learning goals (Koehler & Mishra, 2008). When these factors are converged together successfully, teachers are considered to have reached a TPACK model of instruction (Koehler & Mishra, 2009; Mishra & Koehler, 2006; Mishra, Koehler, & Henriksen, 2011). There is much research into the different components–content knowledge (CK), pedagogical knowledge (PK), and technology knowledge (TK)–but this particular study will follow three teachers regarding their MTT training experiences, what they have gained from

those experiences, and how those experiences have impacted their teaching practices with technology. Through examining these individual components, the goal of this case study is to explore the decisions these teachers make when integrating technology and through those decisions if they have reached the point of teaching technology-based lessons meeting the TPACK model of instruction.

Findings from this study may provide relevant information that will allow teachers, administrators, and university personnel to make decisions that will improve how professional development is delivered that will allow teachers to successfully integrate technology into curriculum lessons as expected through the TPACK model. Although this study follows three secondary teachers, the data will be beneficial to other educators and professional development programs on all levels.

Delimitations

In performing field work, the researcher is prone to record everything that she sees or hears and realistically that cannot happen as the data collection and the research itself will reach a point in which it is unmanageable. Reaching the point of unmanageability is what Wolcott (2009, p. 40) labels the "vacuum-cleaner" approach. Delimitations in a research study allow the researcher to better manage the data collection and analysis efficiently. This study was limited to three participants of the MTT Program who all teach at one high school in the southeastern United States. The three participants volunteered to participate in the interviews and observations and are considered to be teacher leaders in pedagogy and technology. Each participated in the MTT Program for more than two years and either has held or is currently holding technology positions at her school.

Limitations

All research is not perfectly designed and all has its own limitations (Patton, 2002). Marshall and Rossman instill that limitations "remind the reader of what the study is and is not–its boundaries–and how its results can and cannot contribute to understanding" (2011, p. 76).

This study focused on three teachers who were participants in the MTT Program, and they were all from the same school. The researcher did not randomly choose these participants from the forty-plus current or previous MTT participants, who have taught in a variety of schools. The findings from the interviews and observations of these teachers' experiences may

1. reflect certain biases. In addition to being the principal researcher in this case study, the researcher is also a colleague of the study participants and the MTT Program. The participants may respond in ways that they think the researcher would expect.
2. be influenced by other professional development training, both pedagogically and technologically. The study participants are heavily involved in different professional development opportunities and there may be some overlapping of skills learned through those offerings.
3. not be representative of all the TPACK components expected. The TPACK model of instruction has not been explicitly taught to the participants; therefore, they may be unaware of the language and concepts.

Assumptions

Halpern (2003) describes an assumption as a statement for which no proof or evidence is offered. However, in research, an assumption may be based on an idea one believes to be true based on prior experience or one's belief systems (Elder & Paul, 2002). Creswell states that

"assumptions reflect a particular stance that researchers make when they choose qualitative research. After researchers make this choice, they then further shape their research by bringing to the inquiry paradigms or world-views" (2007, p. 19). The paradigms are the set of beliefs that guide action (Creswell, 2007). Exploring assumptions allows researchers to test their theories and address tendencies toward biased reasoning (Evans, Newstead, Allen, & Pollard, 1994).

The design method employed in this study is based on the following assumptions. First, the MTT Program participants have integrated much of the technology tools received through the professional development into their curriculum instruction (Mishra & Koehler, 2006). Second, the MTT Program participants have excelled in the area of technology integration in a manner that has propelled them to become faculty leaders in the area (Joyce & Showers, 2002). Finally, the MTT Program participants have, in effect, created a community of practice among themselves (Wenger, Trayner, & de Laat, 2011).

Definitions of Terms

The following definitions are provided to clarify the terms used within this study.

21st century learning – the process whereby individuals become students utilizing the power of modern, 21st century technology, to learn anything, anytime, anywhere, thereby increasing their cognitive skills and knowledge (Kereluik & Mishra, 2011).

21st century technology – the digital technologies (e.g., laptops, computers, iPads, iPods, smartphones, apps, web-based tools, etc.) that will allow individuals to learning anything, anytime, anywhere (Kereluik & Mishra, 2011).

Annual Yearly Progress (AYP) – the measure by which schools, districts, and states are held accountable for student performance under Title I of the No Child Left Behind Act of 2001 (Keegan et al., 2002).

Computer-based technology – technology that cannot stand alone, but requires the use of a computer in order to operate properly (e.g., Software, Web-based resources, video or audio recorder, document camera, calculator) (Hofer, Grandgenett, Harris, & Swan, 2011).

In-service teachers – Teachers who have completed a teacher education program and are employed in a professional manner in a school system or education setting (Spafford, Pesce, & Grosser, 1998)

International Society for Technology in Education (ISTE) – a professional organization that provides leadership and service to improve teaching, learning, and school leadership by advancing the effective use of technology in PreK-12 and teacher education (ISTE, 2007).

Master Technology Teacher Program (MTT) – a program that encourages collaboration among educators (pre-service teachers, in-service teachers, and university faculty) to integrate technology into the secondary education content classroom (Wright, Wilson, Gordon, & Stallworth, 2002).

NETS•S—the National Educational Technology Standards for Students, a set of standards developed by ISTE that serves as the framework for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world (ISTE, 2008a).

NETS•T—the National Educational Technology Standards for Teachers, a set of standards developed by ISTE that serves as the framework for evaluating teacher preparation

programs across the nation in regard to the skills and knowledge educators need to teach, work, and learn in an increasingly global and digital world (ISTE, 2008b).

Non-computer based technology – technology that can stand alone and operate without the use of a computer (e.g., overhead projector, textbook, whiteboard, pen/pencil/marker) (Hofer, Grandgenett, Harris, & Swan, 2011).

Preparing Tomorrow's Teachers to use Technology Program (PT3) – a grant initiative from the U.S. Department of Education whose main focus was on preparing educators with the necessary skills for creating and delivering high quality, technology-infused lessons to engage students and improve learning (Bahr, Shaha et al., 2004; Ertmer, 2003; U.S. Department of Education, 2005).

Pre-service teachers – students who have been accepted into the teacher education program but have not yet graduated and received state licensure.

Professional development – programs and activities designed to allow teachers and school administrators to reflect upon and evaluate pedagogical practices that will lead to greater teacher effectiveness and student improvement (Guskey, 2000; Hassel, 1999). Much professional development may be offered in a "sit and get" format – one-time-only workshops in which training is provided to teachers in a lecture type format (Jaquith, Mindich, Wei, & Darling-Hammond, 2010).

"Sit and get" professional development – sessions, in which relatively passive participants were made aware of the latest ideas regarding teaching and learning from "experts" in a linear or top-down approach (Abadiano & Turner, 2004; NJCLD, 2000 as cited by Klinger, 2004, p. 248-49).

Technology – electronic devices such as smart devices (iPads, iPods, cell phones, Kindles, and Nooks), computers, web sites, and applications by which students can employee as a medium to facilitate learning experiences in the classroom and in online environments (ISTE, 2008a).

Technology integration – when the use of technology tools by students are selected in such a manner that helps them obtain information in a timely manner, analyze and synthesize the information, and present it professionally (ISTE, 2008a).

Technology, Pedagogy, and Content Knowledge (TPACK) – the basis of effective teaching with technology; attempts to identify the nature of knowledge required by teachers for technology integration in their teaching, while addressing the complex, multifaceted and situated nature of teacher knowledge (Koehler & Mishra, 2009).

Overview of the Dissertation

This dissertation is a case study design that examines how participants of the MTT Program have integrated technology into their classroom instruction. Chapter 1 provides an introduction to the topic, context of the study, a description of the purpose and problem statement, research questions, significance of the study, the delimitations, limitations, and assumptions. Chapter 2 provides a review of the relevant literature and lays the groundwork for the rationale of this study. Chapter 3 describes the methodological design of this study, outlines the data collection procedures, and explains the methods used to analyze the data to ensure the trustworthiness/validity of the findings. Chapter 4 relates the data analysis of the research questions revealing the findings and themes from the interviews and observations. Chapter 5

provides a discussion of the findings and themes for the research questions, the implication for educators, and recommendations for future research.

CHAPTER 2

REVIEW OF THE LITERATURE

Learning technical skills alone is not sufficient – learning how to integrate technologies into teaching is equally important (Mishra, Koehler, & Kereluik, 2009)

Chapter Introduction

Students today are connected in ways that previous generations could never have imagined. They have been labeled the N(ets)-gen or D(igital)-gen because of the thousands of hours they have been immersed in technology (Prensky, 2001, p. 1). It has become clear to educators and researchers that these are not the students the educational system was designed to teach. The students of today think and process information very differently from their predecessors. Research from the field of psychology indicates that the fundamental structures of their brains have changed because of technology (Carr, 2011). Rather than rejecting these changes, many teachers have fully embraced them and sought new ways and methods to engage students in emphasizing these changes for the good of learning.

With the arrival of technology, the routines and practices of the profession have changed, as have those of most human endeavors. With this arrival, new rules have had to be developed and applied to pedagogy that enables teachers to better prepare their students. Merely introducing technology to the education process is not enough (Mishra & Koehler, 2006, p. 1018). Mishra and Koehler argue that for the technology to be used within the scope of educational practices, much thought must go into the decision making. Doolittle and Hicks

stated, "If integrating technology means nothing more than enhancing the traditional delivery system, where laptops replace notebooks, where PowerPoint slides replace handwritten overheads, and where e-textbooks replace hard copy textbooks, then we will be no closer to the vision of transformative, powerful instruction" (2003, p. 75). The instructional decisions surrounding the uses of technology in the classroom should be more than just mere "technocentric" (Papert, 1987) in approach; they should be more than using technology for technology's sake.

The review of the literature is presented in a five-part discussion. The first section discusses the need to evolve professional development from a "sit and get" format to one of pedagogical involvement that allows for sustainability. The second section discusses the initiation of the MTT Program and its purposes and goals. The third section examines the learning by design model in terms of its inception and how it evolved into a TPACK model of instruction. The fourth section discusses the TPACK framework as a model of instruction and how what has been learned through the MTT Program may be implemented into individual classrooms by using the TPACK model. The fifth section provides a review of how the professional development practices of teachers may allow them to create communities of practice through their efforts of improving classroom practices.

Professional Development

In 1998, Linda Darling-Hammond argued that the quality of the teacher is the factor that matters most for student learning. This dictum was reiterated by Geringer (2003) who not only affirmed that a good teacher is a crucial factor in student learning, but also stated that teacher quality outweighs the importance of standards, funding, and class size. Professional development

is a common and necessary approach to improving teacher quality. Effective professional development needs to go beyond learning new material and skills to significantly change classroom instruction for the utmost impact on student learning (NSDC, 2001). However, while teachers are required to participate in professional development activities, it is often the case that they are not involved in selecting and planning those activities, and that professional development may not be closely tied to classroom practice (Colbert, Brown, Choi, & Thomas, 2008). Thus, the success of ambitious education reform hinges, in large part, on the qualifications and effectiveness of teachers. As a result, teacher professional development should be a major focus of systemic reform initiatives (Corcoran, 1995; Corcoran, Shields, & Zucker, 1998). The major focus of this current research is the integration of technology into the classroom using the TPACK model of instruction, but there is significant consideration, such as the organizational manner, that must be taken into account regarding professional development for it to become an actuality.

Before the No Child Left Behind (NCLB) Act, professional development was slowly moving away from the "sit and get" model to one which allowed teachers to collaboratively interact with colleagues, but with NLCB, the scope of professional development has somewhat returned to the previous model (Colbert, Brown, Choi, & Thomas, 2008). The NCLB Act has created a system of professional development that limits teachers in utilizing their professional judgment to determine their own professional development needs or make decisions regarding what professional growth activities are relevant to their classrooms (Borko, 2004). With the NCLB Act, the professional development most offered is the type that holds true to the "sit and get" model. Teachers are expected to show up for professional development opportunities only to find that they are being read another scripted mandate or to watch a video of the same caliber

(Borko, 2004; Guskey, 2003; Guskey & Yoon, 2009). The handicap of this form is that it is a "one size fits all" delivery. It does not take into account the culture of the school, the students, or the teaching personality of the educator. If policymakers expect children to achieve at levels of high standards, as established by the NCLB Act and state mandates, teachers must be provided with the appropriate amount and caliber of professional development (Garet, Porter, Desimone, Birman, & Yoon, 2001; Lester, 2003), especially in the area of technology.

In response to the professional development models after the passage of the NLCB Act, Sparks (2004) described a two-tier system of professional development. Tier I focuses on creating a professional development community, while Tier II depends on scripts and mandates for teachers. However, much of the literature now indicates that characteristics of effective professional development are the methods that help teachers develop methods that will enable them to understand not only the academic content, but how students learn the content (Guskey, 2003).

The research performed by the National Research Council (2000) supports the notion that "learning is both an active and social process and in order to learn, one must make the decision to engage deliberately with an idea" (Gess-Newsome, Blocher, Clark, Menasco, & Willis, 2003, p.326). Engagement is the first step in considering if the professional development is meaningful to the context of what a teacher needs to know for the classroom. Educational researchers have endeavored to identify and understand the characteristics of what makes professional development meaningful. Through extensive case studies, Loucks-Horsley and colleagues (1998) identified the following trends of successful professional development sessions:

1. utilized well-defined language of effective classroom learning and teaching to drive the professional development experience;

2. provided teachers with opportunities to build their knowledge and skills;
3. modeled the strategies teachers would use with their students;
4. created a learning community among participants;
5. led teachers to assume leadership roles; and
6. required teachers to continuously assess themselves and make improvements that impacted teacher effectiveness, student learning, leadership, and the school community.

Similarly, Garet, Porter, Desimone, Birman, and Yoon, (2001) found that professional development was most effective when it

1. was sustained and intensive rather than short-term;
2. was focused on academic subject matter with links to standards of learning;
3. provided teachers opportunities to be active learners;
4. afforded opportunities for teachers to engage in leadership roles;
5. involved the collective participation of groups of teachers from the same school; and
6. was meaningfully integrated into the daily life of the school.

When teachers have a democratic role in their professional development, there tends to be more open and positive collaboration. Applying collaboration in the scope of learning about teaching in the context of their classrooms, the application of knowledge is clear and the motivation to learn is high (Gess-Newsome et al., 2003). Collaboration brings about cultures of inquiry (Bonner, 2006; Hart & Robottom, 1990; Zeichner, 2003). Having cultures of inquiry allows teachers to have personal ownership in their professional development by presenting the opportunity to give and receive feedback about learning among their colleagues (Danielson, 2005; Mills & Donnelly, 2001). The particular model of inquiry does not necessarily matter, but

what should matter is the quality of professional development and the effect it has upon the classroom. The research also indicates that there is still too much short-term, top-down, and time consuming processes in the planning of professional development that do not necessarily result in successful professional development opportunities or implementation (Peckover, Peterson, Christiansen, & Covert, 2006).

Newmann, King, and Youngs (2000), from a two-year study, found that professional development was most effective when it addressed five aspects of school capacity: teachers' knowledge, skills, and dispositions; professional community; program coherence; technical resources; and principal leadership. They also found that the effectiveness varied depending on their design features and the characteristics of the teachers who participated in the professional development.

The goal of professional development is to help teachers master the diverse components of knowledge that will enable them to make the appropriate instructional decisions that will result in student learning (Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). Professional development is a process and not an event (Hall & Hord, 2001) and for teachers to receive the utmost for it, they should be allowed to take charge of their own professional growth. Like all learners, teachers will only be impacted by those ideas in which they deliberately choose to engage. Teachers must be afforded the respect to set their own course of development and be encouraged to actively monitor their own progress (Gess-Newsome, Blocher, Clark et al., 2003, p. 328).

The current curriculum standards from national organizations now focus on providing relevant, meaningful tasks; developing higher-order thinking skills; and integrating technology tools to support learning (Polly & Hannafin, 2010). Despite the new focus on technology

integration, the research indicates that teachers are reluctant. The U.S. Department of Education's 2010 National Educational Technology Plan notes that they "feel they are not well prepared to use technology in their practices" (p. 39). Davis, Preston, and Sahln (2008) note that teachers are most likely to adopt the practices when they perceive ownership in the content activities selection and are comfortable with their own pedagogical and technology practices. In preparing a nation of technology-savvy teachers, professional development will need to be long-term, collaborative, and grounded in teachers' daily practices (Morsink et al., 2010). The MTT Program allows teachers the opportunities to be engaged in these characteristics.

Master Technology Teacher Program (MTT)

The MTT Program began in 2000 at The University of Alabama as part of the Preparing Tomorrow's Teachers to Use Technology (PT3) grant initiative (Wright, 2010). The PT3 grant's main focus was on preparing pre-service teachers with the necessary skills for creating and delivering high quality, technology-infused lessons to engage students and improve learning (Bahr, Shaha et al., 2004; Ertmer, 2003). How the purpose and goals of the PT3 grant were achieved by the grantees varied. Some used the PT3 monies to increase the technology knowledge of their faculty or to upgrade their technology infrastructures (Denton, Clark, & Allen, 2002; Krueger, Hansen, & Smaldino, 2000; Sutton, 2010). Many institutions went further and created collaborative models that provided field experiences for their pre-service and in-service teachers that would ensure that the NETS standards for students and teachers were met (Beckett et al., 2007; Brawner & Allen, 2006; Dawson, Pringle, & Adams, 2003; Duran, Fossum, & Luera, 2007; Henning, Robinson, Herring, & McDonald, 2006; Wright, 2010).

The MTT Program began under the auspices of the Project Integrating Technology (I.T.).

> The Project Integrating Technology at the University of Alabama has focused on innovative and traditional best practices for infusing technology in its teacher education preparation programs. The overall goal of Project I.T. is to enable pre-service teachers to fully use instructional technologies and to prepare them for classroom best practices to enhance teaching and learning (Wright, Wilson, Gordon, & Stallworth, 2002, p. 356).

The MTT Program was actually created when The University of Alabama took the initial purpose a step further and created professional development opportunities for its educational partners, the in-service teachers (Wright & Wilson, 2007; Wright, Wilson, Gordon, & Stallworth, 2002). The purpose in taking the initiative to the practitioners was multi-faceted, but served the overall purposes of helping to alleviate the negative feelings toward the integration of technology and to help all the partners (pre-service, in-service, and University faculty) to develop deeper understandings in the methods of using the tools to move beyond simple consumerism of the technologies. Identified by several researchers, the largest barrier to successful technology integration is teachers' pedagogical beliefs and their resistance to change (Gilmore, 1995; Hancock & Betts, 1994; Hannafin & Savenye, 1993). If teachers do not have positive attitudes toward technology in instruction and toward using the technologies available in instruction, then even the best systems and methodologies will remain unused (Bahr, Shaha et al., 2004).

Although the MTT Program has evolved through the years to include partnerships with the Alabama In-Service Center – Technology in Motion (UA-TIM) branch and the Alabama Consortium for Educational Renewal (ACER), the conceptual purpose remains the same: to provide its participants the responsive professional, instructional, and technical support needed to integrate technology into the classroom and to overcome encountered barriers. Technology in

Motion is a statewide initiative, established in 2000, to provide technology training to K-12 education professionals. It was designed to take novice users and provide them with the proper training to enable them to deliver technology-augmented classroom instruction. There are eleven Regional In-Service Centers, and The University of Alabama is one of those eleven. ACER, created in 1997, supports the collaborative development of school-university partnerships for the purpose of educational renewal.

Being comfortable with technology and having a basic understanding of how to use its tools does not guarantee effective teaching facilitated by technology (Harris & Hofer, 2009; Wright, 2010). Effectively integrating technology into instructional practices requires more than the two hour "sit and get" workshop to a sustainable method through which teachers receive the proper training that allows them to "systemically change instruction" (Brock, 2009; Wright, 2010) and to learn from other professionals and colleagues over a period of time (Joyce & Showers, 2002; Wright, 2010). Teachers become exemplary technology users by progressing through a series of stages that takes them from novice users to experts (Hadley & Sheingold, 1993; Marcinkiewica, 1993; Sandholtz, Ringstaff, & Dwyer, 1997; Willis, 1992). The MTT Program is designed to allow teachers to think about their relationship with technology as being complex, dynamic, and continuously engaging (Wilson & Wright, 2010; Wright, 2010; Wright & Wilson, 2007; Wright, Wilson, Gordon, & Stallworth, 2002).

While teachers are progressing through the various levels of knowledge and usage, they will face differing barriers that must be overcome and the MTT Program provides the supporting community to help teachers face and overcome these barriers and to help close the gap between the potential uses of technology and classroom integrations (Wilson & Wright, 2010; Wright & Wilson, 2007). Some of these barriers may be eliminated by obtaining additional resources and

providing ongoing technical support, whereas, secondary barriers may require the teachers to confront their long-held beliefs about classroom practices and technology usage. Various types of support must be available to address the ever-changing barriers they face.

The teachers who have been members of the MTT Program group have been challenged to use technology to effectively facilitate teaching, and their professional development sessions are presented within the scope of the TPACK framework, with components of peer coaching and modeling (Joyce & Showers, 2002) and learning technology by design (Koehler & Mishra, 2005a; Koehler & Mishra, 2005b), but the question remains if this happens and to what degree. In essence, the MTT Program allows participants to move beyond the simple technological instruction by way of the workshop approach to addressing the richness of instruction by integrating technology into content and pedagogical goals.

Learning by Design Leads to TPACK

In 2005, Mishra and Koehler came to realize that merging all the complexities of technology integration required more than just focusing on one component at a time (Koehler & Mishra, 2005a; Koehler & Mishra, 2005b). Good teaching is not just adding technology to the mix, but adding technology in a way that helps to develop a consciousness to the dynamics of all three components – technology, pedagogy, and content. In examining the educational technology standards, such as those developed by the International Society for Technology in Education (ISTE, 2008) (see Appendixes A and B for standards) and the National Council for Accreditation of Teacher Education (NCATE) (standards may be viewed at www.ncate.org), Mishra and Koehler, 2005a; Koehler & Mishra, 2005b) recognized that a series of higher-order goals above the basic competencies that told what teachers should know but not how they were

supposed to learn it was needed. After much research, Mishra and Koehler offered a way to merge the components of the teaching practice and to achieve technology integration.

To merge all three components – technology, content, and pedagogy – successfully, Koehler and Mishra stated that it should be done in a circular system "that would honor the complex, multidimensional relationships by treating all three components in an epistemologically and conceptually integrated manner" (2005b, p. 134). The ultimate goal is to gain knowledge in how technology can support the pedagogical goals, not to just use technology for technology's sake. The learning technology by design approach facilitated by Mishra and Koehler is related to a constructivist, project-based approach in which learning takes place through a learning-by-doing or problem-based approach over time (Cole, 1997; Harel & Papert, 1991; Vygotsky, 1978). The sustained inquiry and revisionary process helps the designers come away with a deeper understanding in how to apply knowledge in the complexity of real world practices (Koehler, Mishra, Yahya, & Yadav, 2004). In Mishra and Koehler's attempt to design the best development method, they began to modify the learning by design model to include the component of technology. Koehler and Mishra see their modified creation as "being situated in action and codetermined by individual-environment interactions" (2005b, p. 134).

The learning technology by design is constructed over a period of time by having participants design a lengthy course. The ultimate goal is shared through the process of learning the new technologies because participants are building something that is both sensitive to their content matter and specific instructional goals. Additionally, the view shared with the learning technology by design approach, participants come to realize that there are multiple ways in which the technology applications can be manipulated to benefit instruction and that the rules of application do not always have to be rigid (Mishra, Spiro, & Feltovich, 1996; Norman, 1993).

Participants are moving beyond thinking of themselves as being passive users and participants with the tools to thinking of themselves as active users and designers of educational lessons with the technologies (Koehler, Mishra & Yahya, 2007; Mishra & Koehler, 2003).

TPACK: A Theoretical Framework

Halverson and Smith (2009) argue that technologies have fundamentally transformed schools – but not in the consensus expected, which was to have universal access to support progressive instructional practices. Technology use has been found to improve classroom experiences for students (Doerr & Zangor, 2000; Guerrero, Walker & Dugdale, 2004). However, the general consensus emerging from the literature is that effective integration of technology into classroom instructional practices is not widespread (Bracewell, Sicilia, Park & Tung, 2007; Cuban, Kirkpatrick, & Peek, 2001; Ertmer, 2005; Jaipal & Figg, 2010). Technology should be integrated in ways which will foster meaningful learning. It is important to know not only what technology is used and what terms must be known to use it, but also how that technology is being used (Carr, Jonassen, Litzinger, & Marra, 1998; Mishra & Koehler, 2006). Becker and Ravitz (2001) argued that classroom instruction could improve if teachers gained the necessary experiences and became committed to a progressive philosophy of instruction. Zhao and Frank (2003) stated that teachers must go beyond mere competences and develop an understanding of the complex web of relationships among users, practices, tools, and the many technologies available.

Shulman (1986) proposed that subject content knowledge alone is not sufficient for instruction to be effective. For effective instruction to occur, disciplinary, general pedagogical, and pedagogical content knowledge must be included. Shulman described PCK as "the blending

of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented and adapted to the diverse interests and abilities of learning, and presented for instruction" (1987, p. 8).

Mishra and Koehler (2006), building off the seminal works of Shulman, developed an instructional model for the 21st century that brought together the complex interplay between content knowledge (CK) and pedagogical knowledge (PK), that an educational professional learned in pre-service instruction, with the technology knowledge (TK) that has emerged since 2000. This model also grew from their learning by design practices.

Besides Shulman, Mishra and Koehler also used the works of Keating and Evans (2001); Lundeberg, Bergland, Klyczek and Hoffman (2003); Margerum, Leyes, and Marx (2004); Pierson (1999, 2001); and Zhao and Frank (2003) to help form their theoretical model. The model, Technology, Pedagogy, and Content Knowledge (TPACK), is used as a way to represent what teachers need to know about technology and how to design authentic activities and lessons that incorporate the technological knowledge with the pedagogical knowledge and content knowledge to provide students with the utmost experience. Mishra and Koehler's TPACK model, as shown in Figure 1 (Koehler & Mishra, 2008, p. 12) captures and expresses two key aspects of technology integration. Thompson and Mishra stated the model was a visual to, "emphasizes, through the letters, the three kinds of knowledge (Technology, Pedagogy, and Content) and the notion that they form an integrated whole, a 'Total PACKage' as it were, for helping teachers take advantage of technology to improve student learning" (2007, p. 38). The research indicates that to successfully integrate technology into classroom instruction, teachers need to develop an understanding of the interrelationship and interdependence of these types of relationships (Lane, 2009); the knowledge about content (C), pedagogy (P), and technology (T)

is vital for developing good teaching (Mishra & Koehler, 2006). What sets Mishra and Koehler's approach apart is "the specificity of our articulation of these relationships between content, pedagogy, and technology" (2006, p. 1026). To obtain the greatest understanding and manipulation of effectiveness, each component should be understood individually and in pairs: pedagogical content knowledge (PCK), technological content knowledge (PCK), and technological pedagogical content knowledge (TPCK) as thoroughly as possible (Mishra & Koehler, 2006).

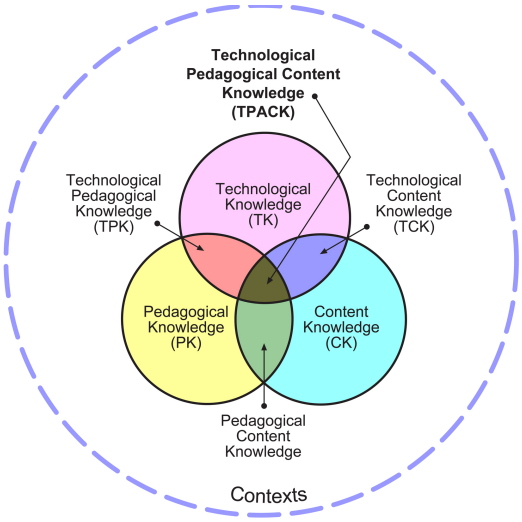


Figure 1. The Mishra and Koehler Model.

Content refers to the actual subject or content matter that is to be learned/taught. Teachers must know and understand their subject fields thoroughly (knowledge of central facts, concepts, theories, and procedures); have knowledge of explanatory frameworks that organize and connect ideas; and have knowledge of rules of evidence and proof (Shulman, 1986). Teachers must also have a basic understanding of the knowledge and inquiry in different fields. For example, how a

particular mathematical formula is applied differently in geometry class versus physics class or how a historical explanation is different from a literary interpretation (Mishra & Koehler, 2006).

Pedagogy is the knowledge that one has about the methods and practices of teaching. This is all the cognitive, social, and developmental theories and how they apply to students in the classroom. Content and technology come together to inform and direct pedagogical decisions. It encompasses the overall educational purpose, values, and goals of the classroom and the strategies for evaluating student understanding (Koehler, Mishra, Hershey, & Peruski, 2004).

Pedagogical Content Knowledge (PCK) is the knowledge of pedagogy specific to teaching the content to be learned. It includes knowing what teaching strategies and best practices that are most applicable to fit the content to be taught and how they can be arranged to be taught most effectively. PCK is also concerned with what prior knowledge is brought to the classroom by the students.

Technology may be considered to constitute two basic types–low-tech (pencil and paper, and whiteboard or blackboard) and digital (Internet and hand-held devices). Technological knowledge involves the skills to be able to operate these technologies. Technology is constantly changing, and technological knowledge must shift with this continuum. It is important for individuals to learn and adapt with the changing technologies.

Technological Content Knowledge is an understanding of the manner in which technology and content influence and constrain one another. Teachers need to know not just their subject matter but also the manner in which that subject matter may be altered by the application of technology (Mishra & Koehler, 2006).

Technological Pedagogical Knowledge provides teachers with the knowledge of the existence and capabilities of technologies and how those technologies can be most effectively used in the classroom or teaching setting.

Technological Pedagogical and Content Knowledge is the basis of effective teaching with technology and requires the understanding of the representation of technological concepts; the pedagogical techniques to constructively use the technologies in teaching the content; how technology can make learning the content more constructive and how to redress those difficulties to help the students overcome the limitations; and how the technologies can develop new epistemologies or strengthen old one (Mishra & Koehler, 2006).

At a meeting of the National Technology Leadership Institute in September 2007, the current acronym, TPACK, was adopted (Niess, 2008; Thompson & Mishra, 2007). Before that time, and in some instances still, TPACK was identified by different names: Technological Pedagogical Content Knowledge; Technological, Pedagogical, and Content Knowledge; Technology, Pedagogy, and Content Knowledge; Information and Communication Technological Pedagogical Content Knowledge.

Many of today's veteran teachers, who graduated prior to 2005, do not have the technology knowledge, skills, and experiences that are necessary to properly teach students because they did not grow up immersed in the language nor were they taught with technology (Goldin & Katz, 2008; National Council for Accreditation of Teacher Education, 1997; Office of Technology Assessment, 1995; Prensky, 2001; Rosenthal, 1999). Kent and McNergney (1999) reported that only 15% of U.S. teachers received nine hours or more of annual professional development technology training, despite the increased emphasis on computers and technology. In the ensuing years, according to the research, that percentage has not significantly increased,

remaining below 24%, despite an increase of available technology (Sawchuk, 2010). This has led teachers to discover and design their own technology-inclusive lessons, if they use any at all. Teachers have been characterized as gatekeepers because they decide what technologies may enter into the classroom and how they can be used (Cuban, 1986; Lei, 2009; Noble, 1996). The gatekeeping mindset of many teachers can be traced back to their attitudes toward technology. If they are digital immigrants, they are unsure of the technology and the methods in which to incorporate it into their curriculum contexts.

Technology skills alone cannot guarantee the effective integration of technology into the classroom (Carr, Jonassen, Litzinger, & Marra, 1998; Ertmer, 2003). Teaching and learning with technology exist in a relationship that is both dynamic and transactional (Bruce, 1997; Koehler, Mishra, Hershey, & Peruski, 2004). To meaningfully integrate technology into the classroom there should be a systematic understanding of the technology, subject matter, pedagogy, and how these aspects work together (Mishra & Koehler, 2006; Zhao & Frank, 2003). For meaningful technology integration to happen, the teacher should develop a sound understanding of all the individual components – PK, CK, and TK – and how all three taken together constitute TPACK. TPACK is a useful framework for thinking about what knowledge teachers must have to integrate technology into teaching and how they might develop this knowledge (Schmidt, Baran, Thompson, Mishra, Koehler, & Shin, 2009). TPACK develops, in part, by doing and as teachers grapple with the different components of TPACK and how to successfully merge them, they are learning and growing and developing meaningful integrations (Bos, 2011); as these bodies of knowledge interact, in theory, and in practice, they produce the type of knowledge needed to successfully integrate technology into the classroom (Mishra & Koehler, 2006).

A Shift from Professional Learning Communities to Communities of Practice

Though the central focus of this current research is to explore and analyze how three of the MTT Program participants are integrating the technologies they received through the MTT professional development sessions into their classrooms, the researcher came to a realization. While the MTT Program participants may be considered a professional learning community as a whole, have the three research participants changed the scope of a professional learning community into a community of practice because they are a smaller, more associated group, and are attempting to integrate technology more readily into their curriculum?

The term "professional learning community" (PLC) has become quite commonplace and is often used interchangeably with the term "professional learning network" (PLN). Roland Barth (1990) described a community of learners as "a place where students and adults alike are engaged as active learners in matters of special importance to them and where everyone is thereby encouraging everyone else's learning" (p. 9). Marsha Speck and Debra Stollenwerk (1999) define a learning community as "one that promotes and values learning as an ongoing, active collaborative process with dynamic dialogue by teachers, students, staff, principal, parents, and the school community to improve the quality of learning and life within the school" (p. 8). The PLCs may be composed of educators, administrators, community members, and other stakeholders with a vested interest in examining and improving professional practices for the greater good of education (Roberts & Pruitt, 2009). PLCs are involved in various activities including sharing a vision, working and learning collaboratively, visiting and observing other classrooms, and participating in shared decision making. In the efforts to effect school change and improvement and to increase student learning, many schools are placing a great deal of emphasis on developing and building PLCs. Overall, the purpose of the PLC is to expand the

knowledge of its participants and to encourage innovation and excellence in the practices of education.

However, there is an ambiguity to PLCs as well because the definition of PLCs has never been one of universality, and the composition of PLCs can be quite different (Hord, 1997). The following definitions offer a range of ways to describe a PLC:

1. A group of educators committed to working collaboratively in ongoing processes of collective inquiry and action research in order to achieve better results for the students they serve. PLCs operate under the assumption that the key to improved learning for students is continuous, job-embedded learning for educators (DuFour et al., 2006).
2. A PLC is one that promotes and values learning as an ongoing, active collaborative process with dynamic dialogue by all the stakeholders to improve the quality of learning within the school (Speck & Stollenwerk, 1999).
3. An ongoing process through which teachers and administrators work collaboratively to seek and share learning and to act on their learning, their goal being to enhance their effectiveness as professional for students' benefit (Hord, 1997).
4. A group that has as its focus the cultivation of learning and interaction among school personnel as to improve teaching and learning outcomes for the school community at large (Kruse, Louis, & Bryk, 1995).
5. Collections of individuals who are bonded together by natural will and who are together bonded to a set of shared ideas and ideals (Sergiovanni, 1994).

6. A place where active learners are engaged in matter of importance to them and where everybody is personally engaged in the process and supportive of the learning goals of members (Barth, 1990).

The extensive research of Kruse, Louis, and Bryk (1995, as cited in Roberts & Pruitt, 2009) led them to design a framework for forming a professional learning community that has as the focus five characteristics: (1) reflective dialogue, (2) focus on student learning, (3) interaction among colleagues, which is a method supported by Joyce and Showers' (2002) views on peer coaching, (4) collaboration, and (5) shared values and norms (p. 7).

The MTT Program participants, as a whole, based on many of the above definitions and characteristics have formed a professional learning community. For the MTT Program, the definition provided by DuFour et al., (2006) most accurately describes the actions of the participants. However, one would have to ponder the possibility that in the more individualized environment of their respective schools if the participants have created communities of practice.

The term "community of practice" (CoP) was coined in 1998 by Etienne Wenger. Communities of practice are composed of people who share common interests and participate in a shared domain of collaborative learning. Wenger (2006) defined communities of practice as "groups of people who share a concern or passion for something they do and learn how to do it better as they interact regularly" (p. 1). CoPs often focus on sharing best practices and creating new knowledge to advance a domain of professional practices (Cambridge, Kaplan, & Suter, 2005). Barab and Duffy (2000) indicate that CoPs share three essential characteristics. First, they share a common goal and/or heritage that goes beyond a specific period of time to address particular needs. Second, the CoP is made up of individuals who are connected to something

larger. Third, every CoP has the ability to regenerate itself as members enter and leave the community.

Communities of practice are dynamic social structures that require careful cultivation so that they can grow, reach, and sustain established goals. In forming communities of practice there are three characteristics that are crucial: (1) a commitment to the domain of interest, (2) in pursuing their interest, members should help each other and share information, and (3) become a community of practitioners who share a repertoire of resources (Wenger, 2006). It is the combination of these three characteristics that constitute a community of practice. These characteristics are applicable to the practitioners asynchronous and synchronous. When not physically together, members continue to actively configure means by which to extend their collaboration. Learning within a CoP is more than just being a member of the community; it is being active participants in the practices of the community and constructing an identity in relation to the community (Wenger, 1998).

Many consider PLCs and CoPs to be interchangeable, and although they do share some of the same components and goals, they are different. A snapshot comparison of the two may be seen in Table 1. Wenger and Snyder (2000) stated that "members share their experiences and knowledge in free-flowing, creative ways that foster new approaches to the problem" (p. 140). They also state that members learn together "by focusing on problems that were directly related to their particular situations" (p. 143). In the short term, this made the work of members more effective and in the long term helped members build shared practices. As members participate together not only are they learning the technical aspects of their particular activities, but they are also developing social learning from the skills that they must manage and incorporate to contribute to the overall success of the community (Wenger & Snyder, 2000)

Table 1

Snapshot Comparison of Community of Practices and Professional Learning Community

	What's the purpose?	**Who belongs?**	**What holds it together?**	**How long does it last?**
Community of Practice	To develop members' capabilities; to build and exchange knowledge	Members who select themselves	Passion, commitment, and identification with the group's expertise	As long as there is an interest in maintaining the group
Professional Learning Community	To have reflective dialogue that will allow members to collaboratively focus on student learning	Members from the education environment, parents, business leaders, and community members who have a vested interest	Supportive leadership and commitment to reaching the collective goal	Until the goal is met or the next reorganization

Note: Adapted from: Wenger and Snyder (2000).

Bruce Joyce and Beverly Showers have written much about peer coaching, and there are components of CoP that lend themselves to peer coaching. By discussing their individual practices, members become more invested and attuned to the practices of their peers and their effects upon their own practices; the members are able to learn from the successes and failures of each other. In this manner, each member has made his or her work meaningful to others and interdependency among the members is being built.

As previously mentioned, the entire MTT Program participant group can be considered a PLC, but an added benefit of this study was to examine the three participants through the potential lens of having formed their own CoP as they took the technologies and lessons learned

through the MTT workshops back to their particular school and engaged in designing and incorporating the technologies into their own classrooms as parlayed by the TPACK model.

Chapter Summary

This chapter began with a discussion relative to the professional development teachers receive and their perceptions toward that professional development. The literature lends indication that it would be more meaningful if teachers were provided with the democratic process and considerations into how the professional development they receive is designed and delivered. The MTT Program allows teachers some considerations into just that – how their professional development is designed and delivered.

The central focus of this study is aimed at how the participants are taking their technological training and preparing it for integration into their classroom instruction. By interviewing and observing three teachers, the researcher hopes to gain insight into the reasoning behind why these teachers chose particular technologies and the cognitive processes they went through in developing lessons to integrate into their classrooms. The theoretical framework used is the TPACK framework. Much has been written about TPACK, and there is a plethora of research into how teachers are using technology with their students, but there remains a deficiency in the research as to the cognitive rationales behind the decisions teachers make around technology integration within their classrooms.

Another goal of this study is to determine if the three participants under study have formed a community of practice as they have taken their gained technological knowledge back to their schools and have begun to work toward integration.

CHAPTER 3

METHODOLOGY

Chapter Introduction

A good 21st century educator is one who is cognizant of the rapidly changing technology trends and is able to apply those trends to the educational setting in a manner that will ensure students are not left behind in the wake of progress and have the necessary skills to compete in the global world (Partnership for 21st Century Skills, 2009). To provide students with these skills, teachers must first possess the very same 21st century skills that they expect their students to exhibit.

This study was designed to explore the insights of the Master Technology Teacher (MTT) participants regarding their instructional practices following their technology professional development opportunities. Specifically, the assessment was focused on the degree to which the MTTs have integrated the technology tools (introduced throughout the MTT Program) into their classroom curriculum practices. This case study sought to answer the following questions:

1. How has participating in the MTT Program changed each teacher's approach to integrating technology into the classroom curriculum?
2. What decisions were made in the area of content and pedagogy to facilitate the inclusion of technology?
3. Did the teachers integrate technology into the curriculum that met the TPACK model of instruction?

The procedures and methods that will guide this study are presented in the following sections. The first sections provide a rationale for the study and a description of the study. Next, the study demographics, data collection procedures, and data analysis procedures will be described. The last section describes the role of the researcher and processes and procedures the researcher employed to add credibility, validity, and trustworthiness to the study.

Rationale for Case Study Design

A case study is the study of a "bounded system," with the focus being the case or an issue that is illustrated by the case. The case might be an event, process, program, or individual(s) (Stake, 1995). Creswell (2007, p. 73) cites Stake (2005), as seeing a case study not as a methodology but a choice of what is to be studied (Creswell, 2007). For others, it is a methodology, a strategy of inquiry (Denzin & Lincoln, 2005; Merriam, 1998; Yin 2003). Creswell views the case study as "a methodology, a type of design in qualitative research, or an object of study, as well as a product of the inquiry" (2007, p. 73). Case studies rely on historical and document analysis, interviewing, and some forms of observation for data collection (Marshall & Rossman, 2011). A case study offers the ability to take the reader into a setting with a clarity and intensity that he/she would not otherwise receive in an analytic reporting format.

Researchers engage in case studies because they wish to investigate and examine phenomena in detail within its real-life context; the focus is on the in-depth understanding of the phenomena (Cavaye, 1996). Merriam (1998) stated, "Qualitative researchers are interested in the meaning people have constructed" (p. 6). This is a statement which Creswell (2007) and Marshall and Rossman (2011) reiterate in their publications on qualitative research. Case studies

are multi-perspective analyses in which the researcher considers the voice and perspective of the individual participants and simultaneously considers the interactions with their environments.

In this case study, interviewing and observing the three MTT Program participants allowed the researcher to capture and report their experiences and gain an in-depth understanding of their thoughts on the technological professional development they received through the MTT Program and the decision making process they each underwent as they considered what technologies to incorporate and how to incorporate them into their curriculum and classrooms.

Types of case study research design. The types of qualitative case studies are "distinguished by the size of the bounded case, such as whether the case involves one individual, several individuals, a group, an entire program, or an activity" (Creswell, 2007, p. 74). Three variations exist under which the case study may be facilitated: the single instrumental case study, the collective or multiple case study, and the intrinsic case study (Creswell, 2007). In the single case study, the researcher focuses on an issue of concern and then chooses one bounded case to illustrate the issue of concern (Stake, 1995). In the collective or multiple case study, the researcher again focuses on one issue of concern but selects multiple cases of analysis to illustrate the issue of concern. By selecting multiple cases the researcher is able to compare and contrast the cases. The third variation of case studies is the intrinsic case study which focuses on the case itself because of the uniqueness of the phenomenon (Stake, 1995).

Miles and Huberman (1994) and McMillan and Schumacher (1997) indicate that a case study is a phenomenon of investigation that occurs through the scope of a bounded context. Creswell (2007) stated that case studies have the intent to "help people learn about phenomena and give voice to individuals who would otherwise not be heard" (p. 214). Creswell also stated that the intent of a case study should be to describe a particular phenomenon with in-depth

clarity and not to generalize it or the research population. The instrumental case study is used to provide a general understanding of a phenomenon. For this case study the researcher chose this type of case study because she was seeking to develop a general understanding of a phenomenon rather than to describe the uniqueness of the case.

Describing the case study method of research design, Hatch (2002), adapting from the works of Marshall and Rossman (1995) and van Manen (1990), indicates that it consist of (1) protocol writing (asking individuals to write their experiences down), (2) interviewing (gathering experiential narrative material through conversation), and (3) observing (collecting anecdotes of experience through close observation). This study utilized a blending of the case study design and the characteristics of research proposed by Creswell and Hatch so that an in-depth understanding could be gained about the decisions the study participants made regarding the technologies received through the MTT Program professional development and how those technologies were integrated into their classroom curriculums.

Participants and Setting

This case study was conducted at a large urban high school (9-12) of approximately 850 students in the southeast United States. The school was created approximately ten years ago when the system decided to build community high schools and to discontinue the mega high school format. The high school was built with 21st century instruction in mind regarding technology. Each classroom is equipped with computer-based and non-computer based technologies. Computer-based technologies include, but are not limited to, a teacher computer, Elmo, data projector, printer, and interactive white board. Non-computer based technologies include, but are not limited to, two whiteboards, overhead projectors, and pen/pencil/paper. The

school also has five computer labs, containing approximately 180 computers, and a mobile lab of 30 laptops. The school has Wi-Fi which allows students to bring their own devices and for teachers to use other 21st century technologies such as smart phones, iPads, and iPods.

The participants for this study, chosen by purposeful sampling, were identified by three intermediaries because they knew the MTT sample population and could best identify the characteristics of participants needed for this study. The participants were chosen from the seven MTTs at this school based on the characteristics of being expert teachers in the program, using technology with their students, and their leadership at the school as teacher-leaders in developing professional development through technology. They were also purposefully chosen because of the location–the participants and researcher all teach on the same campus. The three participants chosen for this study teach English, French, and social studies. For the purpose of this study, subject discipline was not a consideration. Creswell (2007) observed that participants should be chosen because they have experiences that are more relevant to the phenomenon to be researched rather than representative of the larger population connected to the phenomenon of study.

Due to the confidentiality assurances provided to the participants, actual participants' names were not used in the study. They will be referenced as Teacher A, Teacher B, and Teacher C. Each participant was required to sign a form consenting to the study (Appendix C). The students, although part of the observations, were not included in the study, but in order to ensure that ethical research principals were observed, they were requested to return signed consent forms (Appendix C).

Teacher A teaches English and currently teaches English 11, Honors English 11, and AP Literature. She has taught for eight years with all eight years being at the high school in this study. Teacher A holds a bachelor's degree in secondary education English and is currently

pursuing a master's degree in secondary education English. She has been a member of the MTT Program for seven years.

Teacher B teaches French and is currently teaching French I, French II, and French III. She has taught for three years. Teacher B's teaching situation is unique in that she divides her teaching load between two high schools, teaching one half day at each school. She holds a bachelor's degree in foreign languages. She has been a member of the MTT Program for three years.

Teacher C teaches social studies and is currently teaching world history in the freshmen academy. She has taught for twelve years, with the past eight years at the high school in the study. Teacher C holds bachelor's and master's degrees in secondary education social studies. She has been a member of the MTT Program for two years.

Table 2

Teachers Quick Reference

	Discipline	**Current Subjects**	**Years Teaching**	**Highest Level of Education**	**Years at Current School**	**Years in MTT**
Teacher A	English	English 11; Honors English 11; AP Literature	8	B.S.	8	7
Teacher B	French	French I; French II; French III	3	B.S.	3	3
Teacher C	Social Studies	world history	12	M.A.	8	2

While these teachers have had a plethora of professional development opportunities, they have not been exposed to the TPACK model of instruction. Any knowledge they have of TPACK and the TPACK model of instruction they have obtained on their own. Teacher A knew what the acronym stood for and had viewed a video from her RSS Reader that allowed her to "visualize what it means and that it's now important to think about all three components as part of the big picture," but she really did not know how the overall concept was to be achieved. Teacher B had never heard the term, and Teacher C only knew that the *T* and *P* in the acronym stood for technology and pedagogy. It is important to note that the knowledge of the term should not affect a teacher's pedagogical practices or this study, but what could affect the findings of this study is if the teachers had knowledge of the process of the TPACK model of instruction. The three teachers in this study have not explicitly been introduced to the TPACK model of instruction. The fact that the teachers in this study have varying levels of knowledge allow for their pedagogical practices regarding the integration of technology to be more level. Given this factor, an interesting point of this study will be to see which teachers integrate the TPACK model of instruction without explicit realization.

Data Collection

Once a researcher has identified the purpose of the research she is then able to identify the appropriate method for gathering the research information. In this case, the research was a case study, inclusive of the interview and observation methods prescribed by Creswell (2007), Hatch (2002), and Marshall and Rossman (2011). Before any data collection methods were employed, Institutional Review Board (IRB) certification was gained (see Appendix D) and

permission was requested and granted by the Institutional Review Board (IRB) (see Appendix E). This ensured that the research methods were appropriately designed and beholding to the ethical considerations of research. Once the IRB granted permission the researcher engaged the participants in the interview and observation protocols, processed and coded the data, and wrote the interpretation of the findings.

Data for this study came from two main sources–interviews and observations. Each participant was interviewed in a guided interview. The interview protocol questions (see Appendix F), formulated from the research literature, helped to guide the interview and led to information that answered the research questions. The interview questions were formulated in categories that would allow the participant to provide answers relative to their individual, curriculum, and institutional perceptions of professional development and technology integration. Each study participant was observed twice in her classroom as she integrated technology with her students (see Appendix G for protocols). Pre- and post-interviews were conducted during each observation (they will be discussed in the observation section). From these observations, extensive fieldnotes were taken and coded, generating additional information that answered the research questions. In addition to the extensive fieldnotes, the Technology Integration Observation Instrument (TIOI) (Hofer, Grandgenett, Harris, & Swan, 2011) was used to score the classroom observations. The information gained from the interviews was coupled with the information gained from the observations in order to provide a more detailed and relevant answer to the research questions.

As part of the IRB process, consent forms were designed to ensure that the ethical protocols of research were followed, and the three participants were required to sign the form before becoming part of the study (see Appendix C). In an effort to ensure that ethical protocols

were extended to the students of the teachers, consent forms were designed and provided to their guardians for signature. The students who returned the forms were filmed as part of the observation, and those who did not return the forms were seated where they were not videotaped.

Interviews

Kvale and Brinkmann (2009) note, "An interview is literally an inter view, an inter change of views between two persons" (p. 2). One of the most important considerations of interviews is that the researcher approaches the interview in the manner that respects the participants' views as valuable and useful. Patton (2002) categorizes interviews into three types: 1) the informal, conversational interview; 2) the interview guide or topical approach; and 3) the standardized, open-ended interview (pp. 341-347). For this case study, the interview guide or topical approach was chosen. This choice allowed the researcher to conduct the interviews in a guided format using the interview guide (see Appendix F). The aim of the interview was to bring forth stories about the lives of the participants in relation to their roles as MTT Program participants and how the learned technologies influenced their choices in integrating the technologies into their curriculums. A series of interview questions were written, based on the research literature findings and the TPACK framework, that allowed the researcher to investigate and seek answers that helped to answer the proposed research questions (see Appendix F). The interview questions were formulated into categories that would allow the interviewees to provide answers relative to their individual, curricula, and institutional perceptions of professional development, pedagogy, and technology integration.

Two of the three interviewees (Teacher A and Teacher B) were interviewed in the library media center (LMC) conference room during the teachers' planning period. The interview for

Teacher C was conducted in her classroom during her planning period. Each of the two locations allowed for the interview to be conducted in a relaxed and uninterrupted manner. However, the interview with Teacher A was interrupted by her end of school duty. It was resumed the following day in the same location and at the same time. The interview for Teacher A was approximately 1 hour and 15 minutes in length, combining both interview sessions. The interview for Teacher B was approximately 40 minutes and the interview for Teacher C was approximately 30 minutes. As previously stated the interviews were guided by the protocol questions. The researcher did not probe the participants unless she felt that their answer needed clarification or a more detailed response. At that point, she deviated from the protocol questions by requesting the participants to "please clarify" or "can you provide more details or an example."

During the interview, the researcher wrote down the participants' answers for the demographics portion of the interview protocol and allowed the digital voice recorder to function for the remainder of the interview. By not taking notes during the interview, the researcher was able to focus on the participant and not be distracted by the process of writing, thereby noticing important voice reflections and body languages. The data collected during the interview, both written and recorded, were transcribed, and sent to the participants for member-check, assuring the validity and authenticity of the interview and case study relative to this portion of data collection.

Observations

Observations provide a mechanism to conduct research in a more realistic environment, which could reveal more about the research question(s) than the guided interview (Marshall &

Rossman, 2011). Information such as body language, delivery methods, and environmental details are able to be observed, which will only add to the formal data of the interview process (Marshall & Rossman, 2011). Participant observation also offers the possibilities for the researcher to go from being a complete outsider to being a complete insider (Jorgensen, 1989).

Each study participant was observed twice in her classroom instructional environment or one of equal purpose (i.e., computer lab or LMC). Each observation lasted between forty-five minutes and one hour. The researcher felt the allotted time was sufficient to observe the study participants execute the lesson and to observe student engagement in the lesson. The purpose of the observations was to view the study participants integrating technology with their students. The TIOI, developed by Hofer, Grandgenett, Harris, and Swan (2011), was used to aid the research in determining the level of technology integration. In addition to this instrument, the researcher jotted extensive fieldnotes, which were later expanded through the transcription process. Before each observation a pre-observation interview was conducted (see Appendix G for protocols) that provided the researcher with an understanding of what she was going to be observing. After each observation a post-observation interview was conducted as a debriefing and provided the teacher time to reflect upon the lesson and technology integration.

The TIOI was adapted from the Technology Integration Assessment Instrument (TIAI) developed by Harris, Grandgenette, and Hofer (2010). The TIAI is used in an interview to determine the level of technology integration, whereas the TIOI is used in the observation to measure the same. The TIOI's design was to focus on the actual use of technology in any teaching approach the observed instructor had chosen to employ. Both instruments have been used many times in their research, as well as others, to judge the level of technology integration into the curriculum. The researcher found the TIOI to be subjective in that it requires the

researcher to define the individual scoring categories (see underlined words in Appendix H). The researcher contacted Dr. Judi Harris, one of the instrument's creators, via email requesting the definitions of the scoring categories. Dr. Harris (personal communication) responded April 3, 2012, stating that they did not "see each word to have a standalone definition. Instead, we see each row of the rubric as a continuum of congruence or 'fit' between the elements included in the cells' text, based upon what appears in parentheses in the leftmost cell of the row." Thereby the scoring elements were subjective in that the person scoring the rubric had to determine their meaning; they had to determine the rationale for how the cells and rows fit the continuum and allowed for the observed to be scored. The researcher developed the definitions, outlined in Table 3, pertinent to the observations of this research. This allowed her to adapt the instrument making it more applicable to the context of her study.

In each observation, fieldnotes were taken that allowed the researcher to maintain a record of the people, setting, actions, and conversations as they were observed. For this study, as prescribed by Creswell (2007), the fieldnotes of the researcher were detailed, nonjudgmental (as much as possible), and concrete descriptions of what was observed. The fieldnotes taken by the researcher in this case study were descriptive fieldnotes, which allowed the researcher to record a "word-picture" of the setting and environment as observed. The observations were videotaped for the researcher to review for potential research biases she may have had due to the professional relationship to the participants. Each videotaped observation was reviewed to ensure that biases did not occur. The researcher was very careful to maintain an unbiased position and upon review feels that she did not allow biases into the observations and maintained and objective balance

Table 3

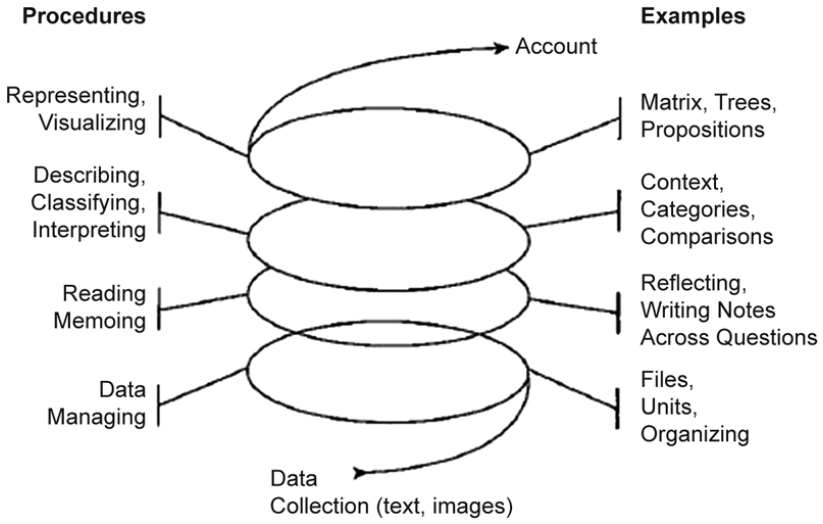
Researcher Definitions for the Technology Integration Observation Instrument.

	4	3	2	1
Curriculum Goals & Technologies	**Strongly aligned** Technologies used meet all curriculum goals	**Aligned** Technologies used meet two or more, but not all, of the curriculum goals	**Partially aligned** Technologies used meet only one of the curriculum goals	**Not aligned** Technologies used do not meet the curriculum goals.
Instructional Strategies & Technologies	**Optimally support** Technologies used allows students to complete the assignment as instructionally designed	**Supports** Technologies used allows students to complete the assignment as designed with slight modification to the instruction strategies	**Minimally supports** Technologies used allows students to complete assignment as designed with significant modifications to instructional strategies	**Does not support** Technologies used does not support the instructional strategies
Technology Selection(s)	**Exemplary** Technologies selected allows students to fully complete the assignment without modifications	**Appropriate, but not exemplary** Technologies selected allows students to meet more than half of the goals of the assignment	**Marginally appropriate** Technologies selected allows students to meet less than half of the goals of the assignment	**Inappropriate** Technologies selected does not allow the students to meet the goals of the assignment
"Fit"	**Fit together strongly** The technologies selected meet all instructional strategies and curriculum goals	**Fit together** The technologies selected meet at least two of the instructional strategies and curriculum goals	**Fit together somewhat** The technologies selected meet at least one instructional strategies and curriculum goals	**Do not fit together** The technologies selected does not support the instructional strategies and curriculum goals
Instructional Use	**Maximally effective** The technologies selected allow the students to achieve all of the lesson goals	**Effective** The technologies selected allow the students to achieve at least two of the lesson goals	**Minimally effective** The technologies selected allow the students to achieve at least one of the lesson goals	**Ineffective** The technologies selected does not allow the students to achieve the lesson goals
Technology Logistics	**Very well** Teachers and/or students operate technologies smoothly and without assistance	**Well** Teachers and/or students operate technologies without assistance, solving their own issues	**Adequately** Teachers and/or students could not operate technologies without verbal assistance	**Inadequately** Teachers and/or students could not operate technologies without physical assistance

Note: Adapted from: Hofer, Grandgenett, Harris, & Swan (2011).

Data Analysis/Coding

Data analysis is custom-built, revised, and "choreographed" (Huberman & Miles, 1994). The processes of data analysis are not distinct steps in the process–they are interrelated and often go on simultaneously in the research process. Creswell (2007) stated that qualitative researchers often learn "by doing data analysis" (p. 150). Metaphorically, he views data analysis as a spiraling process (see Figure 2).



Source: Creswell (2007)

Figure 2. The Data Analysis Spiral.

All of the data that were collected from this research were transcribed and coded for themes using a modified method of open, axial, and selective coding, that Creswell described for grounded theory research. The researcher for this case study was trained in its methods and finds value in its processes. The intent of a grounded theory study is to "move beyond description and generate or discover a theory" (Creswell, 2007, p. 63). The participants in a grounded theory study would have had experienced the phenomenon being studied and would be able to offer general explanations of the process that would aid the researcher in developing a theory. The

theories for this study have already been created by Mishra and Koehler (2006) and Harris, Mishra, and Koehler (2009), but it is the experiences of the participants that the researcher found most valuable in examining. The template (see Figure 3) modified and used for coding this case study was developed by Creswell (2007). What he illustrated through this figure was a multiple case study, but for her particular study the researcher modified this for a single case study.

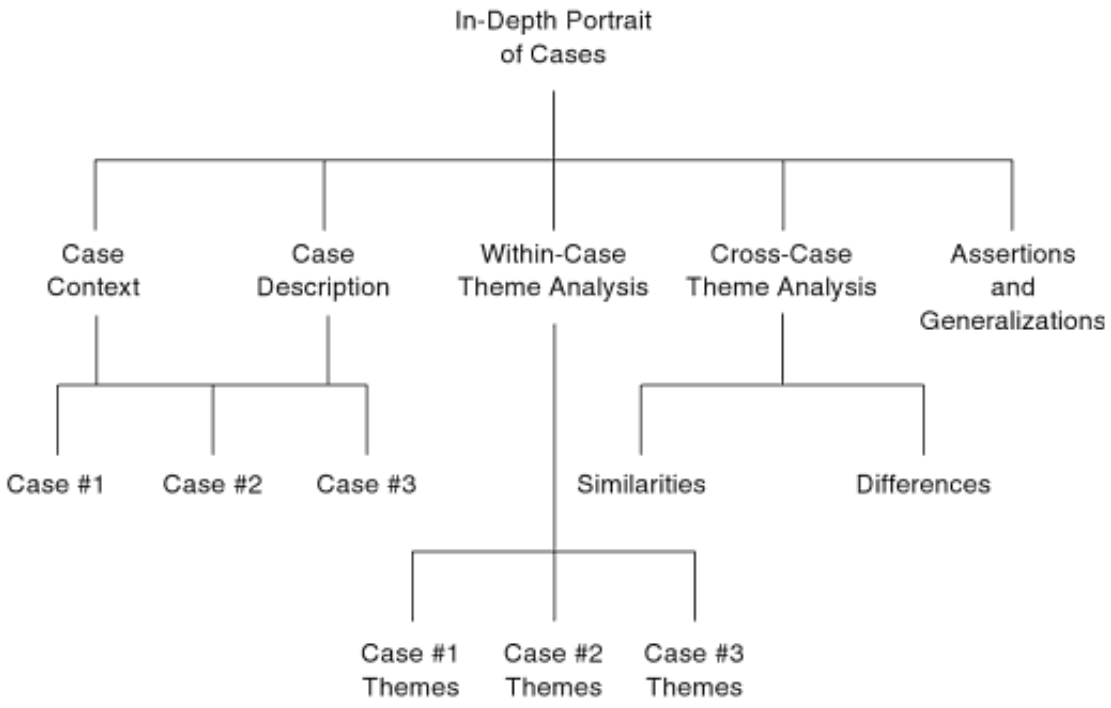


Figure 3. Template for coding a case study (Creswell, 2007).

In the case context and case description steps, the researcher simply sets the case within its setting and begins stating the facts of the case study. Stake (1995) calls these steps the conceptualization and "narrative description" (p. 123) of the case study. In the case description step, the researcher begins to analyze and code the data for potential themes, which become more distinguished in the within-case step. In within-case analysis, the researcher analyzes the data collected from the participants for themes, which are further analyzed for similarities and

differences among the participants in the cross-case analysis step. The researcher adapted these two steps to fit the needs of her data analysis and merge them with the open, axial, and selective coding process in which she was trained. The final step is the assertion and generalization step. In this step the researcher makes sense of the data and provides the reader with an interpretation of the data and constructs meanings for the case study and implications for future constructs.

The interviews were conducted and coded for themes relative to professional development and how the professional development received affects how the teachers integrated the TPACK model of instruction into their classroom lessons. The observations followed, with the researcher taking extensive fieldnotes, and each observation was coded for themes along the same consensus. The observations were also scored using the TIOI (see Appendix H) created by Hofer, Grandgenett, Harris, and Swan (2011).

The Role of the Researcher

This researcher has been a teacher for more than ten years and during that period has attended a vast array of professional development workshops, seminars, and conferences that have played integral parts on shaping how she delivers classroom instruction. However, in the respects of this study she has a valuable perspective because (1) she is a member of the MTT Program, (2) she works with those who will be study participants, (3) she is a technology leader at her school, and (4) she integrates technology into her classroom curriculum.

These factors may also be considered hindrances of the research. Qualitative research has regularly pointed to the centrality of the relationship between researcher and research for the knowledge produced. Having been so integrally involved, this researcher recognized that there was not a completely effective way to wholly separate herself from the process. In performing

the research, this researcher had to be aware of the powers that she held as the researcher, a colleague of the participants, and a member of the group being researched. From this perspective, she recognized that there were biases that would be brought to the research process and that there must have been a conscientious effort to be as objective as possible.

Trustworthiness/Validity

Denzin and Lincoln (1994) and Lincoln and Guba (1985) suggest that four factors be considered in establishing the trustworthiness of findings from qualitative research: (1) credibility, (2) transferability, (3) dependability, and (4) confirmability. Creswell (2008) believes that verification is critical to evaluating the quality of research. He identified eight procedures for verifying the research findings: (1) prolonged engagement and persistent observation, (2) triangulation, (3) peer review or debriefing, (4) negative case analysis, (5) clarification of researcher bias (reflexivity), (6) member-checking, (7) rich, thick description, and (8) external audits. He recommends that any research study employ at least two of these procedures.

Of course, a study is only as trustworthy as the existing literature, participants, and researcher. To be credible, one must have confidence in the truth of the findings, and this can be established by various methods. The two methods of validity for this study were member checking and triangulation. The researcher used the member-checking method by having the participants review their interview transcripts for accuracy and validity and for any further insights they may have had in the ending interview. Triangulation allowed for the data from the interviews and observations to be compared to ensure that the researcher had gotten the

participants' real views and authentic behavior regarding the integration of technology into the classroom curriculum.

Chapter Summary

The case study described above allowed the researcher to gain insight into the experiences of the participants as they worked to integrate technology into their classroom curriculums by examining their cognitive processes through the TPACK framework. The chapter explained the rationale for the study's design and described the strategies the researcher used for the data collection and analysis procedures.

CHAPTER 4

FINDINGS

Chapter Introduction

This chapter discusses the analysis of data obtained from three guided interviews, the pre- and post-observation interviews, fieldnotes from the six observations and the Technology Integration Observation Instrument (TIOI) scoring (Hofer, Grandgenett, Harris, & Swan, 2011). The first section provides the reader with the context for the study. The remainder of the chapter relates the findings of the three research questions. Question 1 provides the reader with the perceptions of the participants regarding professional development, in general, and received through the MTT Program that allowed participants to integrate or improve technology in their instructional practices and the development of a community of practice (CoP), which was a latent purpose of the study. The findings of the second research question provide the readers insight into the decisions the teachers made to integrate technology-based lessons. Question 3 reveals the findings relative to the teachers' integration of technology that met a TPACK model of instruction.

Context

The study was designed to explore the insights of the MTT Program participants regarding their instructional practices following their MTT Program professional development opportunities. Specifically, the assessment was focused on the degree to which the MTTs have integrated technology tools, many of which were introduced throughout the MTT Program, into

their classroom curriculum practices. The goal was to determine if the participants had converged technology with their content knowledge (CK) and pedagogical knowledge (PK), resulting in a TPACK model of instruction as designed by Mishra and Koehler (2006).

Research Question 1

How has being a participant in the MTT Program influenced the teacher's integration of technology into the classroom curriculum?

This section summarizes the findings that were developed from the data analysis of the interviews. In order to answer this question, guided interviews were conducted, and the transcripts were coded and analyzed accordingly for recurring themes. This section will present the findings and answer research question 1. The interview protocol (Appendix F) was situated in a manner that allowed for the participants to reveal their perceptions on the professional development received through the MTT Program, how the MTT Program influenced their use of technology in the classroom, and how the professional development and technology influenced them and their school through three contexts: (a) individual, (b) curricula, and (c) institutional. The three contexts became noticeable as the protocol questions were being formulated from the research literature. The researcher noticed that the three contexts would allow for her to gain insight into the perceptions the participants held in three separate spheres and would reveal the overarching issues on all three levels that would allow the researcher to gain the greatest understanding of their lived experiences.

Individual Context. The individual context dealt with why the individuals became a member of the MTT Program, their perceptions of the professional development received through the program, and the professional collaborations/partnerships they made, which became

the first finding from the coded data. The section also dealt with their perceptions on how they situated the professional development to allow them to integrate technology into their curriculum.

Each teacher indicated that she became a member of the MTT Program because it would provide her an opportunity to grow as an educator and to accomplish the goals of integrating more technologies into the classroom curriculum. For Teacher C, being a member of the MTT Program allowed her to "incorporate technology into the curriculum not for technology's sake, but with the purpose of increasing student engagement." For Teacher B, joining the MTT Program during her first year as a teacher allowed her to develop a mentoring group:

> I think the time out of the classroom to analyze what you are doing in the classroom with other professionals helps you see things that you couldn't see otherwise. It's encouraging to know that there are others who want to develop into good teachers with good lessons.

Each study participant indicated in her respective interview that being a participant of the MTT Program allowed her to become more confident in the approaches and methods that they employ to bring technology into her classroom. The teachers all stated that the professional development delivered through the MTT Program sessions helped them to grow in their own technology experiences and to be more willing to bring new technologies to their students. Teacher A stated:

> I think that my experience with MTT has made me be a little more willing to take risks that I would not have if I had been on my own. It has made me seek out things on my own that I may not have done before, so it has made me a continual learner. It has also given me more confidence because I know there is a group of educators who, like me, are also being reflective in their practices and we can have these experiences together.

This thought was also one affirmed by Teacher B and Teacher C in their interviews. Being a member of the MTT Program allowed them to integrate 21st century technologies and to take risks in their classrooms without being afraid; it was permissible to experiment and to learn alongside the students. Teacher B stated, "It's helped me to not be afraid to try something new or not to be afraid of something going wrong; just to take chances. To even allow the students to experiment with technology and figure it out on their own." Teacher C indicated, "Because of MTT, I have gained confidence in integrating the 21st century technologies and using technology with a purpose." The collaboration and partnership that developed among the study participants and the other MTT Program participants, as indicated by the participants in their interviews, provided the sense of support and empathy for taking on new ideas and risks.

For all three teachers, being members of the MTT Program has allowed them to expand their technological knowledge and professional development beyond the MTT Program. They have taken multiple professional development technology sessions from many sources, as indicated in their interviews, that have allowed them to integrate other technologies into the classroom, to become on-line facilitators, to present at conferences, and to connect internationally with other professionals through electronic discussion boards or Twitter. Teacher A best summed up these alternative experiences that professional development opportunities have provided when she stated:

> Having all of these professional development opportunities centered around technology only makes me a little more sensitive in making sure that what I present to my students is a little more relevant and hands-on and engaging because that is what is important if they are truly to be engaged in positive learning environments.

Although these three teachers became members of the MTT Program at various times, it is evident from their responses in their interview that being engaged in the professional development offered allowed them to significantly change their approaches to integrating technology into the classroom. As stated by Teacher A:

> MTT has influenced my technology use in the classroom and has helped me develop lessons that use technology for my students to achieve learning goals. It has also made some things I do for them more engaging.

Teacher B stated that because of the MTT Program she has,

> taken a look at the technology that my school already had that I could use and I have not been afraid to try something new and adapt the technologies, those we already had and new ones, to give my students a chance to experiment and develop new skills.

Teacher C has changed how she integrates technology by,

> learning from the experiences of other teachers and how they incorporate technology to make it more inside the classroom, hands-on, and what you can do quick and other ways instead of whole group. I don't just take my students to the computer lab anymore to "do this assignment." We go with a purpose and that came from the interactions I've had in MTT.

They are now more willing to take chances and find the technologies that will enhance the lesson instead of just using technology for technology's sake.

Curricula Context. The curricula context dealt with the pedagogical, content, and technological decisions the participants made regarding the integration of technologies into their classroom lessons and curriculum content.

The three teachers in this study agreed that before becoming MTT Program participants they used technology more as a method of delivering content (i.e., PowerPoint, Word) than as a method of engaging students in the cognitive discovery of the content or directed learning activities. They credit the professional development they have received through the MTT Program with greatly increasing their ability to bring more technologies into the classroom, allowing them to create lessons that are technology driven and student-centered instead of teacher-centered, which they felt they were before receiving professional development from the MTT Program. These teachers have been able to place more content lessons into the hands of their students that are meaningful and not just for show in using technology. Teacher B, as a result of her short tenure in the field, has a unique situation. Teacher B has been a member of the MTT Program since her first year of teaching. Her situation has allowed her to mature in her pedagogical practices and in her practices of developing technology-based lessons. Teacher B indicated that although she had always tried to use technology whenever she could, she now tries to figure out what "technologies will benefit the students and not just be another hoop to jump through."

All three teachers agreed that since becoming a participant in the MTT Program they use technology more purposefully. Teacher C stated, "Each integration of technology into the classroom curriculum should done purposefully." Each teacher was asked if she *chose technology tools that were content specific or tools that could be used across the curriculum* (research question) and Teacher A and Teacher C responded that the majority of technology tools they chose could be used cross-curricular and that they rarely chose content specific technologies because they did not want to limit the students. Teacher A stated that when choosing the tools she chose tools that could purposely be used across the curriculum because

"the chances of the students having used them before were high and that they would know how to use them and could continue building their own technology skills." Examples of the tools would include Edmodo and WordPress. Teacher B indicated that she chose the technologies used in her classroom almost equally for the content purpose and for the cross-curriculum purpose, but that she "did look for technologies that could be molded to meet my lesson needs easily, like Quizlet, for the students to learn the French vocabulary."

The factor of importance to all three teachers when preparing to teach a topic or particular lesson was not the technology itself, but how the technology would allow the students to develop certain skills and to learn the content in the most beneficial manner. The skills they wanted their students to develop was the second finding revealed from coding the transcripts. The difference among the three teachers was how they organized the lessons that ensured the content, cognitive, and technology skills were learned. Teacher B and Teacher C allowed the content to dictate what technology was chosen. For Teacher B the goal was often to have students work collaboratively toward developing the proper pronunciation and carrying on conversations in French. She had to cover her content in a linear approach and chose technologies that would allow the content goals to be achieved. Teacher B stated,

> I would love to have a classroom where only French is spoken, but I know that too many students are not going to participate in that format. Therefore, I try to find resources that will allow them to participate in various ways in developing the skills they need for learning and applying the language.

For Teacher C, content also was the premier deciding factor. She focused on the higher order cognitive skills she wanted her students to use in learning the content material, and once she had determined how to address those skills, she chose the appropriate technologies that would most

benefit the students as they proceeded toward the objectives. Teacher C, upon beginning the lesson planning process, stated that she "identified an essential question and then would design the lesson to allow the students to interpret the question(s) and discover for themselves the information to be learned from the essential question." Teacher A first identified the cognitive skills, such as higher order thinking or synthesis and analysis, that she wanted her students to learn then determined the technology that would best facilitate the acquisition of the skills before she chose the course content. Teacher A stated:

> I want my students, through the technology and content, to develop for themselves an understanding of the materials and the research process of uncovering meaning to the content objectives. I want my students to be able to think and employee the research skills needed to find the answers on their own.

Whether it is the content or the skills driving the decision making, all three teachers agreed that the influence of technology has allowed them to make their instruction more student-centered. It has also allowed them to focus more on the learning skills they wish their students to possess, and because the instruction is more student-centered, the teachers have more time to plan lessons that are purposely focused on skills and technological collaboration.

Institutional Context. The institutional context dealt with how the participants saw the integration of technology on a school-wide level and the components necessary to help faculty integrate technology into their curriculums.

The three teachers in this study, based on their interview responses, know they are teaching students for the 21st century and for jobs that have yet to be created. In that context they realize the importance of technology and the need for sustained professional development that will allow them, and their colleagues, to continue developing curriculum that will deliver the

skills their students will need to compete in the 21st century. Teacher C stated, "Technology, when used with a purpose in mind, with an objective in mind, can greatly enhance learning because students will be more engaged." This is a thought that was also shared by Teacher B when she stated:

> We are trying to teach our students for things that they will face or need to know for the future. The technology has to reflect that; it has to be current and up-to-date. It has be to meaningful for them and help them develop the skills to not only enable them to perform the task at hand, but teach them skills and the necessary knowledge so that if they are presented with a similar situation they have the know-how of applying these skills.

This ideal is one that is held on the institutional level because in the interview responses, three participants indicated their impressions that many of their colleagues understand the importance of integrating technologies into their curriculum. Despite these teachers willingness to integrate technology into their curriculum, there is a "significant number of teachers who realize the importance of technology and the enhancements it can bring to their curriculum but are apprehensive about its integration," as noted by Teacher A. She also noted, "Given a lot of support and very small, on-going, increments of technology professional development these teachers could make really substantial strides in technology integration in the classroom."

The third finding that was revealed from coding the transcripts was the need for sustained professional development. All three teachers agreed that in order for them to bring 21st century technologies and meaningful instruction to their classrooms, the professional development they receive must be sustained, such as that provided by the MTT Program. Receiving professional

development from the MTT Program allows for the "greatest experience" in the perceptions held by Teacher A:

> With the MTT seminars you have a group of like-minded teachers gathering together who all have the same desire to change their practice in some way, some substantial way, and they are open to dialogue and to opening their classrooms if it will better the practices of all.

According to the participants, as gathered from the interviews, the professional development offered by the MTT Program is more than just professional development for its participants. Its organizational structure allows for its participants to feel more familial and comfortable. The seminars allow for participants to come together, share new ideas, bring the resources they have found, as well as those learned from the structured professional development, and take that all back to their classrooms to implement for their students. In each interview, the study participant commented that they appreciated the professional development opportunities of the MTT Program due to the seminars being offered by local professionals and teachers who are in the field, who know what is going on in the classroom and can offer new research and practices that are more specific for the realities of the classroom. Teacher A stated:

> Good professional development does not come from outside consultants, but it comes best from people who are there every day, who know what's going on and who have your best interest and the best interest of your students in mind. It needs to come from people, I think, who are already within your system, within your school, or whatever the case may be because those are the people who can speak in a way that is going to resonant with the people who are listening.

The interview responses indicate to the researcher that the members, through the professional development offered by the MTT program, have developed a Professional Learning Community (PLC), but beyond that the members at the individualized schools have formed a Community of Practice (CoP). A CoP is defined as "groups of people informally bound together by shared expertise and passion for a joint enterprise" (Wenger & Snyder, 2000, p. 139). When presented a question in the interview regarding their formation of a CoP among themselves, all three teachers agreed that they felt they had formed such a practice. Teacher C stated:

> Before MTT, we didn't share our technology finds among each other as much as we do now. Now that we have been participating in the MTT Program for a time we now more openly share our finds. Thinking in terms of the definition (provided by Wenger and Snyder, 2000, p. 139) I know we have created a CoP because we readily email, text, or Tweet things that we come across that we think each other might find helpful in some way. Also when we see each other in the hallway we typically are sharing something relative to technology, even if that wasn't the initial point of conversation.

Teacher A stated:

> We have people who have been members of MTT at various times, but they did not share the passion about technology that we did. I think if you have the passion to change your practice, if you have the passion to do something new, to be innovative in your classroom and be a learner yourself and not to be afraid to try out something new, then the expertise will come from that passion, and we all help each other with the passions that grow the expertise.

Summary of Research Question 1

The three teachers in this study became members of the MTT Program because they had previously used technology in their classrooms and saw the MTT Program as a means of continuing their vested interests toward technology integration. Each teacher stated that it was the way the professional development was situated within the MTT Program seminars that elicited her initial interest in the program. The professional development was situated in such a manner that was hands-on, collaborative, and engaging. The teachers preferred this method because it allowed them to consummate the learning experience. An added advantage to this professional development approach was that the sessions were conducted by professionals and teachers who were within the local educational systems and knew the needs of the participants and their students.

The sessions provided the participants with new tools, new ideas, and an agency for face-to-face collaboration. The majority of the participants were like-minded and shared similar desires to change their pedagogical practices in substantial ways. The collaboration that was developed at the sessions became a greater asset to the participants as they maintained that collaboration between the sessions by continuing to share ideas and to discuss issues.

To the three participants in this study, the collaboration experienced during the MTT Program sessions were personable, allowed them democratic participation in their professional development, and encouraged them to become the type of learners who are not afraid to fail when trying new ideas using emerging technologies. The professional development they received from the MTT Program sessions focused on using technology not for technology's sake but using technology to enhance their students' skills and to help them learn new skills via the technologies that would imminently allow them to reach curriculum goals.

Research Question 2

What decisions were made in the area of content and pedagogy to allow for the inclusions of technology?

Research question 2 sought to examine the pedagogical and content decisions that the teachers considered and made when designing curriculum that included technology. A series of questions were written that required the teachers to think through the process, in linear formation, and to explain the decisions they made and why they were made.

When first contemplating the inclusion of technology in a lesson and what technology to include, a first consideration made by the teachers was that the technology would not be just "another hoop to jump through" (Teacher B). They each approached the process differently, but the final result in their decisions was to ensure that the technology was purposefully used and not just for the sake of using technology.

Teacher A, due to the course she teaches, has a unique freedom in how she organizes her course materials. She teaches AP English and Literature, and there is no particular linear order that she must follow in meeting the course objectives within the allotted time frame. In ensuring her students covered the mandated objectives, she placed the emphasis not on the course materials, but on the cognitive skills she desired her students to possess at the end of the course. Of the three study participants, she integrated technology more readily in her classes because of the freedom allowed through course objectives and pedagogical decisions. Teacher A chose the technologies she integrated into her curriculum by first considering the cognitive skills, such as the higher order thinking skills of comprehension, analysis, synthesis, and evaluation that she desired her students to learn. She placed great emphasis on providing the students with the

learning opportunities that would enable them to develop the cognitive skills and knowledge to create intrinsic learning for themselves.

Once the cognitive skills were identified, Teacher A had the pedagogical freedom to choose the particular course content that allowed for the acquisition of the skills. Secondary in her pedagogical decision-making was the technology selection that would best address the cognitive skills and content knowledge. In making the technology selections, she acknowledged that there would be skills the students would learn through the manipulation of the technologies that she also considered. In selecting the technologies, Teacher A considered technologies that could be used across the curriculum because she was aware other teachers would also integrate the technologies into their lessons and therefore the students would be more familiar and comfortable with using the technologies.

Teachers B and C based their technology choices upon the content to be learned foremost and then the cognitive skills they wanted their students to exhibit to achieve the overall learning goal(s). Teacher B largely depended upon technology as the vehicle for learning French vocabulary. According to Teacher B, "Learning French is often best done in a linear process. In that manner I know which learning objectives must be covered and can plan in advance, finding the appropriate technologies that would allow my students to meet certain learning objectives." To that end she

> searches for resources first and thinks how they can be used in the classroom. There are a ton of resources out there, whether they be audio flashcards, songs, or YouTube videos, that have been created by native speakers and this way the students can hear the language, and I can get authentic target language resources.

With the resources she has compiled, Teacher B was able to provide the necessary tools that allowed her students to work individually in learning to speak and write the French language. In addition, she also sought out tools, such as Twitter, that allowed the students to collaborate together as well as with other classes across the nation, enriching their learning experiences beyond the singular approach.

Teacher C, who teaches world history in the freshman academy, stated that she began her curriculum preparations by identifying what she wanted her students to know from the content, (i.e., what were the essential questions to be asked and answered). She has the task of teaching freshmen who are new to the rigors demanded by the levels of cognitive skills required in high school. Successfully teaching these cognitive skills will enable her student to succeed in future coursework, as well as many new and unfamiliar technology tools that they may encounter. Teacher C indicated that she hoped through the technology opportunities that her students, "would learn how to analyze and synthesize information in order to answer the essential questions charged to them. I want them to develop skills here that they can carry forward with them."

In order to scaffold these skills, she begins many of her lessons with the lower order cognitive skills and builds toward the higher order cognitive skills as the year progresses. She does the same with the technology, beginning with many of the tools the students used in middle school, such as Word, and incorporating more Internet-based technologies as the year progresses. At the particular time the research was conducted, the students had progressed to the higher order cognitive skills and the Internet-based technologies. Teacher C aligns her goals with the content and the skills she wishes for her students to develop before she chooses the technology and the

skills the technology tools bring to the students because "the content does not lend itself to every type of technology," and in my discipline we must cover all of the content objectives.

The methods by which the three study participants arrived at integrating technology varied, but they all agreed the reason for using technology was to have their students grow and develop the skills to properly use the technology would enable them to identify the essential questions, analyze sources, and become independent learners regarding the content.

Summary of Research Question 2

The approaches these three teachers took toward incorporating technology into their lessons were as varied as the content they teach. Teacher A identified the cognitive skills before the technology skills and content skills. Teacher B allowed the content to determine the technology before considering the content skills and cognitive skills. Teacher C also allowed the content and the content skills to determine the technology, before considering the cognitive skills. They all agreed the reason for incorporating technology into the curriculum was to have students grow and develop in the proper skills of content and technology use that would facilitate becoming cognitive learners in their own rights.

Research Question 3

Did the teachers integrate technology into the curriculum that met the TPACK model of instruction?

A primary goal of this study was to determine if the participants had integrated technology in such a manner that allowed them to converge technology with their content knowledge (CK) and pedagogical knowledge (PK), resulting in a TPACK (Technology, Pedagogy, and Content Knowledge) model of instruction as designed by Mishra and Koehler

(2006). When the content knowledge (CK), pedagogical knowledge (PK), and technology knowledge (TK) factors are converged together successfully, teachers are considered to have reached a TPACK model of instruction (Koehler & Mishra, 2008; Mishra & Koehler, 2006; Mishra, Koehler, & Henriksen, 2011).

To determine if the participants met the TPACK model of instruction, the participants were observed integrating technology into the classroom using the TIOI (Hofer, Grandgenett, Harris, & Swan, 2011). Prior to the classroom observations, the participants were interviewed regarding what was to occur during the observations. The observations were conducted with fieldnotes being taken and the TIOI being scored. A post-observation interview was held as a debriefing for gauging the perceptions of the teacher on how she felt the lesson was executed.

Each participant was observed twice as they conducted lessons with their students. The observations with Teacher A and Teacher B were with the same classes, but constituted different lessons, because the teachers had scheduled the observations for the most opportune time for the researcher to observe technology-based lessons. The observation for Teacher C constituted the same lesson, but different classes because she taught the class every other day due to the school's modified block schedule and she wanted the researcher to observe on consecutive days. The following discussion describes, in detail, the six lessons conducted by the teachers; the content, pedagogical, and technology decisions they made in preparing the lessons; the scoring of the TIOI; and whether the teachers met a TPACK model of instruction.

Teacher A. The observations with Teacher A occurred one week apart with the same class but different lessons. Observing the same class allowed the researcher to view how easily the students engaged with different technologies. The first lesson occurred in the library media center (LMC). The LMC, in addition to its book and media collections, contains two computer

labs. Lab one holds twenty computers, and lab two holds ten. The labs are openly situated within the LMC but on separate sides of the library. This arrangement permits the possibility of two classes using the labs simultaneously, but with the typical class between twenty-five and thirty students, this rarely occurs. For the first observation the researcher observed an AP Literature class of twenty senior students. The classes at this school are held in a modified block format of ninety-eight minutes with classes meeting every other day (A/B schedule). The demographics for the class were twelve females, eight males, thirteen Blacks, two Hispanics, and five Whites.

The lesson assigned by the teacher involved the students answering open-ended questions regarding the daily life of the characters and the government in the novel *1984*. For approximately one week before the assignment, the students had been involved in lessons centered on the context and plot of the novel. The teacher wanted to formatively assess the knowledge of the students based on the past lessons and their independent reading of the first few chapters. The teacher stated she could have developed an assignment in the classroom that would have served the same purpose, but she "felt that the students needed a change of venue and a change of technology tools, from non-computer-based to computer-based." Teacher A operates a paperless classroom and incorporates many technology tools into her student instruction, and she knew the students were becoming restless with the classroom-based instruction. Therefore, she designed an assignment that would formatively assess the students and return them to the use of technology. She developed the questions for the students and uploaded them as an assignment to Edmodo, which was the technology driving the assignment. The other technologies used by the students during this lesson were Word, WordPress, and Google Books. The teacher chose these technologies because she felt these would allow the

students to continue to develop "an efficacy for their own learning as they continued to develop their content, critical thinking, and technology skills."

Once the students had downloaded and opened the Word document containing the directions and questions from Edmodo, they were able to begin their assignment. Most students worked independently, but there were two groups who worked together. The first group of three students worked together because two of the members had lost computer privileges during the school year. Students at the school lose computer privileges when they violate the Acceptable Use Policy (AUP). The other group of eight worked together by taking turns reading the introduction and first chapter of the novel. As the students worked through each question, they were able to manipulate the technology tools allowing them to keep the Word document and Google Reader side-by-side so that they were able to read the novel and respond to the open-ended questions. Once the students had completed the assignment, they saved the document to their school server account and uploaded it to Edmodo using the assignment option. Once the Word and Edmodo requirements were met, the students completed the lesson by responding to a question on the WordPress blog, which was open for all the class to read. The teacher stated that she often required the students to respond to a prompt regarding an assignment so that it would facilitate open classroom discussion among the students.

After the observation, the researcher engaged the teacher in a post-observation interview that required her to reflect on the lesson and how well she felt the objectives were met. For this lesson the teacher felt that the lesson execution had "gone very well and that the students were provided with multiple technologies to aid and assist them in completing the assignment, and they were engaged and on-task." From her comments, the one component of the lesson that she was displeased with regarded the cognitive level of the questions that she had developed. The

next time she would "develop questions that would require the students to think deeper and more philosophically in formulating their responses."

To determine if Teacher A had designed this lesson incorporating the TPACK components, the pre-observation interview, observation, and post-observation interview were coupled with the TIOI. For this observation, the implementation and execution of the lesson scored 23 points out of a possible 24 on the TIOI. The scored TIOI for this observation may be reviewed in Appendix I. Table 4 provides the reader with an overview of the individual component scores for this lesson. Immediately following the table, the reasoning for the assigned score by the researcher is explained.

Table 4

Technology Integration Observation Instrument, Teacher A, Observation #1

Curriculum Goals and Technology	Instructional Strategies & Technologies	Technology Selection(s)	"Fit"	Instructional Use	Technology Logistics
Strongly aligned (4)	Optimally Supports (4)	Exemplary (4)	Fit together (3)	Maximally effective (4)	Very well operated (4)

Curriculum Goals and Technology – The technologies identified by the teacher and used by the students strongly aligned with the curriculum goals identified by the teacher and allowed the students to complete all curriculum goals as designed.

Instructional Strategies and Technologies – The technologies identified by the teacher and used by the students optimally supported all instructional strategies identified by the teacher to allow the students to complete the curriculum goals. The students were able to use the technologies beyond the expectations of the teacher to complete the assignment.

Technology Selection(s) – The technologies selected by the teacher allowed the students to complete the assignment in exemplary fashion because they did not have to modify the selected technology to complete any portion of the assignment.

"Fit" – The technologies selected met all the curriculum goals and instructional strategies with the exception of using Google Books. Several of the students preferred to use the paperback books instead of the electronic versions. These students stated, when probed, that they liked the ability to touch a book and flip back and forth with more ease than was allowed by a computer.

Instructional Use – The technologies selected by the teacher were maximally effective in that they allowed for the students to achieve all of the lesson goals. Neither students nor the teacher had to modify any instructional goals in order for the assignment to be completed as written.

Technology Logistics – The students were able to operate all technologies chosen for this lesson very well and did not require any assistance or modifications in order to complete the lesson as written.

Based on the pre-observation interview, the observation, and the scoring instrument, the researcher determined that Teacher A attained a TPACK model of instruction with this lesson. Teacher A, in the pre-observation interview, expressed introspective pedagogical planning by identifying the learning objectives and skills she wished her students to master in learning the content, purposefully choosing the appropriate technologies for the students to be able to accomplish the established learning objective and goals.

The second observation with Teacher A involved a Quick Response (QR) Code search. A QR Code is a barcode-like image that can be scanned by smart-devices with preloaded apps

providing an array of data. This was the same class as in observation one, but there were many students absent. Present for this class were six females, six males, nine Blacks, two Hispanics, and one White. The observation occurred just after lunch and was purposely timed to engage students in an activity when there could have been the potential for lost attention.

Teacher A designed the lesson with her methods student, and the teacher candidate conducted the lesson. Teacher A does not hold a master's degree, but supervises many methods interns from the university. As a result of the teacher candidate teaching her first lesson with the students, Teacher A wanted to design a lesson that would be simple and not overwhelm the teacher candidate because she would be teaching an AP Literature class, which is challenging in its own right. The goal of the lesson was to prepare the students for the vocabulary they may encounter during the AP Literature Exam, which was approximately one month in the future. Teacher A also wanted to design a lesson that would allow the students to get out of the classroom and have fun because they had been intently focused on completing the *1984* novel assignments. With these two considerations, Teacher A determined that the best technology to use would be smart devices preloaded with QR Code Reader apps such as Red Laser or Eggmon, which can be downloaded to the iPhone, iPad, or Android systems. Conducting a QR Code search is an easy lesson to design, and it can be tailored to meet many pedagogical and content objectives.

The teacher candidate developed the QR Code search, consisting of ten locations for the students to find and scan the codes for the AP vocabulary definitions. Once the definitions were obtained, the students were to answer with the proper word. In order to participate in the QR Code search, each group of students had to have access to a smart device, iPad, or iPod preloaded with QR Code Reader applications. Many students, because of the extent of

technology used by their teachers, bring their own devices (BYOD) to school. The teacher candidate provided the directions for the lesson, and the students were allowed to proceed through the activity at their own pace in groups of three. Two groups made a race out of the activity to see who could complete the course and assignment in the fastest time. The other two groups proceeded at their own pace scanning the definitions and trying to answer before moving to the next location. As the students proceeded through the QR course, the teachers walked to ensure that the students were on-task and no problems were encountered either with the assignment or just by having students in the hallways where there could be the potential for off-task behavior. Upon completing the QR course, all groups returned to the classroom and shared their answers to ensure they answered correctly. The teacher candidate went over the assignment with the students and clarified their correct answers. After the assignment was completed, Teacher A instructed the students to keep the assignment in their notebooks for the upcoming exam review sessions.

To determine if Teacher A had designed this lesson incorporating the TPACK components, the pre-observation interview, observation, and post-observation interview were coupled with the TIOI. For this observation, the implementation and execution of the lesson scored 24 points out of a possible 24 on the TIOI. The scored TIOI for this observation may be reviewed in Appendix I. Table 5 provides the reader with an overview of the individual component scores for this lesson. Immediately following the table, the reasoning for the assigned score by the researcher is explained.

Table 5

Technology Integration Observation Instrument, Teacher A, Observation #2

Curriculum Goals and Technology	Instructional Strategies & Technologies	Technology Selection(s)	"Fit"	Instructional Use	Technology Logistics
Strongly aligned (4)	Optimally Supports (4)	Exemplary (4)	Fit together strongly (4)	Maximally effective (4)	Very well operated (4)

Curriculum Goals and Technology – The technologies identified by the teacher and teacher candidate and used by the students strongly aligned with the curriculum goal identified and allowed the students to complete the goal as designed.

Instructional Strategies and Technologies – The technologies identified by the teacher and teacher candidate and used by the students optimally supported the instructional strategy identified by the teacher and teacher candidate thereby allowing the students to complete the curriculum goal. The students were able to use the technologies beyond the expectations of the teacher and teacher candidate to complete the assignment because they had used the technologies selection in previous assignments.

Technology Selection(s) – The technologies selected by the teacher allowed the students to complete the assignment in exemplary fashion because they were very familiar with the manner in which the technologies should be used and did not have to modify the technologies to complete the assignment.

"Fit" – The technologies selected met all the curriculum goals and instructional strategies without exception.

Instructional Use – The technologies selected by the teacher and teacher candidate were maximally effective in that they allowed for the students to achieve all of the lesson goals without any modification.

Technology Logistics – The students were able to operate all technologies chosen for this lesson very well and did not require any assistance or modifications in order to complete the lesson as written.

Based on the pre-observation interview, the observation, the post-observation interview, and the scoring instrument, the researcher determined that Teacher A attained a TPACK model of instruction with this lesson. Teacher A, in the pre-observation interview, expressed introspective pedagogical planning by identifying the learning objectives and skills she wished her students to master in learning the content, purposefully choosing the appropriate technologies for the students to be able to accomplish the established learning objective and goals.

Teacher B. The observations with Teacher B occurred with the same French class, meeting on subsequent days. In this school, which is on a modified block schedule (A/B), the foreign language classes meet every day to ensure that enrolled students receive two foreign language credits during the course of a school year. This method ensures that the students will be able to meet the required number of credits to graduate on time. The demographics for the class were nine males, fourteen females, twelve Blacks, two Hispanics, and nine Whites. For this lesson Teacher B had secured the mobile laptop lab for use in the classroom. However, the school recently changed its firewall security related to its Wi-Fi, and the laptops had not been updated which prevented the students from logging on to their accounts. Despite the technology problem, the teacher did not panic and rescheduled the activity to be conducted in one of the computer labs.

In the pre-observation interview, Teacher B explained that the students had been engaged for several days in French vocabulary lessons that had them learning how to identify and properly translate the future tense of words and phrases. To continue this objective and to help

facilitate the students' progress, the teacher designed a couple of lessons that would allow the students to use technology tools to help their progress. Her goals for designing technology-based lessons were for the students to have a different medium of learning and to get "a better ear for pronouncing the words." She set a goal for the students of conjugating verbs with 85% accuracy.

Once in the computer lab, the students logged into their accounts and began an assignment the teacher had preloaded on Edmodo. In addition to a Word document, the teacher linked the web tools Quizlet and Conjuguemos. Quizlet is a web tool that provides students numerous study options via flashcards and games. The students used the "learn study" option to help them conjugate the verbs and had to meet an 85% accuracy requirement. Next, they played a scatter game provided by Quizlet, utilizing the Conjuguemos website to assist them.

The teacher had purposely chosen these technologies, but the researcher noticed many students using Google translator or other online French dictionaries. When the researcher asked one of the students why she was using Google translator, she responded that "it was just easier and I like it better than the website the teacher had chosen." The teacher did not redirect the students who chose to use Google translator back to the assigned technologies. There was no grade for this assignment, so the students did not take it as a serious learning opportunity. With approximately fifteen minutes left in the class period, the students had proceeded through the assignment at least twice, reaching the 85% success rate and were allowed to focus on other activities.

With the students focused on other activities the researcher took the opportunity to hold a post-observation interview with the teacher. Teacher B felt, given the technology difficulties, the lesson "went well." She felt she had accomplished the lesson goals by providing the students an assignment that allowed them to proceed at their own pace in learning how to conjugate and

pronounce the French verbs they had been studying. She was displeased with some of the Quizlet choices, and to improve the lesson, she would find alternative Quizlets that would increase the number of options to the students.

To determine if Teacher B had designed this lesson incorporating the TPACK components, the pre-observation interview, observation, and post-observation interview were coupled with the TIOI. For this observation, the implementation and execution of the lesson scored 16 points out of a possible 24 on the TIOI. The scored TIOI for this observation may be reviewed in Appendix I. Table 6 provides the reader with an overview of the individual component scores for this lesson. Immediately following the table, the reasoning for the assigned score by the researcher is explained.

Table 6

Technology Integration Observation Instrument, Teacher B, Observation #1

Curriculum Goals and Technology	Instructional Strategies & Technologies	Technology Selection(s)	"Fit"	Instructional Use	Technology Logistics
Aligned (3)	Minimally support (2)	Marginally appropriate (2)	Fit together (3)	Effective (3)	Well (3)

Curriculum Goals and Technology – The technologies identified by the teacher and used by the students aligned with the curriculum goal of conjugating the verbs but did not meet the second curriculum goal of providing a verbal pronunciation of the word.

Instructional Strategies and Technologies – The technologies identified by the teacher and used by the students minimally supported the instructional strategies, and in order to complete the assignment, the instructional strategies were altered to allow the students to use other web sites to complete the assignment of conjugating verbs.

Technology Selection(s) – The technologies selected by the teacher allowed the students to marginally complete the assignment due to the students having to find alternative technologies to help them complete the assignment. Additionally, very few of the students were able to hear the pronunciation of the words.

"Fit" – The technologies selected met at least two of the curriculum goals and instructional strategies, but not all instructional goals.

Instructional Use – The technologies selected by the teacher allowed the student to achieve the goals of conjugation and meeting an 85% accuracy rating, but did not allow the students to hear the pronunciations.

Technology Logistics – The students were able to operate the technologies chosen for this lesson well, but found the Google Translator website to be more user-friendly than the Conjuguemos website. The students were able to use the Quizlet website without modification.

Based on the pre-observation interview, the observation, the post-observation interview, and scoring instrument, the researcher determined that Teacher B did not attain a TPACK model of instruction with this lesson. Teacher B, in the pre-observation interview expressed introspective pedagogical planning by identifying the learning objectives and skills she wished her students to master in learning the content and by choosing the technologies for the students to be able to accomplish the established goals. However, during the execution of the lesson the reality did not match the lesson plan. The researcher observed many of the students relying upon other websites to provide them with the help needed to complete the assignment, which means they did not make a concerted effort to achieve the instructional goals with the technology identified for the lesson. Teacher B did not plan in a manner that allowed her to identify and choose the most appropriate Quizlets for the benefit of her students. During the implementation

of the lesson she allowed her students to use other technologies beyond those she had identified, thereby allowing them to complete the assignment on their terms rather than by her instructions, which was inconsistent with the pre-observation interview.

The second observation with Teacher B occurred with the same class the next class day. Present for this class were thirteen females, seven males, eleven Blacks, three Hispanics, and six Whites. The class met in the library media center for use of the computer labs. (The LMC was described in the second observation for Teacher A). The students were working in pairs so they were able to situate themselves in a manner that only reserved computer lab one. There were several students who had been barred from using the computers by violating the AUP rules during the year and had to work with partners who still had computer access. While the students were logging into their accounts on the computers, the researcher conducted the pre-observation interview with the teacher. Teacher B, in the pre-observation interview, related that they were still learning how to identify and properly translate the future tense of French verbs, and since they had used Quizlet during the previous class time, she wanted to still accomplish the learning objectives and goals but in a manner that would be "fun and creative for the students." In an effort to accomplish the cognitive learning objectives and goals, she planned for the students to use the web-based application Storybird to create stories about "their daily lives ten years in the future using a minimum of five sentences in the future tense of the verbs."

After the students had logged into the computers and accessed the Storybird website, the teacher directed the students as to the expectations of the assignment. They were to choose a template theme from the program, write a story using the five sentences, and upon completion submit the story link to the assignment option in Edmodo. She had used Storybird with the class a few times before, but the researcher assumed that it had been some time since they had used

the site by observing several students refreshing their memory on the operation of the program. After the students became familiar with the program they began to select the themes for their stories. In proceeding with their assignment many of the students began to use Google Translator and other online French dictionaries to help them conjugate the verbs, even requesting the advice of the teacher upon occasion. Based on the pre-interview with the teacher, the researcher got the impression that she expected the students to write their sentences using their prior knowledge, with very little help from the technology sources available, and apply it to the current assignment. However, almost all of the students were depending upon Google Translator to perform the translations for them.

While the students, as indicated by their comments, were appreciative of the opportunity to be creative and have fun in completing an assignment, several who had consented to be videoed as part of the study were overheard stating that the assignment would have been "much better if some other program beside Storybird had been used" because they were limited in their creativity by the template options presented within the program. One student provided an example of their displeasure of program choice: "We don't play soccer but because one of the template pages had a soccer player we had to deviate from the assignment and lie about playing soccer so we could write in the future tense of the verb." Many of the students agreed that the chosen technology did not allow them to complete the assignment as instructed.

In the post-observation interview Teacher B thought the execution of the lesson went well and that the activity gave the students an opportunity to be creative and have fun in learning the objectives. She agreed that the Storybird program did not allow for as much creativity as she had hoped for the students to have, but related that she had not found a similar program that

would provide the creativity to the students. Despite the limitations of the assignment, she felt the learning objectives and goals were accomplished as she had planned.

To determine if Teacher B had designed this lesson incorporating the TPACK components, the pre-observation interview, observation, and post-observation interview were coupled with the TIOI. For this observation, the implementation and execution of the lesson scored 14 points out of a possible 24 on the TIOI. The scored TIOI for this observation may be reviewed in Appendix I. Table 7 provides the reader with an overview of the individual component scores for this lesson. Immediately following the table, the reasoning for the assigned score by the researcher is explained.

Table 7

Technology Integration Observation Instrument, Teacher B, Observation #2

Curriculum Goals and Technology	Instructional Strategies & Technologies	Technology Selection(s)	"Fit"	Instructional Use	Technology Logistics
Partially Aligned (2)	Minimally support (2)	Appropriate (2)	Fit together somewhat (2)	Effective (3)	Well (3)

Curriculum Goals and Technology – The technology identified by the teacher aligned with the curriculum goal of conjugating the verbs but did not meet the second curriculum goal of allowing the students to write stories about their future lives.

Instructional Strategies and Technologies – The technologies identified by the teacher and used by the students required significant modification to the instructional strategy of writing stories about their future lives with the conjugated verbs. The templates provided by the technology would not allow the lesson to be completed as originally designed.

Technology Selection(s) – The technologies selected by the teacher allowed the students to marginally complete the assignment. The students were unable to complete the assignment as directed by the original instructional strategies due to the templates, which could not be modified, provided by the websites.

"Fit" – The students had to modify their stories to meet the template designs, which could not be modified.

Instructional Use – The technologies selected by the teacher allowed the student to achieve the goals of conjugation and writing modified stories of their future lives.

Technology Logistics – Once the instructional strategies were modified to meet the limitations of the website templates, the students were able to operate the technology and complete the assignment.

Based on the pre-observation interview, the observation, the post-observation interview, and scoring instrument, the researcher determined that Teacher B did not attain a TPACK model of instruction with this lesson. Teacher B, in the pre-observation interview, expressed introspective pedagogical planning by identifying the learning objectives and skills she wished her students to master in learning the content, but the technologies chosen for the students did not fully match the curriculum and instructional goals. The researcher was left with the impression, based on the TIOI and the comments by the students regarding the limitations of the technology, that Teacher B had chosen a technology-based lesson more for the sake of using technology. Teacher B has the knowledge and ability to find alternative technologies, but the chosen technology severely limited the creativity of the students in accomplishing the learning objectives and goals developed by the teacher.

Teacher C. The observations with Teacher C occurred with different world history classes on subsequent days but consisted of the same lesson. The duplicity in lesson implementation was an advantage to the researcher in that she could compare the delivery of the lesson and how the two classes of students approached the technology. Both observations were conducted in the freshmen academy computer lab, a lab designed specifically for the use by the academy. The lab contains thirty computers situated in five rows of six computers each. The lab also contains a teacher computer station and ceiling mounted projector and screen. The teacher is able to conduct the class from behind the students in a manner that enables her to view all the computer screens, redirecting student engagement when needed.

This first class observed, an advanced class, consisted of twenty-three students. The demographics for the class were eleven males, twelve females, twenty-one Blacks, and two Whites. In the pre-observation interview conducted the previous day, Teacher C revealed that the lesson would be taught to both observed classes. Teacher C, knowing that the content to be covered was driving the pedagogical decisions she made regarding how to best deliver the instruction for the student, chose to develop a lesson that was at first teacher-centered and then transitioned into a student-centered lesson incorporating a variety of technology tools. She began the lesson by showing the students two YouTube videos on the content topic – the Mexican-American War and the Alamo. Each video showed the material to be covered from slightly different viewpoints, which the teacher enhanced through explanation and questioning the students relative to their prior knowledge and suppositions getting the students to use their cognitive skills. From this point, the teacher transitioned the students to the portion of the lesson that they were to individually complete, further employing their cognitive skills, such as analysis and synthesis, which the teacher had purposely designed the assignment to facilitate. Teacher C

had developed a WebQuest related to the content to be covered, which she had uploaded as an assignment in Edmodo. The WebQuest was created using Word, which she had saved in the pdf format incorporating many Internet-based hotlinks the students accessed as they analyzed and synthesized the content information to formulate their responses to the questions. The students were able to download the pdf file and manipulate it and the Word document in which they were to complete the assignment on the screen in such a way that they were side-by-side. From this position the students were able to use the hotlinks, analyze and synthesize the information, and type their responses to the questions using the Word document. Before the teacher allowed the students to proceed through the assignment individually, she modeled the first couple of questions to help them understand the cognitive skills and technology skills she wished for them to use. The students continued the assignment with great focus on the content and easily manipulated the technologies that allowed them to successfully complete the assignment. As the students began to complete the assignment, Teacher C consulted with each student as he/she saved his/her work to his/her school server accounts and turned it in by uploading to the assignment option of Edmodo. Several of the students had done this before, but the teacher wanted to ensure that the students were capable and did not lose their work, which could frustrate them in the use of technology.

The WebQuest prepared by Teacher C posed the essential questions she developed for the students and required them to search several pre-identified websites to synthesize their answers, furthering their cognitive skills and content skills. Secondary to her lesson design was that the students practice and continue to develop their technology skills by downloading and uploading documents, manipulating and moving between sources, and practicing their keyboarding techniques. The students in her classes, although digital natives, have very limited

instruction in technology use as it pertains to teacher-directed learning. During the pre-observation interview, Teacher C stated she had worked very hard to develop and implement lessons that will build not only cognitive skills for her students but increase their levels of technology use.

In the post-observation interview Teacher C indicated that she felt the lesson developed and proceeded as she had designed it and that the students were very focused due to the essential questions developed and the multiple websites from which they garnered their information. She sought to include websites that were user friendly, colorful, and provided information that was on the reading levels of the students in the class. She did not want to overburden the students by giving them too much work from a variety of sources that were beyond their cognitive abilities. The one component of the lesson development that displeased her was that she assumed the students had more prior knowledge on the content of the lesson topic. Teacher C stated in the post-observation interview, "I really thought they would remember more about the Mexican-American War and the Alamo from previous classes." She planned to adjust how she began the lesson by designing questions for the students that would allow her to formatively assess their prior knowledge and how to alter the questions she posed in the teacher-centered portion of the lesson. This adjustment was made in the lesson that Teacher C instructed the following day during the second observation.

The second observation occurred the following day with a regular world history class. The demographics for this class were eight females, seven males, thirteen Blacks, and two Whites. Based on the thoughts of the teacher, revealed in the previous day's post-observation interview, regarding the amount of prior knowledge she presumed the students held, she held a brief brainstorming session with the students to activate their prior knowledge and allow her to

formatively assess what they knew and make expeditious changes to how she phrased the questions she posed to the students regarding the two YouTube videos.

After the video portion of the lesson, the teacher led the students more deliberately through the lesson instructions, having them open a Word document and save it to their school server account before proceeding to Edmodo, where they opened the pdf document. The students, as with the previous class, situated the technologies to where they were side-by-side, allowing for easy manipulation. The teacher did not proceed to the next component in the lesson until she was assured that each student had completed the present step. In the post-observation interview the researcher questioned her as to why she was so deliberate in the steps. She responded that "despite the amount of times the students had been brought to the computer lab they still would not proceed through the steps properly and this often presented difficulties when finishing the assignments." She had developed this approach to prevent potential problems.

As with the previous day's class, she walked the students through the first couple of questions to ensure that the students knew what was expected of them and how they were to analyze and synthesize the information in order to formulate their responses. Upon releasing the students to work on their own, the teacher spent the majority of the time the students were working walking among them, looking over their shoulders, formatively assessing the quality of their work. Again, as in observation 1, as the students completed the assignments she led them through saving and uploading the assignments to Edmodo.

In the post-observation interview, the researcher questioned why she walked among this class more so than the previous class. Teacher C responded by stating, "Even though there are some very bright students in the group they need more interaction with the teacher to assure them that they are doing the assignment as they should and just reinforce their confidence in their

abilities." She also related that this was a factor that still surprised her given the time of the school year (2/3 completed) and how many technology-based lessons she had conducted with the class.

Although the assignment design was the same for both classes, it was evident to the researcher through the observations that the approaches the teacher took in delivering the lessons were different given the different cognitive abilities of the two classes. She deliberately walked the students through the teacher-centered portion of the lesson, but allowed the advanced class to proceed through the student-centered portion of the lesson more freely, only offering assistance when requested.

To determine if Teacher C had designed these lessons incorporating the TPACK components, the pre-observation interviews, observations, and post-observation interviews were coupled with the TIOIs. For the first observation, the implementation and execution of the lesson scored 22 points out of a possible 24 on the TIOI. For the second observation, the implementation and execution of the lesson scored 21 points out of a possible 24 on the TIOI. The scored TIOIs for these observations may be reviewed in Appendix I. Tables 8 and 9 provide the reader with overviews of the individual component scores for the two lessons. Below each table, the reasoning for the assigned score by the researcher is explained.

The difference between the scores of these two lessons was the ability level of instructional use by the students in the second observation. They were not as sure of their technological abilities as the first group of students, and they had a tendency to be distracted by the logistics of other technologies (i.e., YouTube and Facebook) temporarily removing their focus from the assignment.

Table 8

Technology Integration Observation Instrument, Teacher C, Observation #1

Curriculum Goals and Technology	Instructional Strategies & Technologies	Technology Selection(s)	"Fit"	Instructional Use	Technology Logistics
Strongly Aligned (4)	Optimally support (4)	Exemplary (4)	Fit together strongly (4)	Effective (3)	Well (3)

Curriculum Goals and Technology – The technologies identified by the teacher and used by the students strongly aligned with the curriculum goals identified and allowed the students to complete the goals as designed.

Instructional Strategies and Technologies – The technologies identified by the teacher and used by the students optimally supported the instructional strategy identified by the teacher thereby allowing the students to complete the curriculum goals. The students were able to use the technologies to complete the assignment because they had used the technologies selection in previous assignments.

Technology Selection(s) – The technologies selected by the teacher allowed the students to complete the assignment in exemplary fashion because they were very familiar with the manner in which the technologies should be used and did not have to modify the technologies to complete the assignment.

"Fit" – The technologies selected met all the curriculum goals and instructional strategies without exception.

Instructional Use – The technologies selected by the teacher were effective in that they allowed for the students to achieve at least two of the lesson goals. The one goal, watching YouTube videos as a precursor to the lesson, was teacher-led rather than student-engaged.

Technology Logistics – The students were able to operate all technologies chosen for this lesson well but to ensure that the student-response portion of the lesson was saved properly, the teacher walked the students through the process.

Table 9

Technology Integration Observation Instrument, Teacher C, Observation #2

Curriculum Goals and Technology	*Instructional Strategies & Technologies*	*Technology Selection(s)*	*"Fit"*	*Instructional Use*	*Technology Logistics*
Strongly Aligned (4)	Optimally support (4)	Exemplary (4)	Fit together strongly (4)	Effective (3)	Adequately (2)

Curriculum Goals and Technology – The technologies identified by the teacher and used by the students strongly aligned with the curriculum goals identified and allowed the students to complete the goals as designed.

Instructional Strategies and Technologies – The technologies identified by the teacher and used by the students optimally supported the instructional strategy identified by the teacher thereby allowing the students to complete the curriculum goals. The students were able to use the technologies to complete the assignment because they had used the technologies selection in previous assignments.

Technology Selection(s) – The technologies selected by the teacher allowed the students to complete the assignment in exemplary fashion because they were very familiar with the manner in which the technologies should be used and did not have to modify the technologies to complete the assignment.

"Fit" – The technologies selected met all the curriculum goals and instructional strategies without exception.

Instructional Use – The technologies selected by the teacher were effective in that they allowed for the students to achieve at least two of the lesson goals. The one goal, watching YouTube videos as a precursor to the lesson, was teacher-led rather than student-engaged.

Technology Logistics – The students were able to operate all technologies chosen for this lesson well but to ensure that the student-response portion of the lesson was saved properly, the teacher walked the students through the process. The teacher also had to walk more among the students as they had questions pertaining to how to manipulate the technologies. In addition, they tended to be more distracted by the accessibility to other web-based technologies (i.e., YouTube and Facebook).

Based on the pre-observation interviews, observations, the post-observation interview, and scoring instruments, the researcher determined that Teacher C attained a TPACK model of instruction with these lessons. Teacher C, in the pre-observation interviews expressed introspective pedagogical planning by identifying the learning objectives and skills she wished her students to master in learning the content, purposefully choosing the appropriate technologies for the students to be able to accomplish the established learning objective and goals.

Summary of Research Question 3

The goal of the observations was to determine the decisions the teachers made in preparing their lessons and upon implementation and execution of those lessons if they succeeded in reaching a TPACK model of instruction. The teachers approached their objectives and goals pedagogically and considered many factors when developing the lessons from the content to be covered to the cognitive skills to be learned by the students and the subsidiary benefits they would gain from participating in the lessons. Upon implementation and execution

of the lessons two of the three teachers met the TPACK model of instruction based on their pre-observation interviews and the scoring of the TIOI.

Chapter Summary

In this chapter, data were obtained from three guided interviews, six observations, fieldnotes, and documents. The data collected from the guided interviews, upon analysis, revealed three findings relative to the study participants' professional development received from the MTT Program: (a) the benefits of professional collaboration/partnerships, (b) the ability of teachers and students to develop skills, both content and technology, and (c) the need for sustained professional development. The data collected from the six observations and pre- and post-interviews revealed the decisions each of the three study participants made when planning lessons. The data also revealed two of the three teachers meeting a TPACK model of instruction and the disconnect that caused the third participant not to meet the TPACK model of instruction. Chapter five will present conclusions, implications, and recommendations for future research.

Chapter 5

DISCUSSION

Chapter Introduction

This case study examined how the professional development opportunities of three participants in the MTT Program allowed them to integrate technology into their classroom curricula in a manner that allowed them to converge technology with their content and pedagogical knowledge, meeting a TPACK model of instruction. The findings of Research Questions 1 and 2 revealed the themes of (1) the benefits of professional collaboration/partnerships, (2) the desire for students to develop skills in content and technology, and (3) the need for sustained professional development. Discussion will explain the implications for and recommendations for each theme. The findings of research question 3 revealed that two of the three teacher's lessons met a TPACK model of instruction. The discussion will explain why the two teachers met the TPACK model of instruction with their lessons and why one teacher's lessons did not. The chapter ends with a discussion on the implications for educators and the recommendations for future research.

Themes

Professional Collaboration/Partnership. Revealed in the initial guided interviews, each participant related how important the professional collaborations and partnerships were that they had been able to make as a result of the MTT professional development. Each participant

parlayed an appreciation for the professional growth and confidence she developed from connections made with university educators, local professional resource staffs, and among the other members. Teacher A remarked, "As we meet each time, I am able to sit with other teachers and discuss how they accomplish integrating the technologies we learn about into their classrooms and how they accomplish the learning goals they set for their students." Teacher B remarked,

> Being in MTT has provided me with a group of teachers that I can look to as mentors because many of them have taught longer than I and they can provide me with valuable insight into things I need to do in my classroom to help my students, and myself, reach the goals we set.

Teacher C, views the professional collaboration as "a way to find more resources and more strategies for how others are incorporating technology into their classrooms. I can probe them for the advantages and disadvantages before deciding if it's something I want to try out."

These connections allowed the MTT participants to create a sense of professional collaboration and a partnership with other teachers who were harmonious in their desires to be more analytical about the lessons they created for their students and the technologies they integrated into those lessons. The MTT Program not only provides its participants with these connections, but it also provides its members with a sense of mentorship, as indicated by Teacher B.

The MTT participants use the professional development sessions to meet and discuss curriculum goals, to analyze the best ways in which to enrich the technology experiences of their students, and to generally encourage each other to persevere in the endeavors to teach students. Through these sessions the teachers strive to find and establish new technology strategies and

practices to cognitively engage their students in learning with the tools that will enable them to continue toward the 21st century learning expectations. In this manner, the teachers are also acting as mentors to each other. Beyene, Anglin, Sanchez, and Ballon (2002) define mentoring as a mutually beneficial relationship in which those involved are impacted by the connection. This is consistent with the mission of the MTT Program (Wright & Wilson, 2007; Wright, Wilson, Gordon, & Stallworth, 2002). The MTT Program participants are from different schools and teach a variety of subjects throughout various grade levels. Because of the many levels of pedagogical practices and technological expertise, the participants are able to share a sense of empathy and support.

In essence, what the members have established through the mentorship is a professional learning community (PLC). Roland Barth (1990) best describes a PLC as "a place where all are engaged as active learners in matters of special importance to them and where everyone is thereby encouraging everyone else's learning" (p. 9). Barth's description holds true for the MTT participants because they continually support each other beyond the synchronous meetings. As noted by the study participants in their interviews, the collaboration among the participants of the MTT Program strengthens resolve, permits vulnerabilities, and carries people through the frustrations that accompany the aspirations of successfully educating students.

A connotation that resulted from the theme of professional collaboration is that teachers should be permitted to collaborate openly and freely. Teacher B stated,

> The most meaningful factor of any professional development is to have a sense of collaboration between teachers. When we are able to collaborate together, we are able to have sessions that are much more valuable to us rather than just attending something where we are talked at. When there is no engaging conversation between teachers, the

professional development just doesn't seem as legit as it should be. However, something can be learned from these sessions as well, even if it is to serve as a reminder of how much you hate the session format and to not treat your students with the same behavior.

When teachers are allowed collaboration, they are benefitting more from the professional development because they are provided the opportunities to mentor others, share their issues, and get help in shaping and improving their practices. Unfortunately, these collaborations do not happen as much as they should due to budget and time restraints, but when teachers are permitted to collaborate with each other, students become the winners.

Skills. A second theme that was revealed from the data regarded the cognitive skills, content skills, and technology skills that the teachers thought their students, as well as themselves, should possess or develop. Teachers within disciplines make pedagogical decisions about instruction and learning based on (1) what they believe are the purposes for teaching the content, (2) what knowledge they believe students should be developing, (3) what discipline-based teaching materials are available, and (4) what representations or activities they have successfully used in the past (Eggen & Kauchak, 2004). In the circumstances surrounding the decisions that the teachers in this study made, technology was considered a part of the discipline-based material choices because they use technology regularly and the school has a variety of technologies available. Many teachers openly choose to replace the publisher-provided discipline-based materials with those that they find on the Internet and with other technology tools that they can easily adapt to cater more to the needs of their students. The pedagogical approaches by the teachers in this study support the research that has indicated for a number of years student success and achievement are intricately associated with students' interactions with effective teachers (Darling-Hammond, 1997; McCaleb, 1994; Mizell, 2001). These teachers

work beyond the minimum standards, with larger than the standard class size of 25 students, and often without any technology-focused curriculum or technology funding. These teachers are achieving student gains despite these limitations.

The teachers in this study are reflective practitioners who put much thought and consideration into their lessons, as illustrated in their interview responses. The pedagogical decisions they make to ensure their students are actively engaged in developing their content knowledge and cognitive skills are not done lightly. All three teachers search for lessons that will allow their students to achieve the identified cognitive goals and meet the content course objectives. In reality, all three teachers go beyond the minimal competencies as expected by the state course objectives by setting high expectations for their students and providing the support to help students reach those expectations. In that aspect, their actions and decisions are consistent with Zhao and Frank (2003), who relate that teachers must go beyond mere competencies to develop an understanding of the complex web of relationship among users, practices, tools, and the many technologies available.

For teachers to help their students achieve success, they must possess the very skills they want their students to develop. The technology skills these teachers bring to the classroom are vast. The MTT Program introduced the teachers to many technology tools, and before introducing the tools to their students, each teacher developed the self-competencies to effectively use the tools. Each teacher was motivated by a personal desire to use technology in the classroom and was able to provide her students with many alternative methods by which to learn the content. There were varied reasons the teachers provided for using technology in the classroom, but having their students develop cognitive and technology skills were profoundly important in their decisions.

To enhance the lessons they teach and to provide alternative ways to develop the technology skills and cognitive skills of their students, these teachers have identified multiple ways to incorporate varieties of tools into their curricula. Through carefully planned technology integration, these teachers provided a mechanism for their students to encounter unfamiliar situations, uncertainties, dilemmas, or questions that will help them cultivate their content and cognitive skills, enabling them with the potential to become independent life-long learners. The research of Polly and Hannafin (2010) and Davis, Preston, and Sahln (2008) supports this by stating that to promote the learning methods of students and allow them to adopt high-level cognitive practices, teachers must be willing to adopt the concepts and become comfortable with the very practices they impose on their students.

The MTT Program has provided these teachers with a foundation for adding technology to their pedagogical practices and addressing required content through many different lenses. To help build a library of content, content skills, pedagogical skills, and technology skills, the teachers in this study have created Delicious or Diigo accounts where they stores new tools, new teaching ideas, and strategies for use in planning lessons. Revealed in the interview sessions, the teachers related the following regarding the methods by how she built her library of resources. Teacher A stated she depends upon her daily RSS feeds to help her develop a repertoire of resources. For Teacher B, she is building a store of technologies that will help her teach real world content and the skills she requires herself to possess, as well as her students, must be current and up-to-date. Teacher C, like Teacher A, uses daily RSS feeds and blogs to help her identify potential technology tools to use in the classroom. Teacher C stated, "We teach in a digital age and these kids love technology and so if we can harness it and get them engaged in a lesson just using it, it would be so much better because we would greatly be enhancing the

lesson." In order to harness the engagement of the students, these teachers depend upon the professional connections they make through MTT, their RSS feeds, and the various other resources they have to keep abreast of the new 21st century technologies and the ways to integrate them into the classroom curriculum and lessons.

In designing technology infused lessons, the overall goal for each teacher was to place her students in an environment whereby she would be using technologies to further content learning and to develop intrapersonal skills that would help further student desires for self-directed learning. Developing cognitive skills may not have been at the forefront of the decision-making for each teacher, but it was revealed through the interviews that they considered this to be of extreme importance in the process. Having students use technology as a way to facilitate increasing their cognitive skills was also very important in the decisions the teachers made. In addition, Teacher A and Teacher C responded that the majority of the technology tools they chose could be used cross-curricula. Teacher A stated that she chose tools that "could purposely be used across the curriculum because the chance of the students having used them before were high and they would know how to use them and continue building their technology skills." Identifying tools that can be used in multiple opportunities allows students to develop a familiarity and comfort with the tools that will allow them to build a sense of confidence not only with one tool but the confidence to learn others. Teacher C stated,

> Choosing technologies that I feel or know that my students will have used in another class is a big help. That way they will be familiar with the tools and will be more comfortable using them, and we can focus more on the content or cognitive skills to be learned because I know other teachers are also helping them learn the technology tools being used.

Sustained Professional Development. The participants' belief in the need for sustained professional development was the third theme revealed from the data analysis. The intermediaries who identified the participants for this study stated that even before participation in the MTT Program these teachers readily sought professional development opportunities beyond those mandated by their local system because they are self-motivated to become the best in their pedagogical practices for the benefit of their students. It was apparent to the researcher from the responses these teachers provided in the interviews that they knew the importance of continually seeking the best pedagogical practice strategies and technologies and how to properly integrate them into their content curriculum. Teacher A stated,

> When I began teaching, I knew that technology was an area of interest to me and something I needed a lot of help with. Because of being in MTT and seeking out other professional development opportunities in this area, I have been able to personally grow as an educator and make the choices and decisions needed to provide my students with relevant, hands-on, and engaging opportunities.

This thought was also shared by Teacher C who said,

> Technology has become such a large part of my life. Everything I do–lesson planning, researching, organization– is done with technology. If it is that integral to me, I am sure it must be to the students. To provide them with the best opportunities, I must continually learn myself. It's important to me because technology is such an important part of their lives.

The common factor that the teachers addressed regarding technology use in their classes was that it not be done for the sake of using technology but that it have a purpose. Through the MTT Program professional development seminars, the teachers related that they not only

received a plethora of technology tools to be used in their classes, but they related much attention was placed on the importance of teaching with technology relevant for the identified goals and objectives in their content fields. This concept is one advocated by Garet et al. (2001), Becker and Ravitz (2001), Carr, Jonassen, Litzinger, and Marra (1998) and Mishra and Koehler (2006) who found that professional development technology trainings that are intensive, relevant, and coherent result in successful technology integration.

As a result of their participation in the MTT Program, these teachers have voiced their aspirations for sustained professional development in the area of technology integration and advocated strongly within their school, system, and PLCs for more seminars that are meaningful for teachers. They strongly feel that every teacher should receive professional development relative to technology use and strategies and that it is best received, and put into practice, when delivered by people the recipients know and trust. Additionally, they realize that within a school the level of technology use is varied and that if all teachers are to prepare their students according to 21st century learning ideals, then they should be receiving professional development accordingly. In addition, to best allow for classroom integration, the professional development received by the teachers must be sustained over time for maximum achievement. Teacher A best sums up this ideal:

> We have three levels of teachers relative to technology. Those who are tech-savvy and run in the same circles regarding professional development. On the other end of the spectrum is probably a slightly larger, but still a handful of teachers who are not comfortable with technology and will not use technology to lead any student activities. In the middle, I think, we have a much larger group of teachers who understand the value of technology for instructional purposes but who are, I think, apprehensive about using it.

That's exciting, and that's where the professional development that is provided to them must be done for maximum achievement. If we get the right folks lined up and our district puts more of a value on professional development, that could make a real difference to this group and to the students. A large group, given a lot of support and in very small, very purposeful chunks, could start implementing technology more regularly and more purposefully.

Ample research supports the value of sustaining professional development (Burbank & Kauchak, 2003; Garet et al., 2001; Putnam & Borko, 2000; Wilson & Berne, 1999). Garnered from the interview responses, the three teachers indicated their beliefs that if technology was to become an integral part of the curriculum and a vital part of the daily considerations and practices of the teacher, then there should be more sustained professional development offered to whole faculties. Characteristics that these teachers suggested for sustaining professional development include the following:

1. Identifying technologies that are relevant to meeting content objectives and developing cognitive skills that may be used cross-curricula;
2. Ongoing professional reflection about actual practices and their effects on students;
3. Professional development opportunities that are scaffolded in order to facilitate innovation and improvement for both teachers and students;
4. To have professional development opportunities facilitated by teacher-leaders within the system who are familiar with the teachers, students, and academic situations;
5. To have professional development opportunities that are democratically organized.

As related by the three MTT participants, because of their experiences, professional development is a necessary component of a teacher's responsibilities, but for it to be meaningful and relevant for the teachers, and therefore the students, it must be designed and delivered in a manner which allows the teachers to actively engage rather than sit and be talked to; teachers must be purveyors. This consideration is supported by Sparks (2004) who related that research and experience indicate that high-quality ongoing professional development deepens teachers' content knowledge and pedagogical skills; provides opportunities for practice, research, and reflection; and includes a sustaining and collaborative component, that remains teacher-focused and up-to-date, not "sit and get."

Research Question 3

Did the teachers integrate technology into the curriculum that met the TPACK model of instruction?

The TPACK model of instruction is used as a way to represent what teachers need to know about technology and how to design authentic activities and lessons that incorporate the technical knowledge with the pedagogical knowledge and content knowledge to provide the students with the utmost learning experience. Mishra and Koehler (2006) articulate the importance of knowing the relationships between content, pedagogy, and technology and stated that for this to happen, teachers should have a systematic understanding and respect for each components and how they work together.

In designing lessons, each teacher in this study incorporated components of the TPACK model of instruction but did so without conscious knowledge. The teachers had not been introduced to the TPACK framework and how to actively incorporate its components into their

curriculum design. In the execution of the observed lessons, two of the three teachers in this study did meet a TPACK model of instruction in both of their lessons based on their pre-observation interview responses and the scoring of the Technology Integration Observation Instrument (TIOI). The design of their lessons indicated a strong introspective for what they wanted their students to gain the most from the education experience. The teachers indicated a high contemplation for the content and the best methods for learning the content, increasing cognitive skills and technology skills, and thereby demonstrated their pedagogical decision-making. Teacher B, who did not meet the TPACK model of instruction, stated in the pre-observation interview many of the aforementioned goals, but the execution of the lesson did not manifest the technology integration as she hoped. In the execution of the lesson, Teacher B allowed the technology to direct the lesson, but as the students proceeded through the lesson, they found the technologies ill-equipped to complete the lesson objectives as instructed. The reality of this situation is that Teacher B is a new teacher, having taught three years, and she may be more overwhelmed by outside of the classroom responsibilities and teaching at two different schools and is unable to dedicate the appropriate time to vet new technologies properly. Despite the support Teacher B receives from the MTT Program, her virtual PLC, and her CoP member, it may just not be the properly support that a new teacher needs. This perceived lack of sustained support has the potential to manifest itself, as possibly in this case, in the students finding the chosen technologies ill-fitting. When the technology is ill-fitting and the students have to make too many concessions, they will tend to lose the focus of the lesson and not be actively engaged in the content or focused on the technology skills to be learned. As a result, teachers must carefully select the appropriate technologies that best fit the goals and objectives and have

trained themselves on the technologies so that they can judge the effectiveness and make alterations if the technologies do not fit the goals to be achieved.

It is interesting to note that two of the three teachers met the TPACK model of instruction without any specific knowledge of TPACK. TPACK develops as teachers grapple with the different components and how to successfully merge them. In that aspect, they are growing and developing meaningful integrations (Bos, 2011), and as the bodies of knowledge interact, the teachers are producing the type of knowledge needed to successfully integrate technology into the classroom (Mishra & Koehler, 2006). Many teachers have the capabilities of reaching this point in their pedagogical practices without actually knowing they have reached the TPACK model of instruction expectations, but the reality is that more teachers than not lack the professional development necessary that will educate them on the components of TPACK. Teachers need to be trained to plan and design instruction that will support the learning needs of their students while integrating technology. The appropriate professional development should be offered to the teachers that would allow them to develop an understanding of both TPACK and how technology-driven contextual changes can affect learning in small chunks. By offering the professional development in this format, teachers will be able to develop the knowledge in pieces, learn how to employ the pieces, and not feel overwhelmed as they began to integrate technology into their classroom curriculum and lessons. The MTT Program has provided these teachers with a plethora of technology resources and knowledge, but a connotation for the program should be that the TPACK model of instruction be a component included in future professional development sessions for the teachers to have a deep and pragmatic understanding of how the individual components can be merged together to provide a balanced educational experience.

Implications for Educators

The National Center for Education Statistics indicates that 97% of students in grades 9-12 are using computers daily with that number only increasing (Sutton, 2010; Wells & Lewis, 2006). The number of technologies and technology tools available to students begs the necessity that they be guided in the proper uses of the technologies and that lessons be developed for them that will incorporate the best of pedagogy, content, and technology. As strongly as education advocates for students to be presented with and taught 21st century skills, teachers must be provided appropriate professional development to demonstrate those skills for the students. The U.S. Department of Education's 2010 National Educational Technology Plan notes "widespread agreement that teachers, by and large, are not well prepared to use technology in their practices" (p. 39). The connotation is that if teachers feel ill-prepared to use technology, in general, in their classrooms, then they will probably lack the means and understanding of using that technology through the framework of the TPACK model of instruction. Because of this lack of TPACK knowledge and understanding, any technology used in their classrooms may not be strategically designed with the best instructional intentions. The nation's students are digital natives and will be engrained in technology their entire lives. To best provide them with academic instruction, the nation's teachers should be provided with the proper training to design instructional lessons to meet their needs.

For teachers to overcome the shortcomings pertaining to technology use in the classroom, they must be presented with ample professional development opportunities that are embedded in school and classroom practices, sustained over a period of time, including opportunities for reflection. The responses of the teachers in this study indicate the need for sustained professional development that will provide them and other teachers the skills to successfully

integrate technology in their classroom instructional practices through the TPACK model of instruction. Based on the responses of these teachers, the perceptions of Loucks-Horsley et al., (1998), Gess-Newsome et al., (2003), and Hall and Hord (2001) are supported. These researchers champion the principals of professional development that (1) are grounded in the teachers' classroom practices, (2) are developmentally appropriate, (3) are sustained, (4) promote learning, change, transfer, and metacognition, and (5) allow teachers to take charge of their own growth. The implication for education relative to future professional development opportunities is that the opportunities become a process and not microcosm events that are presented in the "sit and get" format and irrelevant to the realities of the classroom. Additionally, teachers must adopt the notion that to best take advantage of technology and improve student learning they must understand and integrate a whole "Total PACKage" (Thompson & Mishra, 2007, p. 38).

A second implication for teachers integrating technology into their classroom curriculum is that they do so for the educational benefits it may bring to learning, instead of just integrating it for the sake of using technology. In meeting this contingency, teachers should be presented with and educated upon the TPACK model of instruction. That should be a considerable component of the professional development offered. The TPACK framework has been touted to be the most effective model pertaining to integrating technology into the classroom (Harris & Hofer, 2009; Harris, Mishra, & Koehler, 2009; Koehler & Mishra, 2008). It allows teachers to take into consideration the pedagogy, content, and technology when making epistemological decisions for the curriculum. Technology, or the use of, is not neutral, and it provides a way for teachers to consider new methods of instruction.

If teachers are going to develop or redress conceptual challenges, then they should be provided with the professional development, tools, and resources. This is where the

administration–local school, professional development leaders, and system leaders–must provide the mechanisms of professional development that will allow the teachers to address the issues of integrating technology into the curriculum and be provided the long-term support to ensure that technology is integrated appropriately. As the emphasis on technology in the classroom continues, it is important for teachers to be provided the support, appropriate resources, and long-term training to successfully implement the mandates. Administrators should encourage teachers to seek out professional development opportunities and make sure that they have the opportunities for job-embedded and sustained professional development to help them integrate technology into their curriculum in ways that will meet the TPACK model of instruction and help them become more skilled in integrating technology into the classroom curriculum.

As teachers become more familiar with the concepts of TPACK and seek out professional development that will help them integrate technology into the curriculum, they will find that they are developing a series of professional connections with their colleagues and others in the field. Some of these connections will enable them to develop a PLC that can be beneficial by providing support as they encounter new concepts and face potential problems as they learn new methods of practice. They may also develop a CoP resulting from the location of colleagues as well as individual local relationships. Administrators and professional development leaders should encourage teachers to develop such relationships in that they can be valuable beyond the overall professional development opportunities because of the sense of familiarity they provide. Through a CoP individuals can develop more personable relationships with their colleagues that will help facilitate professional growth and a sense of solidarity.

Recommendations for Future Research

The idea of the TPACK model of instruction was introduced in 2006 by Mishra and Koehler, and they continue to be the leading researchers in the field pertaining to this framework. Many of the researchers who have joined Mishra and Koehler in the research, perceived gaps relative to how to actually evaluate the integration of technology into the classroom and what pedagogical decisions were made in order to integrate the technology. Beyond Mishra and Koehler, Judi Harris and Matthew Hofer, at this time, are the leading researchers in developing evaluation instruments to describe and score technology integration. Their most notable contributions have been the Technology Integration Assessment Instrument and the Technology Integration Observation Instrument. With these two instruments, they provided a mechanism by which to gauge if a teacher is integrating technology into the lesson. The TPACK framework has proven to be a valuable tool for assessing technology knowledge in the area of technology integration and for designing teacher education experiences.

Future research should continue to investigate the impact of the TPACK model of instruction and if the model is changing how teachers prepare curriculum for the integration of technology. Research should also include more work in the assessment area of the Technology Integration Assessment Instrument and the Technology Integration Observation Instrument to refine the scoring components. There is a weakness in the clarity of the individual constructs and how they are defined and connected to each other. For the purposes of the research of this study, the researcher wrote her own definitions, but researchers should find a way in which to clearly clarify how the individual constructs should be defined and rationalize how they are essential and relate to the next.

Future research should also investigate the TPACK knowledge and use of the TPACK model of instruction with new in-service teachers as they matriculate into the field from pre-service status. There are numerous research articles that investigate the TPACK knowledge of pre-service teachers. Two such articles are Graham, C., Cox, S. and Velasquez, A. (2009) and Schmidt, D. et al., (2009). These articles focus on the pre-service teacher programs of colleges and universities but there is a gap in the literature that follows pre-service teachers into the teaching field measuring how they integrate technology using the TPACK model of instruction given their new environments and responsibilities.

A third possibility for future research would be to investigate the TPACK model of instruction within specific subjects. There is ample literature pertinent to TPACK research in the area of social studies and mathematics, but there is a lack of literature in the other disciplines. Why do these two subjects have more research literature than others? Is it easier to implement a TPACK model of instruction in a particular subject? Investigation should expand into other discipline areas to address the integration of TPACK.

The TPACK framework and model of instruction could become the leading framework for gauging teacher integration of technology, but to bring that to fruition, teachers must be provided the professional development in order to understand the components of TPACK and how to best integrate technology into the classroom curriculum. Continued research in the field using the TPACK framework will only prove the importance of this concept, thereby leading to the potential of making it a standard measurement instrument.

Conclusion

This study investigated three in-service teachers and their technology integration to determine if the lessons they taught met a TPACK model of instruction. The investigation found that two of the three teachers met the TPACK model of instruction. The findings of the study related various mechanisms that were important to meeting a TPACK model of instruction and how the teachers perceived or situated each mechanism. The overall findings of this study are important in developing a rationale for providing teachers with sustained professional development, helping them to integrate technology into their curriculum meeting the TPACK model of instruction. The future of education will continue to prove the importance of technology and in that aspect it is important that teachers equally consider their pedagogy, content, and technology approaches when making curriculum choices.

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APPENDICES

APPENDIX A

The ISTE NETS for Students

The ISTE NETS and Performance Indicators for Students (NETS•S)

1. **Creativity and Innovation**
   Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students:
   - **a.** apply existing knowledge to generate new ideas, products, or processes
   - **b.** create original works as a means of personal or group expression
   - **c.** use models and simulations to explore complex systems and issues
   - **d.** identify trends and forecast possibilities

2. **Communication and Collaboration**
   Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. Students:
   - **a.** interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media
   - **b.** communicate information and ideas effectively to multiple audiences using a variety of media and formats
   - **c.** develop cultural understanding and global awareness by engaging with learners of other cultures
   - **d.** contribute to project teams to produce original works or solve problems

3. **Research and Information Fluency**
   Students apply digital tools to gather, evaluate, and use information. Students:
   - **a.** plan strategies to guide inquiry
   - **b.** locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media
   - **c.** evaluate and select information sources and digital tools based on the appropriateness to specific tasks
   - **d.** process data and report results

4. **Critical Thinking, Problem Solving, and Decision Making**
   Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students:
   - **a.** identify and define authentic problems and significant questions for investigation
   - **b.** plan and manage activities to develop a solution or complete a project
   - **c.** collect and analyze data to identify solutions and/or make informed decisions
   - **d.** use multiple processes and diverse perspectives to explore alternative solutions

5. **Digital Citizenship**
   Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students:
   - **a.** advocate and practice safe, legal, and responsible use of information and technology
   - **b.** exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity
   - **c.** demonstrate personal responsibility for lifelong learning
   - **d.** exhibit leadership for digital citizenship

6. **Technology Operations and Concepts**
   Students demonstrate a sound understanding of technology concepts, systems, and operations. Students:
   - **a.** understand and use technology systems
   - **b.** select and use applications effectively and productively
   - **c.** troubleshoot systems and applications
   - **d.** transfer current knowledge to learning of new technologies

APPENDIX B

The ISTE NETS for Teachers

The ISTE NETS and Performance Indicators for Teachers (NETS•T)

Effective teachers model and apply the National Educational Technology Standards for Students (NETS•S) as they design, implement, and assess learning experiences to engage students and improve learning; enrich professional practice; and provide positive models for students, colleagues, and the community. All teachers should meet the following standards and performance indicators. Teachers:

1. Facilitate and Inspire Student Learning and Creativity

Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments. Teachers:

- **a.** promote, support, and model creative and innovative thinking and inventiveness
- **b.** engage students in exploring real-world issues and solving authentic problems using digital tools and resources
- **c.** promote student reflection using collaborative tools to reveal and clarify students' conceptual understanding and thinking, planning, and creative processes
- **d.** model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments

2. Design and Develop Digital-Age Learning Experiences and Assessments

Teachers design, develop, and evaluate authentic learning experiences and assessments incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the NETS•S. Teachers:

- **a.** design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity
- **b.** develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress
- **c.** customize and personalize learning activities to address students' diverse learning styles, working strategies, and abilities using digital tools and resources
- **d.** provide students with multiple and varied formative and summative assessments aligned with content and technology standards and use resulting data to inform learning and teaching

3. Model Digital-Age Work and Learning

Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society. Teachers:

- **a.** demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations
- **b.** collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation
- **c.** communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital-age media and formats
- **d.** model and facilitate effective use of current and emerging digital tools to locate, analyze, evaluate, and use information resources to support research and learning

4. Promote and Model Digital Citizenship and Responsibility

Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices. Teachers:

- **a.** advocate, model, and teach safe, legal, and ethical use of digital information and technology, including respect for copyright, intellectual property, and the appropriate documentation of sources
- **b.** address the diverse needs of all learners by using learner-centered strategies and providing equitable access to appropriate digital tools and resources
- **c.** promote and model digital etiquette and responsible social interactions related to the use of technology and information
- **d.** develop and model cultural understanding and global awareness by engaging with colleagues and students of other cultures using digital-age communication and collaboration tools

5. Engage in Professional Growth and Leadership

Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources. Teachers:

- **a.** participate in local and global learning communities to explore creative applications of technology to improve student learning
- **b.** exhibit leadership by demonstrating a vision of technology infusion, participating in shared decision making and community building, and developing the leadership and technology skills of others
- **c.** evaluate and reflect on current research and professional practice on a regular basis to make effective use of existing and emerging digital tools and resources in support of student learning
- **d.** contribute to the effectiveness, vitality, and self-renewal of the teaching profession and of their school and community

APPENDIX C

Consent to Participate

The University of Alabama
Consent to Participate in Research

You are asked to participate in a research study by Lisa H. Matherson, doctoral candidate in the College of Education at the University of Alabama. Your participation in this study is entirely voluntary. You should read the information below, and ask questions about anything you do not understand, before deciding whether or not to participate.

Purpose of Study

This study is designed to analyze how the professional development received through the MTT Program has changed a teacher's approach to integrating technology into the classroom curriculum. Specifically, I hope to accomplish the following:

1. To better understand how the teachers make decisions when integrating technologies that move them toward the TPACK instructional model.

Procedures

If you volunteer to participate in this study, you will be asked to do the following things:

- Allow the researcher to interview you two times. The interviews will be digitally recorded and will not exceed sixty minutes.

- Allow the researcher to observe you in your classroom two times teaching with technology. Each observation will last approximately ninety minutes and will be videotaped for the purpose of reviewing the observations for biases by the researcher.

Anticipated Benefits to Subjects

As a willing participant in this study you will be compensated for your willingness. Indirectly, you may benefit by understanding your classroom instruction through the lens of the TPACK model of instruction.

Participation and Withdrawal

Your participation in this research is entirely VOLUNTARY. If you decide to participate, you are free to withdraw your consent and discontinue participation at any time without prejudice.

Costs and Compensation for Being in the Study

There is no financial obligation to participate in this study. For your participation in this study you will be compensated for your time in the amount not to exceed $100.00. You will receive $50.00 after the first interview and observation and $50.00 after the second interview and observation.

Privacy and Confidentiality

All recorded interviews, transcripts, and observational data will be kept by the principal researcher for five years from the end date of the study. The videos will be destroyed after the publication of Mrs. Matherson dissertation. The principal researcher will be the primary viewer of all data. No information about you or the data you have provided will be disclosed to others without your written permission. You will be assigned a pseudonym for all written reporting; no information will be included that could reveal your identity.

Contact Information for the Researcher

If you have any questions about the research, please contact:

Lisa H. Matherson.....lhmatherson@gmail.com.....(205) 242-7422.

- OR -

Dr. Liza Wilson.....ewilson@bama.ua.edu.....(205) 348-4580.

If you have any questions about your rights as a research participant, please contact Ms. Carpantato Myles, Research Compliance Officer at The University of Alabama at 205-348-5152 or e-mailing cmyles@fa.ua.edu.

Signature of Research Subject

I have read this form and I understand the information provided above. I have been given an opportunity to ask questions and all of my questions have been answered to my satisfaction. I have been given a copy of this form.

By signing this form, I [ ] agree [ ] do not agree to participate in this research study.

_____ _____

Signature of Participant Date

I have explained the research to the subject, and answered all of his or her questions. I believe that he or she understands the information described in this document and freely consents to participate.

_____ _____

Signature of Researcher Date

The University of Alabama

Informed Consent for Video Recording

You are receiving this Informed Consent form because your child is in a classroom where video recording of the teacher will be taking place. This video recording is due to the classroom teacher taking part in a research study. The study is examining their use of technology in instructional practices. The research is being conducted by Lisa Matherson who is a doctoral student at The University of Alabama. Mrs. Matherson is being supervised by Dr. Liza Wilson who is a professor in the College of Education at The University of Alabama.

Being in this study will require your child, given your consent, to be videotaped during portions of two class periods. Each videotaped session will last approximately ninety minutes. Your child is not part of the study and will not be named in the study. They are simply in the classroom where the video recording is taking place. All video recordings will be stored in a locked cabinet during the study and will be destroyed after the publication of Mrs. Matherson's dissertation. If you choose to not allow your child to participate in the video recording, they will be seated in such a manner in which to exclude them from view of the camera.

Taking part in this study is voluntary; it is your choice to allow your child to be video recorded. There is no benefit or punishment to your child.

The University of Alabama Institutional Review Board (IRB) is the agency that protects the rights of people in research studies. The IRB is charged with insuring that all studies and principal investigators follow their code of conduct for the ethical treatment of people participating in research studies.

If you have any questions about the research, please contact Lisa H. Matherson at (205) 759-3538 or Dr. Liza Wilson at (205) 348-4580. If you have any questions about your child's rights as a research participant, please contact Ms. Carpantato Myles, Research Compliance Officer at The University of Alabama at 205-348-8461or 1-877-820-3066 or by e-mailing cmyles@fa.ua.edu.

By signing below and checking the appropriate box you are indicating that you are aware that:

- Video recording will be taken during the study.
- Identifying information of my child will not be used in the study.
- The video recording will be destroyed after the publication of the dissertation.

_____ _____

Parental/Guardian Signature Date

I [ ] give permission for my child to be video recorded as part of this study.
I [ ] do not give permission for my child to be video recorded as part of this study.

Appendix D

IRB Certification

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Lisa Matherson** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 08/25/2010

Certification Number: 494196

APPENDIX E

IRB Approval

November 30, 2011

Office for Research

Institutional Review Board for the
Protection of Human Subjects

THE UNIVERSITY OF
ALABAMA
RESEARCH

Lisa Matherson
College of Education
The University of Alabama
Box 870232

Re: IRB # 11-OR-344, "Supporting Improvements in Classroom Instruction Through Technology with the Master Technology Teacher Approach"

Dear Ms. Matherson:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your application will expire on November 29, 2012. If the study continues beyond that date, you must complete the IRB Renewal Application. If you modify the application, please complete the Modification of an Approved Protocol form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, please complete the Request for Study Closure form.

Should you need to submit any further correspondence regarding this application, please include the assigned IRB application number.

Good luck with your research.

Sincerely,

Carpentato T. Myles, MSM, CIM
Director & Research Compliance Officer
Office for Research Compliance
The University of Alabama

358 Rose Administration Building
Box 870127
Tuscaloosa, Alabama 35487-0127
(205) 348-8461
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APPENDIX F

Protocol for Interview Questions

These questions will be used to guide the guided interview at the beginning of the research data collection (This will be the first interview).

Demographics

1. Do you consent to be a research subject as outlined in the consent document I sent you?
2. Would you like to be identified in the dissertation or would you rather remain anonymous?
3. What is your current position?
4. What subjects are you currently teaching?
5. How long have you been teaching?
6. How long have you been a member of the MTT Program?

Individual
1. Why did you decide to become a member of the MTT Program? 2. Upon becoming a member of the MTT Program what were your goals? 3. What did you hope to get out of the program? In what ways has the professional development you received through the MTT Program influenced the way in which you use technology in the classroom? 4. What is your knowledge of TPACK? (Mishra & Kohler, 2006, 2008). 5. In what ways do you use technology for preparation and productivity? (Graham, Burgoyne, Cantrell, Smith, St. Clair, & Harris, 2009; Harris & Hofer, 2009, 2011). 6. What professional development have you sought in technology beyond the MTT Program? In what ways have those professional development offerings influenced the way in which you use technology in the classroom? (Darling-Hammond, Chung & Frelow, 2002; Garet, Porter, Desimone, Birman & Yoon, 2001; Harris & Hofer, 2009; Wright, 2010).

Curricular	
7.	Before becoming a member of the MTT Program did you use technology in your instructional practices? Please describe the ways in which you did or did not use technology. (Harris & Hofer, 2009, 2011; Wright, 2010).
8.	Now that you have been a member of the MTT Program for a period of time, has your level of use of technology in the classroom changed? Has it become a regular fixture in your teaching or do you use it only occasionally? (Harris & Hofer, 2009, 2011).
9.	Do you choose technologies that are content specific or do you focus on choosing technologies that can be used across the curriculum? Can you provide examples? (Harris & Hofer, 2009, 2011; Mishra & Kohler, 2006, 2008, 2009).
10.	What is your thinking process as you prepare to teach a topic? In preparing to teach this topic what factors affect your choice of technology? (Gess-Newsome, 2002; Harris & Hofer, 2009; Mishra & Kohler, 2006, 2008, 2009).
11.	Have you allowed technology to influence how you prepare to teach a subject? Can you provide examples? (Doering, Veletsianos, Scharber, & Miller 2009; Mishra & Kohler, 2006, 2008, 2009).
12.	In what ways has technology influenced your instructional methods and the content you are able to teach in general? (Doering, Veletsianos, Scharber, & Miller 2009; Harris & Hofer, 2009, 2011; Mishra & Kohler, 2006, 2008, 2009).
13.	In what ways does the content you teach influence the technology you choose? (Harris & Hofer, 2009, 2011; Mishra & Kohler, 2008, 2009).
14.	Do you ever choose technologies to match a specific pedagogical strategy? Please explain. (Graham, Burgoyne, Cantrell, Smith, St. Clair, & Harris, 2009; Harris & Hofer, 2011).

Institutional
15. In what ways do you think technologies will shape the future of teaching and learning? (Neiss, 2011).
16. Describe the ultimate professional development experience. What characteristics make it meaningful to you? Describe the worst professional development experience you have had? (Bos, 2011; Wenger & Snyder, 2000; Polly & Hannafin, 2010; Wright, 2010).
17. Wenger and Snyder (2000) define a community of practice as "groups of people informally bound together by shared expertise and passion for a joint enterprise." Do you think you and your colleagues in this study, due to your participation in the MTT Program, have formed a community of practice? Describe how you perceive this thought. (Wenger, 2006).
18. What have been the most beneficial characteristics of participating in the MTT Program? (Gess-Newsome, Blocher, Clark, Menasco, & Willis, 2003; Wenger 2006; Wright, 2010).
19. What additional technology resources are needed to meet the needs of students? (Bos, 2011; Cuban, Kirkpatrick, & Peck, 2001; Polly & Brantley-Dias, 2009).
20. In what ways do you feel that technology resources can be used to meet your needs as teachers? (Harris & Hofer, 2011; Neiss, 2011).
21. In what ways would you describe the culture of your school for technology integration? (Harris & Hofer, 2011).

APPENDIX G

Protocol for Classroom Observations

The Pre-Observation questions will be used prior to each of the two observations.

Pre-Observation Interview

1. Teacher
2. Date/Time
3. Class
4. Description of the classroom
5. General description of the students (grade level, male/female, etc.)
6. Description of the tasks the teacher and students are engaged in.
7. What was your thinking process as you prepared to teach a topic? In preparing to teach this topic what factors affected your choice of technology? (This question could be curricular as well)
8. Were these decisions based more on the technology or the content? What drove your decision making the technology or the content?
9. Is there anything in particular you are hoping to have happen today in terms of the goals of this lesson? (This question could also be individual).
10. What do you hope to accomplish for the technology and/or the content?
11. How do you think the students are prepared technologically for this lesson?
12. Is there anything I should especially pay attention to while I am here observing?

During the Observation

During the observation, which is to be done in thirty to forty-five minute increments, fieldnotes will be taken in such a manner to allow for open coding to be performed later. In addition to fieldnotes, the Technology Observation Assessment Rubric will be used (Harris, J., Grandgenett, N., & Hofer, M., 2011).

The Post-Observation questions will be used after each of the two observations.

Post Observation

1. How do you feel things went in class? Did things proceed as you had imagined?
2. Do you feel you properly modeled the objectives that you wanted the students to achieve?
3. How do you think the students engaged in or with the technology? Do you think it was helpful to them or a hindrance to them? (i.e. do you think they exhibited the necessary skills to engage with this particular technology?)
4. If you were to teach this lesson again what would you change? What would you do the same?
5. What did you learn from preparing and teaching this lesson?
6. I noticed that _____. Why is that, or why did that occur?
7. Based on your understanding of TPACK, do you feel you accomplished a TPACK model of instruction for this lesson?

APPENDIX H

Technology Integration Observation Instrument

Technology Integration Observation Instrument

Observer _____ Teacher _____ Date_____

Grade Level(s) _____ Subject Area(s) _____

Primary Learning Goals _____

Directions:

We have tried to key the components of this instrument to different aspects of teachers' knowledge for technology integration. Please note, however, that the instrument is *not designed to assess this knowledge directly*. It is designed to focus upon the use of technology integration knowledge in observable teaching. Please record the *key curriculum topics addressed*, *instructional strategies/learning activities observed*, and *digital and non-digital technologies used* by the teacher and/or students in the lesson.

Curriculum Topic	Key Instructional Strategies/Learning Activities	Digital[1] & Non-Digital[2] Technologies

What, if anything, do you know about influences upon what you have observed in this lesson? Examples might include students' learning needs, preferences, and challenges; access to technologies; cultural, language and/or socioeconomic factors.

[1] Computer-based (e.g., software, Web-based resources, video or audio recorder, document camera, calculator)

[2] Not computer-based (e.g., overhead projector, textbook, whiteboard, pen/pencil/marker)

Technology Integration Observation Instrument[3i]

Directions: Referring to the notes you made on the previous page, including your responses to the question about influences, please complete the following rubric, considering the lesson as a whole.

	4	3	2	1
Curriculum Goals & Technologies (Matching technology to curriculum)	Technologies used in the lesson are strongly aligned with one or more curriculum goals.	Technologies used in the lesson are aligned with one or more curriculum goals.	Technologies used in the lesson are partially aligned with one or more curriculum goals.	Technologies used in the lesson are not aligned with one or more curriculum goals.
Instructional Strategies & Technologies (Matching technology to instructional strategies)	Technology use optimally supports instructional strategies.	Technology use supports instructional strategies.	Technology use minimally supports instructional strategies.	Technology use does not support instructional strategies.
Technology Selection(s) (Matching technology to both curriculum and instructional strategies)	Technology selection(s) are exemplary, given curriculum goal(s) and instructional strategies.	Technology selection(s) are appropriate, but not exemplary, given curriculum goal(s) and instructional strategies.	Technology selection(s) are marginally appropriate, given curriculum goal(s) and instructional strategies.	Technology selection(s) are inappropriate, given curriculum goal(s) and instructional strategies.
"Fit" (Considering curriculum, pedagogy and technology all together)	Curriculum, instructional strategies and technology fit together strongly within the lesson.	Curriculum, instructional strategies and technology fit together within the lesson.	Curriculum, instructional strategies and technology fit together somewhat within the lesson.	Curriculum, instructional strategies and technology do not fit together within the lesson.

(over, please)

[3]Adapted from:
Harris, J., Grandgenett, N., & Hofer, M. (2010). Testing a TPACK-based technology integration assessment instrument. In C. D. Maddux, D. Gibson, & B. Dodge (Eds.). *Research highlights in technology and teacher education 2010* (pp. 323-331). Chesapeake, VA: Society for Information Technology and Teacher Education (SITE).

	4	3	2	1
Instructional Use (Using technologies effectively for instruction)	Instructional use of technologies is maximally effective in the observed lesson.	Instructional use of technologies is effective in the observed lesson.	Instructional use of technologies is minimally effective in the observed lesson.	Instructional use of technologies is ineffective in the observed lesson.
Technology Logistics (Operating technologies effectively)	Teachers and/or students operate technologies very well in the observed lesson.	Teachers and/or students operate technologies well in the observed lesson.	Teachers and/or students operate technologies adequately in the observed lesson.	Teachers and/or students operate technologies inadequately in the observed lesson.

Comments:

APPENDIX I

Scored TIOIs

Teacher A, Observation #1

Technology Integration Observation Instrument[3]

Directions: Referring to the notes you made on the previous page, including your responses to the question about influences, please complete the following rubric, considering the lesson as a whole.

	4	3	2	1
Curriculum Goals & Technologies (Matching technology to curriculum)	Technologies used in the lesson are strongly aligned with one or more curriculum goals. ✓	Technologies used in the lesson are aligned with one or more curriculum goals.	Technologies used in the lesson are partially aligned with one or more curriculum goals.	Technologies used in the lesson are not aligned with one or more curriculum goals.
Instructional Strategies & Technologies (Matching technology to instructional strategies)	Technology use optimally supports instructional strategies. ✓	Technology use supports instructional strategies.	Technology use minimally supports instructional strategies.	Technology use does not support instructional strategies.
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"Fit" (Considering curriculum, pedagogy and technology all together)	Curriculum, instructional strategies and technology fit together strongly within the lesson.	Curriculum, instructional strategies and technology fit together within the lesson. ✓	Curriculum, instructional strategies and technology fit together somewhat within the lesson.	Curriculum, instructional strategies and technology do not fit together within the lesson.

(over, please)

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	4	3	2	1
Instructional Use (Using technologies effectively for instruction)	Instructional use of technologies is maximally effective in the observed lesson.	Instructional use of technologies is effective in the observed lesson.	Instructional use of technologies is minimally effective in the observed lesson.	Instructional use of technologies is ineffective in the observed lesson.
Technology Logistics (Operating technologies effectively)	Teachers and/or students operate technologies very well in the observed lesson.	Teachers and/or students operate technologies well in the observed lesson.	Teachers and/or students operate technologies adequately in the observed lesson.	Teachers and/or students operate technologies inadequately in the observed lesson.

Comments:

Teacher A, Observation #2

Technology Integration Observation Instrument[3]

Directions: Referring to the notes you made on the previous page, including your responses to the question about influences, please complete the following rubric, considering the lesson as a whole.

	4	3	2	1
Curriculum Goals & Technologies (Matching technology to curriculum)	Technologies used in the lesson are strongly aligned with one or more curriculum goals. ✓	Technologies used in the lesson are aligned with one or more curriculum goals.	Technologies used in the lesson are partially aligned with one or more curriculum goals.	Technologies used in the lesson are not aligned with one or more curriculum goals.
Instructional Strategies & Technologies (Matching technology to instructional strategies)	Technology use optimally supports instructional strategies. ✓	Technology use supports instructional strategies.	Technology use minimally supports instructional strategies.	Technology use does not support instructional strategies.
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"Fit" (Considering curriculum, pedagogy and technology all together)	Curriculum, instructional strategies and technology fit together strongly within the lesson. ✓	Curriculum, instructional strategies and technology fit together within the lesson.	Curriculum, instructional strategies and technology fit together somewhat within the lesson.	Curriculum, instructional strategies and technology do not fit together within the lesson.

(over, please)

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	4	3	2	1
Instructional Use (Using technologies effectively for instruction)	Instructional use of technologies is maximally effective in the observed lesson. ✓	Instructional use of technologies is effective in the observed lesson.	Instructional use of technologies is minimally effective in the observed lesson.	Instructional use of technologies is ineffective in the observed lesson.
Technology Logistics (Operating technologies effectively)	Teachers and/or students operate technologies very well in the observed lesson. ✓	Teachers and/or students operate technologies well in the observed lesson.	Teachers and/or students operate technologies adequately in the observed lesson.	Teachers and/or students operate technologies inadequately in the observed lesson.

Comments:

Teacher B, Observation #1

Technology Integration Observation Instrument[3]

Directions: Referring to the notes you made on the previous page, including your responses to the question about influences, please complete the following rubric, considering the lesson as a whole.

	4	3	2	1
Curriculum Goals & Technologies (Matching technology to curriculum)	Technologies used in the lesson are strongly aligned with one or more curriculum goals.	Technologies used in the lesson are aligned with one or more curriculum goals. ✓	Technologies used in the lesson are partially aligned with one or more curriculum goals.	Technologies used in the lesson are not aligned with one or more curriculum goals.
Instructional Strategies & Technologies (Matching technology to instructional strategies)	Technology use optimally supports instructional strategies.	Technology use supports instructional strategies.	Technology use minimally supports instructional strategies. ✓	Technology use does not support instructional strategies.
Technology Selection(s) (Matching technology to both curriculum and instructional strategies)	Technology selection(s) are exemplary, given curriculum goal(s) and instructional strategies.	Technology selection(s) are appropriate, but not exemplary, given curriculum goal(s) and instructional strategies.	Technology selection(s) are marginally appropriate, given curriculum goal(s) and instructional strategies. ✓	Technology selection(s) are inappropriate, given curriculum goal(s) and instructional strategies.
"Fit" (Considering curriculum, pedagogy and technology all together)	Curriculum, instructional strategies and technology fit together strongly within the lesson.	Curriculum, instructional strategies and technology fit together within the lesson. ✓	Curriculum, instructional strategies and technology fit together somewhat within the lesson.	Curriculum, instructional strategies and technology do not fit together within the lesson.

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16/24

	4	3	2	1
Instructional Use (Using technologies effectively for instruction)	Instructional use of technologies is maximally effective in the observed lesson.	Instructional use of technologies is effective in the observed lesson. ✓	Instructional use of technologies is minimally effective in the observed lesson.	Instructional use of technologies is ineffective in the observed lesson.
Technology Logistics (Operating technologies effectively)	Teachers and/or students operate technologies very well in the observed lesson.	Teachers and/or students operate technologies well in the observed lesson. ✓	Teachers and/or students operate technologies adequately in the observed lesson.	Teachers and/or students operate technologies inadequately in the observed lesson.

Comments:

Teacher B, Observation #2

Technology Integration Observation Instrument[3i]

Directions: Referring to the notes you made on the previous page, including your responses to the question about influences, please complete the following rubric, considering the lesson as a whole.

	4	3	2	1
Curriculum Goals & Technologies (Matching technology to curriculum)	Technologies used in the lesson are strongly aligned with one or more curriculum goals.	Technologies used in the lesson are aligned with one or more curriculum goals.	Technologies used in the lesson are partially aligned with one or more curriculum goals. ✓	Technologies used in the lesson are not aligned with one or more curriculum goals.
Instructional Strategies & Technologies (Matching technology to instructional strategies)	Technology use optimally supports instructional strategies.	Technology use supports instructional strategies.	Technology use minimally supports instructional strategies. ✓	Technology use does not support instructional strategies.
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	4	3	2	1
Instructional Use (Using technologies effectively for instruction)	Instructional use of technologies is maximally effective in the observed lesson.	Instructional use of technologies is effective in the observed lesson.	Instructional use of technologies is minimally effective in the observed lesson.	Instructional use of technologies is ineffective in the observed lesson.
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Comments:

Teacher C, Observation #1

Technology Integration Observation Instrument[3]

Directions: Referring to the notes you made on the previous page, including your responses to the question about influences, please complete the following rubric, considering the lesson as a whole.

	4	3	2	1
Curriculum Goals & Technologies (Matching technology to curriculum)	Technologies used in the lesson are strongly aligned with one or more curriculum goals. ✓	Technologies used in the lesson are aligned with one or more curriculum goals.	Technologies used in the lesson are partially aligned with one or more curriculum goals.	Technologies used in the lesson are not aligned with one or more curriculum goals.
Instructional Strategies & Technologies (Matching technology to instructional strategies)	Technology use optimally supports instructional strategies. ✓	Technology use supports instructional strategies.	Technology use minimally supports instructional strategies.	Technology use does not support instructional strategies.
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	4	3	2	1
Instructional Use (Using technologies effectively for instruction)	Instructional use of technologies is maximally effective in the observed lesson.	Instructional use of technologies is effective in the observed lesson. ✓	Instructional use of technologies is minimally effective in the observed lesson.	Instructional use of technologies is ineffective in the observed lesson.
Technology Logistics (Operating technologies effectively)	Teachers and/or students operate technologies very well in the observed lesson.	Teachers and/or students operate technologies well in the observed lesson. ✓	Teachers and/or students operate technologies adequately in the observed lesson.	Teachers and/or students operate technologies inadequately in the observed lesson.

Comments:

Teacher C, Observation #2

Technology Integration Observation Instrument[3i]

Directions: Referring to the notes you made on the previous page, including your responses to the question about influences, please complete the following rubric, considering the lesson as a whole.

	4	3	2	1
Curriculum Goals & Technologies (Matching technology to curriculum)	Technologies used in the lesson are strongly aligned with one or more curriculum goals. ✓	Technologies used in the lesson are aligned with one or more curriculum goals.	Technologies used in the lesson are partially aligned with one or more curriculum goals.	Technologies used in the lesson are not aligned with one or more curriculum goals.
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	4	3	2	1
Instructional Use (Using technologies effectively for instruction)	Instructional use of technologies is maximally effective in the observed lesson.	Instructional use of technologies is effective in the observed lesson. ✓	Instructional use of technologies is minimally effective in the observed lesson.	Instructional use of technologies is ineffective in the observed lesson.
Technology Logistics (Operating technologies effectively)	Teachers and/or students operate technologies very well in the observed lesson.	Teachers and/or students operate technologies well in the observed lesson.	Teachers and/or students operate technologies adequately in the observed lesson. ✓	Teachers and/or students operate technologies inadequately in the observed lesson.

Comments: