

ABSTRACT

A Case Study of How and If a Professional Development Model
Based on the TPACK Framework Builds Teachers' Capacity for Technology Integration

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Digital technologies are prevalent in society and K-12 classrooms today and the belief that educational technology can be a transformative agent of change in education is ever increasing. However, the use of technology as a transformative learning tool for all students has not yet been realized. Research in this area indicates that teachers are the leading factor impacting the utilization of technology for learning. Focused professional development along with time to develop curriculum and lessons has been identified as critical factors in changing the way teachers and students utilize technology.

The purpose of this explanatory single case study, with multiple units of analysis, was to examine the experiences and practices of nine teachers in a technology-rich high school setting to better understand the impact of a TPACK based professional development model, to understand how and why teachers make decisions regarding instructional technology integration, and to determine how their technology integration met the TPACK model of instruction.

Findings from the study revealed that the professional development model based on TPACK framework and effective professional development strategies increased teachers' use of technology, how they considered using technology and changed their instructional focus from teacher to student-centered practices. Additionally, teachers' considerations for instructional technology during planning were influenced by their teacher-centered or student-centered ideas. Finally, teachers who successfully implemented technology based on the Technology Integration Observation Instrument were those who were well versed in active learning strategies, learner-centered in their planning and implementation of instructional strategies, have the greatest number of years experience and exposure to the TPACK training model, while having varying levels of technology efficacy.

The study provided evidence to support the idea that transformational educational change through technology has little to do with the technology itself; instead, it is dependent on the pedagogical knowledge of the teacher and the context of the professional development provided to teachers. It is increasingly evident that the change sought in teaching and learning will only come about by a change in the pedagogical practice of teachers who are appropriately prepared with student-centered learning activities and content knowledge that utilizes technology as an instructional tool to facilitate and impact learning.

A Case Study of How and If a Professional Development Model
Based on the TPACK Framework Builds Teachers' Capacity for Technology Integration

by

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DEDICATION

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CHAPTER ONE

Introduction

Digital technologies have become prevalent in society and K-12 classrooms today. Reports on the potential of educational technology present visions and predictions of technology as a catalyst for change in schools. Assertions have been made that technology may change the "content, methods, and the overall quality of the teaching and learning process, most frequently, triggering changes away from lecture-driven instruction and toward constructivist, inquiry-oriented classrooms" (Culp, Honey, & Mandinach, 2005). The *digital divide* which once separated the *haves* and *have-nots* or those students, who had technology access and those who did not, has nearly been eliminated. Students have more access to technology devices in their homes and schools than ever before. However, the use of technology as a transformative learning tool for all students has not yet been realized.

Although the majority of schools have access and the "connectivity gap" is said to be quickly closing (Education Super Highway, 2017), a second *digital divide* seems to have emerged between students who use technology for passive, entertainment or "consumption" and those who utilize technology for learning activities which lead to higher order thinking strategies, creation of new materials, or production of presentations or original works (Banister & Reinhart, 2011; Becker, 2000; Dolan, 2016; Hohfield, Ritzhaupt, Barron, & Kempner, 2008; Reinhart, J., Thomas, E., & Toriskie, J., 2011). The trend line among the "consumers" versus the "producers" of the new *digital divide*

disturbingly follows the trend lines of the academic achievement gap that educators have tracked and worked to reduce for so long. Students from low SES schools and underperforming academic populations reportedly have access to digital technologies but merely use it for drill and practice purposes rather than those practices that promote communication, collaboration, creativity or critical thinking skills (Banister & Reinhart, 2011; Becker, 2000; Dolan, 2016; Hohfield, et al., 2008; Reinhart et al., 2001).

Research in this area indicates that teachers are the leading factor impacting the utilization of technology for learning. Focused professional development along with time to develop curriculum and lessons has been identified as critical factors in changing the way teachers and students utilize technology.

This study seeks to examine a professional development program based on the Technological Pedagogical Content Knowledge Framework (TPACK) and then explore the experiences and decisions made by teachers regarding their implementation of technology into classroom curriculum.

If technology is to be a transformational change agent for all students, then all teachers must make decisions to adopt new technologies and adapt the teaching and learning environment. As Chapman, Masters, and Pedulla (2010) states, “what does it profit students to have technology access if both they themselves as well as those instructing them do not have the training or capacity to utilize this technology efficiently?” (p. 248).

Background

Three decades ago government and education entities began to acknowledge the importance of emerging technologies and call for increased technology education for all

students. The 1983, landmark report, *A Nation at Risk*, named five “New Basic” courses that formed the “Core of Modern Curriculum” including English, Mathematics, Science, Social Studies and Computer Science (United States. National Commission on Excellence in Education, 1983, p. 24). Specifically, the report called for students to be able to “understand the computer as an information, computation and communication device; [be able to] use the computer in the study of the other Basics and for personal and work-related purposes; and understand the world of computers, electronics, and related technologies” (p. 26).

In 2001, twenty years following *A Nation at Risk*, the *No Child Left Behind Act* (NCLB) recommended that all students be technologically literate by 8th grade and referenced technology as needed support across the curriculum (Culp et al., 2005). Most recently, in December of 2015, the *Every Student Succeeds Act* (ESSA) replaced NCLB and brought about significant changes in technology education and how technological initiatives could be funded. In the ESSA act, educational technology was mentioned explicitly under the Title IV, Part A, Student Support and Academic Enrichment Grant. The \$1.65 billion grant, encompassed three broad areas (1) providing students with a well-rounded education, (2) supporting safe and healthy students and finally (3) supporting the effective use of technology (e.g., professional development, blended learning, technology devices). The “funding needs program” of the act states, “Federal investments in educational technology ensures schools have technology-proficient educators, well-equipped classrooms, sufficiently supported administrative structures, and a curriculum optimized to take advantage of the benefits technology offers to all students such as closing the opportunity and learning gaps and providing students with essential modern workforce skills” (Every Student Succeeds Act, 2015). ESSA continued the course of prioritizing the importance of educational technology in public school but went further than any other act to allow greater discretion for spending and allocating

funds to local and state education entities so that individual schools' and students' needs could be considered.

In addition to technology-focused legislation, great strides have been made in the last five years to close America's "Connectivity Gap" and provide the bandwidth needed for providing high-speed Internet and the physical infrastructure needed to support digital learning in public school classrooms. In 2013, a bipartisan effort to close America's *Connectivity Gap* led to the Federal Communication Commission's revision of the E-rate program (funding for technology infrastructures) and a commitment to three goals for every student in American public schools: (1) 100 kbps per student of Internet access to enable digital learning, (2) fiber connection to every school so bandwidth could be reliable over time, and (3) Wi-Fi in every classroom to support one-device-per student programs (Education Super Highway, 2017). Connectivity to technology and high-speed Internet no longer remain a problem for most American public schools and students. It is reported that 94% of U.S. schools are connected to high-speed Internet, and with assistance from federal and state funding, technology initiatives, and technology industry contributors, the rest of the nation is on track to have access by 2020 (Education Super Highway, 2017).

Technology standards for 21st Century learning have also emerged in recent years identifying the skills students need to be active and successful participants in their post-secondary world. The Partnership for 21st Century Learning, the International Society for Technology Educators (ISTE), the U.S. Department of Educational Technology, and State Departments of Education have widely published the future ready skills students need to be successful using technology as the leave K-12 school

There is growing pressure for educators to respond to this increasing availability of technology resources and the potential of these technologies to enhance teaching and learning. Pressure to change not only comes from the Federal, State, and technology industry entities that have provided the infrastructure for this implementation, but from students as well.

Students in secondary schools were born into an age of technology, and these "digital natives" have known technologies since birth (Prensky, 2001). The emergence of digital technologies in the classroom and students' desire to use them is well documented in the current literature (Harris Interactive, 2015). One study conducted by the Pew Research Center found that 92% of teenagers go online daily and 24% of those reported that they were online "almost constantly" (Lenhart, 2015). Prensky (2001) who first identified modern students as "digital natives" went so far as to say that "today's students are no longer the people our educational system was designed to teach" (p. 1). *Digital natives* have different skill sets than those of previous generations, but classrooms and teachers have changed very little to accommodate this type of learner (United States Department of Education, 2016).

Statement of the Problem

This study seeks to gain an explanation for the disconnect that exists between the change in learning environments and curriculum as access to technology continues to grow. Technology investment in schools has increased dramatically over the last three decades driven by the hopes that "technology-mediated learning environments provide opportunities for students to search for and analyze information, solve problems, and communicate and collaborate, hence equipping them with a set of competencies to be

competitive in the 21st century marketplace” (Lim, Zhao, Tondeur, Chai, & Tsai, 2013, p. 59). The expectation for technology-rich environments to change education is great (Culp et al., 2005). However, a shift from the traditional teacher-led classroom setting to a student-driven learning environment, rich with opportunities to locate and analyze information, solve problems, and to communicate and collaborate with others is still needed. The possibilities for transformational change through technology integration in education are great, but the reality of this taking place in schools has not yet widely occurred (United States Department of Education, 2016).

Although the environment for rich technology integration is present and the notion of a *digital divide* between the *haves* and *have-nots* no longer seems to exist, a new *digital divide* seems to be the growing issue. The previous *digital divide* focused on the importance of physical access to computers and the Internet and not other factors that allow students to use these tools in meaningful ways for learning (Valadez & Duran, 2007). Studies identifying the new *digital divide* call attention to the need to redefine access in social and technical terms to address the questions of who has access, how students use the technology, how teachers utilize the technology, as well as how teachers locate and use instructional materials (DiMaggio et al., 2001; Valadez & Duran, 2007).

Although more students have physical access to technology, there are still differences in the ways they choose or are allowed to use the technology. Technology may be a constant presence in students' lives outside of school however many teens' technology practices are limited to social and entertainment purposes and they are not accustomed to using technology for learning (Blackwell, Lauricella, & Wartella, 2014; Leu, Forzani, Rhoads, Maykel, Kennedy, & Timbrell, 2015; Ritzhaupt, Dawson, &

Cavanaugh, 2012). Influences that affect the purpose of technology use have been identified as a student's socioeconomic status, the socioeconomic status of their school, and how their teachers understand and use technology (Garland & Wotton, 2001; Swain & Pearson, 2003; Tyner, 2003; Watters, 2013, Dolan, 2016).

The characteristics of students' technology interactions have been identified as either being a *consumer* or *producer* in the technology medium. A producing user actively engages with technology and creates a product or can communicate their thoughts while a consumer of technology is passive and uses technology to perform rote tasks such as drill and practice activities or may use technology for no more than a typewriter or writing tablet (Dolan, 2016). The research presents patterns of differences between low and high socioeconomic schools. While low SES schools may use technology more, the use is geared toward drill and practice and not toward higher order thinking strategies or in creation of materials, presentations and original works (Banister & Reinhart, 2011; Becker, 2000; Dolan, 2016; Hohfield et al, 2008; Reinhart et al., 2001).

The Digital Divide

Dolan (2016), through a literature review of the *digital divide*, found that rather than closing the divide by providing more access to technology, we may have inadvertently made the gap more complex. Dolan discusses that instead of a *digital divide* between the previous *haves* and *have-nots*; we now have a divide between the *cans* and *can-nots* (p. 31). She defines the *cans* as those who use technology as active producers and typically come from more affluent communities, higher SES schools, and have teachers and administrators that understand and promote technology for learning. The

can-nots, “assume the role of passive consumers--are students who typically attend lower SES schools, where technology is used to practice skills through drill-like exercise often focused on standardized testing requirement, or to word process documents” (p. 31).

Valadez and Duran (2007) note the social justice concerns of the *divide* between high and low resource schools. A disparity exists between how teachers in low SES schools compared to high SES schools utilize technology to address knowledge, skills and instructional resources. One study found “high SES schools...tended to invest more in professional development, hiring full-time technical support staff and developing lines of communication among teachers, office staff, media specialists, technical staff, and administration that promoted robust digital networks” (Warschauer, Knobel, & Stone, 2004, p. 578). Consequently these practices “encouraged more widespread teacher use of technologies” (p. 578). Inversely, low SES school teachers were less likely to communicate with peers through professional learning networks or social media, which means they had less exposure to opportunities which might lead to skill development, knowledge acquisition, and technology innovation (Warshauer et al., 2004). “The way that students use the Internet for school is largely driven by the kinds of activities and assignments that teachers create” (Levin & Arafah, 2002). Dolan (2016) found consistent themes in the research that identified the following factors as a cause for teen variant use of technology. The emerging themes included "impacts of the socioeconomic status of the students themselves and the schools they attended; discussions on ways students used technology in and out of school; and specific factors that support or limited use, such as teacher beliefs and district restrictions on technology" (p. 19). In a study by Wang, Hsu, Campbell, Coster, & Longhurst (2014), limitations on technology uses were due to two

factors, “teachers who were knowledgeable about using technology for their own personal use, but found difficulty transferring the knowledge to student learning; and finding the time to investigate how to implement technology into pedagogical practices” (p. 656). Valadez and Duran call for professional development for teachers in low resource schools to provide teachers an opportunity to acquire the needed knowledge necessary for integration of computers and the Internet into their instructional practice.

The *digital divide* between the *haves* and *have-nots* may no longer exist in the current educational setting; however, a more complex issue has surfaced related to how students utilize technology and the Internet as a tool for learning. Goodwin (2011) suggested that the issue of technology implementation in schools may be “only as effective—or ineffective—as the schools that adopt them” (p.2) which means that the success of utilizing technology for learning does not lie in the hands of the technology or students but rather each teacher’s knowledge and willingness to adopt new technologies into instruction.

A Teacher’s Influence

“Teachers have been cited in the research as a major supporting or limiting factor on how students use technology” (Dolan, 2016, p. 28). The Ritzhaupt, Dawson, and Cavanaugh (2012) study found that “teacher use of technology strongly and positively explained classroom technology integration and student use of technology”. The study goes on to state that “these findings reinforce the importance of teachers appropriately modeling the use of technology in their classrooms and provide the important evidence that a teacher can directly influence their students’ use of technology through their own professional practice” (p. 247).

Teachers are motivated by both internal and external factors for technology integration including pedagogical beliefs about models of instruction, personal interests and motivation, professional development training, technology support, time to collaborate with peers for curriculum planning and implementations, and time to learn new technology tools for instructional integration (Ertmer, 2005; Levin & Arafeh, 2002; Ritzhaupt et al., 2012; Shnellert & Keengwe, 2012).

Ritzhaupt et al. (2012) used a research-based path model on data gathered from 732 teachers in 107 schools in the state of Florida to examine the effects of teachers' characteristics, school characteristics and contextual characteristics on classroom technology integration and teacher use of technology integration. The study found that a "teacher's level of education and experience teaching with technology positively and significantly influence his/her use of technology" (p. 245). Additionally, "teacher use of technology strongly and positively explains classroom technology integration and student use of technology" (p. 229). Another significant connection was that, "how a teacher integrates technology into the classroom explains how frequently students use technology in a school setting" (p. 229). The study stated that not only does a teacher's level of education and experience teaching with technology *positively* related to his or her use of technology, but also that a teacher who had years of experience teaching without technology *negatively* related to the teacher's and students' use of technology in the classroom (Ritzhaupt et al., 2012). This idea exposes a need for a professional development model that will influence teachers' practice using technology as a pedagogical tool.

Technology Used for Instruction

Recognizing the need for growth in technology integration and access for all students in our nation's classrooms, the Department of Education, Office of Educational Technology published the National Education Technology Plan (NETP) in 2016 titled, *Future Ready Learning: Reimagining the Role of Technology in Education*. The plan was written to articulate the Department of Education's vision of equity, active use and collaborative leadership, which as needed to make all-the-time learning for all students possible (United States Department of Education, 2016).

The Office of Educational Technology acknowledged the progress the United States had seen in the last five years but also the challenges that lie ahead. Since 2010, the dialogue has shifted from *whether or not* technology should be used for learning to *how* can it be used for learning, and *how* can access be given to all learners. Advances have been made in understanding how people learn and technology is being used to customize learning opportunities for individual students. Studies have been conducted to determine what kinds of skills people must possess to be successful in the 21st century, and schools are using technology to achieve these 21st century skills. Technology has begun to be used to differentiate teaching and assessment for all levels of learners. The Office of Educational Technology acknowledges the progress made to increase the availability of devices and access to the Internet. Due to the availability and access to mobile devices, the physical setting in which students learn has also begun to change (United States Department of Education, 2016).

In addition to recognizing the strides that have been made, the National Educational Technology Plan also identifies the work that lies ahead for American Schools. The 2016 publication identifies the following areas for growth:

- A digital use divide continues to exist between learners who are using technology in active, creative ways to support their learning and those who predominantly use technology for passive content consumption.
- Research on the effectiveness of technology-enabled programs and resources is still limited, and we should build capacity to generate evidence of individual, program, and community-level outcomes.
- Many schools do not yet have access to or are not yet using technology in ways that can improve learning on a daily basis, which underscores the need—guided by new research—to accelerate and scale up adoption of practical approaches and technologies.
- Few schools have adopted approaches for using technology to support informal learning experiences aligned with set learning goals.
- Supporting learners in using technology for out-of-school learning experiences is often a missed opportunity.
- Across the board, teacher preparation and professional development programs fail to prepare teachers to use technology in productive ways.
- Assessment approaches have evolved but still do not use technology to its full potential to measure a broader range of desired educational outcomes, especially non-cognitive competencies.
- The focus on providing Internet access and devices for learners should not overshadow the importance of preparing teachers to teach effectively with technology and to select engaging and relevant digital learning content.
- As students use technology to support their learning, schools are faced with a growing need to protect student privacy continuously while allowing the appropriate use of data to personalize learning, advance research, and visualize student progress for families and teachers (United States Department of Education, 2016, p. 5-6).

The National Educational Technology Plan 2016 identifies that technology tools and access are available in classrooms today. Our most significant needs in future

development fall primarily in the areas of teaching students *how* to use these technology tools in active ways which increases students' potential to create, to critically think and solve problems, to collaborate with others, to communicate their ideas and findings, and to be responsible and resourceful for their own learning. The most promising method for guiding students down the more purposeful path of technology use is by empowering teachers with skills, tools, and knowledge regarding purposeful technology integration.

As professional development is designed for technology integration, it is essential that the focus be on how technology can be used for instruction not on the technology itself (Carr, Jonassen, Litzinger & Marra, 1998; Mishra & Koehler, 2003). In 2006, Mishra and Koehler introduced the Technological Pedagogical Content Knowledge framework (TPACK) for technology integration. TPACK was an expansion on an earlier construct published by Lee Shulman (1986). Shulman's work introduced the idea of Pedagogical Content Knowledge (PCK). Shulman claimed that for teachers to be successful instructors, they need expert knowledge in both content and pedagogy. Shulman (1986) stated that the intersection of pedagogy and content creates the opportunity for teachers to present subject matter in a variety of ways that will make it more accessible to all learners.

The TPACK framework introduced an additional component to the previous model developed by Shulman, technological knowledge. The TPACK framework emphasizes the "connection, interactions, affordances and constraints among content, pedagogy and technology" (Mishra & Koehler, 2006, p. 1025). In addition to the main components of the framework, content knowledge, pedagogical knowledge, and technological knowledge there are intersections of the parts. The intersections create the

unique interactions of PCK (pedagogical content knowledge), TCK (technological content knowledge), TPK (technological pedagogical knowledge), and finally technological pedagogical content knowledge or TPACK. The TPACK framework is used in this study as a model for technology integration professional development to address the disconnect between the ever increasing access to technology in schools and the lack of change in classroom learning environments and curriculum as it relates to the teacher's influence.

Purpose of the Study

Teachers have been cited in research as the most impactful factor in supporting or limiting how students use technology (Dolan, 2016). The reported findings state that current teacher preparation and professional programs are deficient in building teachers' capacity to use and model technology in appropriate ways for learning (United States Department of Education, 2016). Studies note, "sustained and intensive professional development for teachers is related to student achievement gains" (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). If teachers can develop, purposefully model, and incorporate technology into the learning process, students will be impacted. Additional studies conducted have determined that there are key elements to effective teacher professional development. *Professional Learning in the Learning Profession* notes, "effective professional development is intensive, ongoing and connected to practice; focuses on the teaching and learning of specific academic content; is connected to other school initiatives, and builds strong working relationships among teachers" (p. 6). Although research suggests that student achievement is positively influenced through teacher professional development and research provides best-practice methods for

effective teacher professional development, one best system or way of preparing teachers to integrate technology into classroom instruction has yet to emerge. A need for appropriate technology professional development is necessary to truly prepare a teacher for instruction with technology tools, which will enhance student learning (Schnellert & Keengwe, 2012).

The purpose of this explanatory case study is to examine the experiences and practices of nine teachers in a technology-rich high school setting where every student and teacher has access to a personal device. The study's intent is to understand the impact of the TPACK based professional development model, to understand how and why teachers make decisions regarding instructional technology integration, and to determine how their technology integration meets the TPACK model of instruction.

Research Design

This study utilizes an explanatory case study design to gain a better understanding of how and if a professional development model based on the TPACK framework and best practice professional development design has influenced teachers' integration of technology into their teaching practice. The study intends to provide details and insights into the decisions teachers make regarding how, why and for what purpose technology is utilized in a lesson and if that integration fits the TPACK framework.

The participants in this explanatory case study are bound by the location and technology environment of the study, a large public high school in Central Texas. Participants will be selected through random purposive criterion sampling and then be observed, interviewed and submit artifacts, which will be analyzed to understand their technology integration decisions and methods. Through a pattern matching process, the

research will use an a priori theoretical framework to code and reduce the data to categories and then themes.

Research Questions

The explanatory case study seeks to address the following questions:

1. How did participation in the *Tech & Teach Tuesday* Professional Development program influence teachers' integration of technology into classroom curriculum?
2. How and why do teachers make decisions regarding technology integration into content and pedagogical practice?
3. How did each teacher's method of technology integration in lessons meet the TPACK model of instruction?

Limitations and Delimitations

The researcher conducting this study is the Associate Principal at the high school campus where the study took place. The researcher was deeply involved in the *Tech & Teach Tuesday* professional development program and collaborated with the campus Instructional Technologists to design the program curriculum, plan the scope and sequence of the training, and develop presentation formats that model best practice. Approximately 85 teachers, including all English, Math, Social Studies, Science and Languages Other Than English (LOTE) teachers, attended 45-minute trainings within the school day each week. Due to the researcher's position on the campus, some teachers in the study may not be honest about their apprehensions about using technology due to the district and campus expectations that are associated with the 1:1 district implementation. Teachers may also be apprehensive to participate in the study because of the appraisal system and the connection of the researcher to the system. The researcher is responsible

for teacher evaluations, but the researcher will not evaluate any of the teachers who participate in the study.

Significance of the Study

How and for what purpose a teacher integrates technology into instruction directly affects student use of technology (Ritzhaupt, Dawson, & Cavanaugh, 2012). The emergence of a second *digital divide* calls for a need to address how all teachers incorporate technology into teaching and learning. Findings suggest that students will primarily use technology for passive content consumption rather than for active learning without teacher guidance (United States Department of Education, 2016).

Technology training for teachers in the past was focused on the technology tool and not how it could be used to advance instruction (Papert, 1990). Harris and Hofer (2011) pointed out that teachers are not aware of “curriculum-based learning activities, projects and approaches that they can use with the help of different educational technologies” (p. 441). Teacher professional development is essential in incorporating technology seamlessly into instructional pedagogy, but no one best system has emerged. The TPACK framework is a common sense approach to technology integration.

Researcher’s Perspective

Creswell (2013) states that our philosophical assumptions are influenced by “our training and reinforced by the scholarly community in which we work” (p. 19). For transparency it is important to note, as the primary investigator, the background experiences, philosophical positionality and current professional perspective I bring to the study and its findings.

My professional background experiences include eleven years as a music teacher in both Texas and Michigan public schools and nine years in academic coaching or administrative positions outside of the classroom. In my support and coaching roles, I served as the Instructional Specialist for three years, at two Title I, schools in the Central Texas Area, where I worked closely with teachers and students to improve teaching and learning through focused instructional groups, curriculum development, professional development, and technology integration training. I then served one year as an Instructional Technologist in the district where the study takes place, where I created and delivered technology professional development to teachers on the brink of a 1:1 iPad initiative. Following my four-year tenure as an instructional specialist, I became an Assistant Principal on that same campus where I once trained teachers and now serve as the Associate Principal of that campus. Due to my previous coaching experience, I was able to continue my work with teachers at the high school in the area of pedagogy and technology integration while working as an administrator. As an Assistant Principal and now Associate Principal on the campus I work with the campus Instructional Technologists to design and lead the professional development training for teachers which we call, *Tech & Teach Tuesday*.

I believe these experiences led me to this study for several reasons. First, my experiences as a classroom teacher in the fine arts area have directed my philosophy toward a constructivist mindset. In the fine arts classroom, much of the learning is a hands-on and experiential. As a student of music and then a band director for eleven years, the act of learning in that setting took place through participation with a live ensemble and individual practice of material, which created an environment and

opportunity for reflection, self-assessment and then the discovery of information or technique. I bring this knowledge and understanding to the professional development world of which I am now a part. The act of teaching students or teachers requires an ongoing self-reflection and ability to adapt to the environment. As I work with teachers on technology integration, the training is focused on the pedagogical application of an instructional strategy, which utilizes a technology tool and not merely the tool itself. At the high school, *Tech & Teach Tuesday* professional development is designed to be as hands-on as possible and time for reflection and collaboration with peers regarding classroom use of a pedagogical tool is of highest priority.

I believe that my years of experiences outside of the classroom working directly with teachers to support the use of technology in their classroom has led me to this study as well. Over time I have been witness to the coming and going of technology tools that became quickly outdated and replaced by the next best tool. This observation taught me to never be dependent on a single tool, which would come and go but instead focus on a pedagogical connection that a tool would help support. If the teaching and learning were the focus, many tools could support the need or purpose of the instructional participation or practice.

Finally, throughout my experiences, I have observed teachers of varying technical savvy grow with or drowned in the emerging technologies introduced in schools. It has been essential to me, throughout my years as a professional developer to find ways to reach and grow all levels of *teacher-learners*. I believe that if all teachers can understand and practice effective instructional strategies utilizing whatever technology is purposeful for their need, then all students will benefit. Teacher growth has been my motivation for

seeking best practice professional development methods to coach and support all teachers.

Conclusion

The last three decades of educational legislation, commercial investments, and school district initiatives have promoted the integration of technology into daily classroom instruction. However, a disconnect continues to exist between the growing access students have to technology and a change happening in learning environments and curriculum. Teachers have been identified as crucial influences on how students utilize technology, while also being identified as ill prepared to utilize technology for instruction to enhance student learning and products. In order to address the issue of technology integration into classroom instruction, research points to the teacher and purposeful professional development as the most influential factors. The purpose of this study is to examine the experiences and practices of teachers in a technology-rich environment to understand the impact of the TPACK based professional development model, to understand how and why teachers make decisions regarding instructional technology integration, and then to determine how their technology integration meets the TPACK model of instruction. Through interviews, observations, and artifacts this study seeks to understand how and if professional development is impactful in classroom technology integration. Chapter Two will present a review of the literature detailing the increased call for emerging technology to be utilized in the classroom, the importance of a teacher's influence on how technology is used in the classroom, the best approach to teacher growth through professional development and a Theoretical Framework that layers technology alongside content and pedagogy.

Definition of Terms

One to One (1:1) – Chalkup’s EdTech Glossary, an online Educational Technology resource defines 1:1 as an environment where a school has given every student a device for individualized learning. In the Midway Independent School district, every child is issued an iPad. At Midway High School students have an iPad issued to them that remains in their possession for the entire school year to be used for schoolwork both at school and at home.

Professional Learning Communities (PLCs) – Are groups of educators that come together to promote professional growth within their common interest-based community. A PLC is a collaborative team whose members work together “interdependently” to achieve a common goal linked to the purpose of learning for all students (Dufour, Dufour, Eaker, Many & Mattos, 2016, p. 10). Professional Learning Communities can meet face to face or through technology mediums. The group looks for best practice strategies to enhance student learning or customized professional growth. In the Midway High School setting PLCs meeting times are embedded within the school day, and all core subject teachers participate with other teachers of the same subject.

Technological Pedagogical and Content Knowledge Framework (TPACK) – this technology integration framework incorporates Shulman’s earlier Pedagogy Content Knowledge framework with technology integration (Mishra & Koehler, 2006).

CHAPTER TWO

Literature Review

The Digital Divide

The United States Department of Commerce, National Telecommunications and Information Administration (NTIA) released a report in 1999 on the state of American households and their access to telephones, computers and the Internet. This report defined “one of America’s leading economic and civil rights issues, the ‘digital divide’, as those with access to new technologies and those without” (United States Department of Commerce, National Telecommunications and Information Administration (1999), p. XIII). The purpose of the report was to identify which Americans were “falling further behind” and then take “concrete steps to redress this gap” (p. XIII). Gains were made toward closing the digital divide and a report published by the Pew Research Center, *Home Broadband 2015*, noted that home Internet access had grown to 80% in 2013 (Horrigan & Duggan, 2015). Nearly twenty years later after the NTIA report, American households have much greater access to technology and Broadband Internet service in their homes.

In addition to improved access to computers and improved broadband Internet, multiple Pew Research Center studies indicated much of the issue of access to technology and the Internet have been facilitated by mobile devices (Horrigan & Duggan, 2015; Lenhart, 2015). This is especially true for school-aged children. The Pew Study, *Teens, Social Media and Technology Overview 2015*, found that “nearly three-quarters of teens

have or have access to a smartphone, and 30% have a basic phone, while just 12% of teens 13 to 17 say they have no cell phone of any type” (Lenhart, 2015, p. 2). One previously underrepresented Internet-connected population in the 1999 NTIA report, African-American households, now passes other demographic groups in their access and usage of mobile devices (Irving, 1999). The *Teens, Social Media and Technology Overview 2015* identified that “African-American teens are the most likely of any group of teens to have a smartphone, with 85% having access to one, compared with 71% of both white and Hispanic teens” (Lenhart, 2015, p. 2). Smartphones and other mobile technologies, and not a necessarily a desktop or laptop computer, have become the primary tools for teen Internet usage. Surveys report that “91% of teens go online from mobile devices at least occasionally”, “94% go online daily or more often”, and “some 68% go online at least daily” (p. 2). Additionally “African-American and Hispanic youth report more frequent Internet use than white teens. Among African-American teens, 34% report going online ‘almost constantly’ as do 32% of Hispanic teens, while 19% of white teens go online that often” (p. 2).

Connectivity to technology and high-speed Internet no longer exist as the problem for American students or their schools. It is reported that 94% of U.S. public schools are connected to high-speed Internet. Through federal and state funding, technology initiatives, and third-party companies, the rest of the nation is on track to have access by 2020 (Education Super Highway, 2017).

The *digital divide* between the *haves* and *have-nots* no longer exists in our current environment; however, a new divide has emerged. The previous *digital divide* was defined by physical access to computers and the Internet and not educational or real-

world skills that allowed a student to access technology for learning (Valadez & Duran, 2007). Studies suggest that we must now reconsider our previous definition of the *digital divide* by take into account who has access, how students use the technology, how teachers utilize the technology, and how teachers locate and utilize instructional materials (DiMaggio, Hargittai, Neuman, & Robinson, 2001; Valadez & Duran, 2007).

Although more students have physical access to technology they do not all access technology for the same purposes. The influences that affect a student's purpose for using technology have been identified as their socioeconomic status, the socioeconomic status of their school, and the ways in which their teachers understand and use technology (Dolan, 2016; Garland & Wotton, 2001, Swain & Pearson, 2003; Tyner, 2003; Watters, 2013).

Students have been identified as being *consumers* or *producers* in the technology medium meaning that they either passively consume content through technology or use technology for simple rote tasks while the producer actively engages with technology and creates a product or is able to communicate their thoughts (Dolan, 2016). The research repeatedly presents patterns of differences between low and high socioeconomic schools. Although the low SES schools may use technology more, the use is geared toward drill and practice and not toward higher order thinking strategies or for creation of materials, presentations and original works (Banister & Reinhart, 2011, Becker, 2000; Dolan, 2016; Hohfield et al., 2008; Reinhart et al., 2001).

Dolan (2016), conducted a review of the literature surrounding the *digital divide*, and found that rather than closing the divide by access to technology, the gap remains and has become more complex. Instead of a *digital divide* between the previous *haves* and

have-nots, we now have a divide between the “*cans and can-nots*” (2016, p. 31). Dolan finds the *cans* are those who use technology as active producers and typically come from more affluent communities, higher SES schools, who have teachers and administrators that understand and promote technology for learning. The *can-nots* “assume the role of passive consumers --are students who typically attend lower SES school, where technology is used to practice skills through drill-like exercise often focused on standardized testing requirement or to word process documents” (p. 31).

Valadez and Duran (2007) note the disparity of the divide between high and low resource schools. A divide exists between how teachers in low SES schools compared to high SES schools utilize technology to address knowledge, skills, and instructional resources. Findings indicate that "high –SES schools ...tended to invest more in professional development, hiring full-time technical support staff and developing lines of communication among teachers, office staff, media specialists, technical staff, and administration that promoted robust digital networks. This, in turn, encouraged more widespread teacher use of technologies" (Warshauer et al., 2004). Inversely, teachers in low SES schools are less likely to communicate with peers through professional learning networks or social media, which means they have less exposure to opportunities which might lead to skill development, knowledge acquisition, and technology innovation. Teacher’s actions have a direct effect on the way students utilize technology. Levin and Arafeh state, “the way that students use the Internet for school is largely driven by the kinds of activities and assignments that teachers create” (2002). In a study by Wang et al., (2014) limitations on technology uses were due to two factors, "teachers who were knowledgeable about using technology for their personal use, but found difficulty

transferring the knowledge to student learning; and finding the time to investigate how to implement technology into pedagogical practices" (p. 656). Valadez and Duran call for professional development for teachers in low resource schools to allow teachers to acquire needed knowledge regarding the integration of computers and the Internet into their instructional practice.

In a review of literature regarding the *digital divide*, Dolan (2016) found consistent themes that identified the following factors as cause for teens variant use of technology including, "impacts of the socioeconomic status of the students themselves and the schools they attended; discussions on ways students used technology in and out of school; and specific factors that support or limited use, such as teacher beliefs and district restrictions on technology" (p. 19).

The *digital divide* between the *haves* and *have-nots* no longer exists in the current educational setting. The divide is a more complex issue of how students utilize technology and the Internet as a tool for learning. Goodwin (2011) suggested that the issue of technology implementation in schools may be "only as effective—or ineffective—as the schools that adopt them" (p. 2) which means that the success of utilizing technology for learning does not lie in the hands of the technology or students but rather each teacher's knowledge and willingness to adopt new technologies into instruction.

A Teacher's Influence

"Teachers have been cited in the research as a major supporting or limiting factor in on how students use technology" (Dolan, 2016, p. 28). The Ritzhaupt et al., (2012) study found that "teacher use of technology strongly and positively explained classroom

technology integration and student use of technology” the study goes on to state that “these findings reinforce the importance of teachers appropriately modeling the use of technology in their classrooms and provide the important evidence that a teacher can directly influence their students’ use of technology through their own professional practice” (p. 247).

Teachers are motivated by both internal and external factors for technology integration including pedagogical beliefs about models of instruction, personal interests and motivation, professional development training, technology support, time to collaborate with peers for curriculum planning and implementation and time to learn new technology tools for instructional integration (Ertmer, 2005; Levin & Arafah, 2002; Ritzhaupt et al., 2012; Shnellert & Keengwe, 2012).

Ritzhaupt et al. (2012) used a research-based path model for data gathered from 732 teachers in 107 schools in the state of Florida to examine the effects of teachers’ characteristics, school characteristics and contextual characteristics on classroom technology integration and teacher use of technology integration. The study found that a “teacher’s level of education and experience teaching with technology positively and significantly influence his/her use of technology”, “teacher use of technology strongly and positively explains classroom technology integration and student use of technology”, and “how a teacher integrates technology into the classroom explains how frequently students use technology in a school setting” (p. 229). The study also found that a teacher’s level of education and experience teaching with technology positively related to his or her use of technology but also that a teacher who had years of experience teaching without technology negatively related to the teacher’s and students’ use of technology in

the classroom (Ritzhaupt et al., 2012). This idea exposes a need for a professional development model that will influence teachers' practice using technology as a tool.

Teacher Beliefs

As schools and administrators look to professional development models to meet the needs of teachers and their acceptance of technology integration in the classroom, it is essential to keep in mind how teachers develop beliefs and ideals. Ertmer (2005) suggested, “if beliefs are formed through personal experience, then changes in beliefs might also be facilitated through experience” (p. 32).

“Three strategies seem to hold particular promise for promoting change in teacher beliefs about teaching and learning, in general, and beliefs about technology, specifically; (a) personal experiences, (b) vicarious experience, and (c) social-cultural influences. These strategies are predicated on the idea that beliefs are grounded in experience and authority” (Ertmer, 2005, p. 32). The first strategy of personal experiences is based on the idea that beliefs are held because of our experiences. This means new experiences through professional development may lead to a teacher’s change in belief. Guskey (1986) presented a *Model of the Process of Teacher Change* that suggested a teacher’s change in beliefs begins with Professional Development, followed by a change in teacher actions, which then leads to a change in student actions, and finally results in a change in a teacher’s beliefs and attitudes. In this model, a change in beliefs follows rather than precedes the change in teacher practices.

The second strategy of belief change relies on the power of vicarious experiences. Vicarious experiences are considered to be powerful learning tools because observing other teachers in similar settings serves both informational and motivational functions

(Ertmer, 2005; Schunk, 2000). Teachers can learn from watching peers or supervising teachers use a tool or strategy in their teaching practice. This application can build teacher confidence and competence (Ertmer, 2005).

The final strategy for teacher belief change noted by Ertmer (2005) is that of social and cultural influences. Teachers' practices and beliefs are constantly shaped by ongoing experiences, by values and opinions of those around them, and by the expectations of influential people. Ertmer states that if the identified three strategies were combined with strategies recommending in the conceptual change literature, the potential for change would be even greater. Ertmer recommends that school personnel interested in designing professional development to support teacher use of technology and support new pedagogical beliefs consider the following components: ongoing public conversations about the ways technology can support pedagogical beliefs, small communities of practice who work on teaching methods for transforming education, opportunities to practice utilizing technology through various pedagogical practices, technology tools introduced gradually and supported based on the teacher's needs, ongoing pedagogical and technological support for teachers as well as in introduction to new instructional strategies (2005).

“As schools continue to acquire more and better hardware and software, the benefit to students increasingly will depend on the skill with which some three million teachers are able to use these new tools” (President's Panel on Educational Technology, 1997, p. 47). Ertmer (2005) states “given these skills are unlikely to be used unless they fit teachers' existing pedagogical beliefs, it is imperative that educators increase their

understanding of and ability to address teacher beliefs, as part of their efforts to increase teachers' technology skills and uses" (p. 37).

Professional Development

In a literature review of 1:1 laptop initiatives in the United States, findings suggest that much needed instructional integration has not kept pace with the emergence of technology in those settings (Shnellert & Keengwe, 2012). A need for appropriate technology professional development is called for to prepare teachers for instruction with technology tools as well as enhance student-centered learning (Shnellert & Keengwe, 2012). Teacher access to technology and professional development has been identified as critical factors in successful technology integration (Baylor & Ritchie; 2002; Hew & Brush, 2006).

Ongoing professional development has been identified as one of the most effective ways to make educational change. Research studies in countries and programs, where high-performing educational systems exist, suggests that professional development for in-service teachers must be job-embedded and available "just-in-time" (Darling-Hammond & Rothman, 2015). Shnellert and Keengwe (2012) suggest that teachers need time to implement classroom change in teaching and learning with technology and time within the school day to collaborate and work with students on this technology. The study also acknowledged that time for curriculum development; student-centered instructional skills and the ability to access and use new tools are needed in order for teachers to successfully implement classroom technology in a 1:1 environment. Ritzhaupt et al. (2012) found that a "school's level of technology professional development and access to technology in classrooms positively and significantly related to a teacher's use of

technology" (p. 246). The study notes that this finding "highlights the importance of providing ongoing technology-related professional development opportunities for in-service teachers" (p. 246)

In the area of teacher education, sustained and intensive professional development for teachers has been linked to student achievement gains (Darling-Hammond et al., 2009). Darling-Hammond et al., 2009) note that effective teacher professional development is active, reflective, sustained, job-embedded, coherent, in-depth and focused on curriculum-based learning. Additionally, *Professional Learning in the Learning Profession* states, "effective professional development is intensive, ongoing and connected to practice; focuses on the teaching and learning of specific academic content; is connected to other school initiatives and builds strong working relationships among teachers" (p. 6).

A research-based approach to professional development is well documented, however, current studies on technology integration in the United States suggests that teacher preparation and professional programs continue to be deficient in building the capacity to use and model technology in appropriate ways for learning (United States Department of Education, 2016). There is still work to be done and considering best practice professional development strategies when creating technology professional development is a necessary step if we are to build capacity for classroom technology integration.

Professional Learning Communities

Professional Learning Communities (PLC) function as a collaborative environment that is focused on student-centered growth where members of a team work

interdependently to achieve common goals (Dufour, Dufour, Eaker, Many & Mattos, 2016). Teachers working within the grade level or Professional Learning teams allows for peer support. Teachers may choose to adopt innovations, including technology tools or practices because of relationships with those peers (Ritzhaupt et al., 2012). Research in the area of school improvement suggests any educational change depends on “teachers’ individual and collective capacity and its link with school-wide capacity for promoting pupils’ learning” (Stoll, Bolam, McMahon, Wallace, & Thomas, 2006, p. 221). Capacity is “a complex blend of motivation, skill, positive learning, organizational conditions and culture, and infrastructure of support” and is critical in creating reform (p. 221). It is suggested that professional learning communities seem to be promising outlets for “capacity building for sustainable improvement” (p. 221).

In addition to providing an opportunity for discussion among teacher peer groups regarding student-learning needs, the PLC also provides an opportunity for teachers to discuss their own needs and deficiencies in their instructional, pedagogical and technological development.

Technology as a Tool

Mobile technologies in the classroom create opportunities but also challenges for teachers who are inadequately prepared to incorporate devices into traditional instruction. Education is a complicated practice that requires the interweaving of many types of specialized knowledge (Koehler & Mishra, 2009; Shulman, 1986). Effective teaching is dependent upon access to knowledge from different domains (Shulman) including “knowledge of student thinking and learning, knowledge of subject matter, and increasingly, knowledge of technology” (Koehler & Mishra, 2009, p. 61). Teachers are

aware of the emerging technology but do not necessarily know how to respond and incorporate these devices into instruction.

Advocates of technology in education believe emergent technologies to be highly effective tools in the classroom but agree that merely introducing technology is not enough (Mishra & Koehler, 2006). A growing body of research presents the idea that our primary focus must not be on the technology itself but how the technology can be used for instruction (Carr et al., 1998; Mishra & Koehler, 2003). Harris (2005) states, “Much of the educational technology professional development to date has been technocentric” (as cited by Harris & Hofer, 2011, p. 22). Seymour Papert (1990) coined the phrase “technocentric” in 1987 to describe the design and function of technology rather than the learning that could be supported by the device. Researchers and educators in the field believe that successful integration of technology must be “rooted primarily in curriculum content-related learning process, and secondarily in savvy use of educational technologies” (Harris & Hofer, 2011, p. 211).

For effective integration of educational technologies in the K-12 setting, teacher’s planning must consider curriculum requirements, students’ learning needs, available technologies and the constraints of the school and classroom (Harris & Hofer, 2011). To accomplish this task, Mishra and Koehler created the Technological, Pedagogical and Content Knowledge (TPACK) framework (2006).

TPACK Theoretical Framework

The TPACK framework was based on the construct developed by Lee Shulman (1986), which introduced the idea of Pedagogical Content Knowledge (PCK). Historically teacher education programs had focused on content knowledge or

pedagogical knowledge but never the combination of the two. Shulman claimed that teacher success was dependent on their ability to confront both content and pedagogy simultaneously (1986). Shulman stated that the intersection of pedagogy and content creates the opportunity for teachers to "interpret subject matter and find different ways to represent it and make it accessible to learners" (Mishra & Koehler, 2006, p. 1021).

The TPACK framework introduces an additional component to the earlier PCK theoretical framework. It emphasized the "connection, interactions, affordances and constraints among content, pedagogy and technology" (Mishra & Koehler, 2006, p. 1025). In addition to the main components of the framework; content knowledge, pedagogy knowledge, and technology knowledge there are intersections of the parts, which creates the interactions of PCK (pedagogical content knowledge), TCK (technological content knowledge), TPK (technological pedagogical knowledge), and finally TPACK. Each intersection in the TPACK framework can be defined (Figure 1).

Content Knowledge

Content knowledge is specific to the subject and includes the teacher's knowledge of what is to be taught and learned by each student. Shulman (1986) identified this as knowledge in the areas of content theories, concepts, ideas, organizational frameworks, and established practices and approaches toward developing knowledge within the subject area. In this case study, the content knowledge required to teach Biology would be vastly different from the content knowledge needed to teach Algebra I. Teachers in a subject area need a comprehensive base of knowledge in order to deliver accurate information to their students.

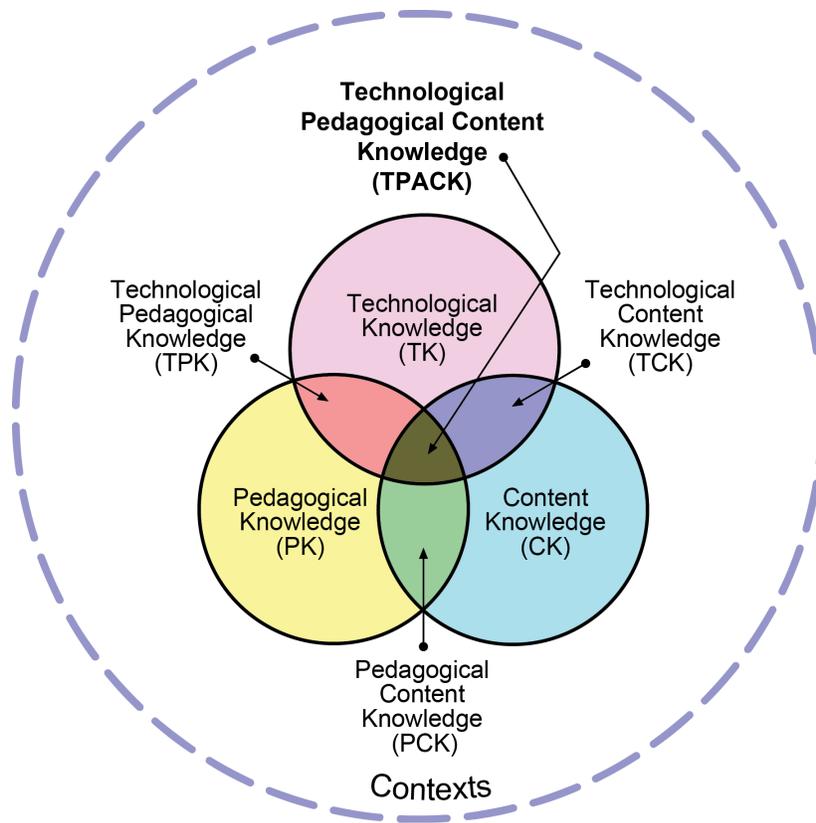


Figure 1. Reproduced by permission of the publisher, © 2012 by tpack.org

Pedagogy Knowledge

Pedagogy Knowledge is a teacher's knowledge about practices or methods for teaching and learning. An understanding of how students learn and best practices or strategies for assisting students in the acquisition of knowledge and is not specific to the subject taught. The teacher's understanding of cognitive, social and developmental theories can be applied in all content areas.

Pedagogical Content Knowledge

Shulman's (1986) work combined the two concepts of pedagogy and content knowledge and theorized that one should not be used without the other. His theory

created the opportunity for teachers to find different ways to present subject matter until it becomes accessible to the learner. Shulman's identification of the intersection of these components needed for teaching and learning creates the foundation for the TPACK structure.

Technology Knowledge

“In this framework, technological knowledge is defined as knowledge of how to use emerging technologies” (Cox & Graham, 2009). Technology knowledge is general knowledge about standard technology and includes the general skills needed to operate particular technologies or programs that are used to manipulate technology. It may include knowledge of resources as diverse as ebooks, digital whiteboards, the Internet or digital video tools. Mishra and Koehler (year) pointed out that most standard educational technology workshop focuses on teacher training in this area. Due to the continually changing rate of technology, merely training on a tool is wasted time and effort. The introduction of technology knowledge is the significant addition to Shulman's PCK model.

Technological Content Knowledge

Technological Content Knowledge is “the manner in which technology and content are reciprocally related” (Mishra & Koehler, 2006). Technological Content Knowledge “refers to a knowledge of the topic-specific representations in a given content domain that utilize emerging technologies” (Cox & Graham, 2009). An example of this would be using “Geometer's Sketchpad as a tool for teaching geometry. It allows students to play with shapes and form, making it easier to construct standard geometry

proofs. In this regard, the software program merely emulates what was done earlier when learning geometry” (Mishra & Koehler, 2006). The technology must relate directly to the content.

Technological Pedagogical Knowledge

Technological Pedagogical Knowledge “is knowledge of the existence, components, and capabilities of various technologies as they are used in teaching and learning settings, and conversely, knowing how teaching might change as the result of using particular technologies” (Mishra & Koehler, 2006). TPK might include knowledge of tools that would enhance a particular learning strategy. This part of the framework requires knowledge of best practice strategies and knowledge of what particular technologies can do to help facilitate these strategies. One example of this is a teacher using an online collaborative document to allow students to work cooperatively on a project.

Technology, Pedagogy and Content Knowledge

Technological Pedagogical Content Knowledge (TPCK or TPACK) “is an emergent form of knowledge that goes beyond all three components” (Mishra & Koehler, 2006). Mishra & Koehler state, “TPCK is the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students’ prior knowledge and theories of epistemology; and knowledge of how technologies can be

used to build on existing knowledge and to develop new epistemologies or strengthen old ones” (need page #). One example of TPACK demonstrated by Cox and Graham (2009) is a scenario of a Biology teacher conducting a frog dissection. Their example explains that the teacher knows the best strategies for teaching body systems is through a dissection lab. The teacher knows the particulars of how to teach the frog dissection lab as part of an inquiry-based learning model. Additionally, she may know how to use a virtual frog dissection simulator online. In this case, “knowledge of how to use the online simulator as part of her subject-specific activities is an example of TPACK” (Cox & Graham, 2009).

Harris and Hofer (2011) noted in their research and development work with teachers that there is an often-overlooked component in technology integration that “educators are simply not aware of the full range of different curriculum-based learning activities, projects and approaches that they can use with the help of different educational technologies” (p. 227). The integrations of technology cannot be about technology; it must be about content and effective instructional practice (Earle, 2002). Current literature suggests that professional development in the field of technology integration must focus not on the technology alone, rather on content related learning processes paired with educational technologies (Harris & Hofer, 2011).

Chapman et al., (2010) asked the question, “What does it profit students to have technology access if both they themselves as well as those instructing them do not have the training or capacity to utilize this technology efficiently?” (p. 248). To truly harness the technology and opportunity available today, teachers need additional time and focused professional development. Schnellert and Keengwe (2012) found that an

important consideration to the implementation of 1:1 program is that educators must focus on technology as a practice to be used, rather than as a tool to be learned.

Conclusion

This study addresses the problem of disconnect that exists between the lack of change in learning environments and curriculum while the access to technology continues to grow. The literature identifies the need for change and the teacher as the most influential factor in addressing the issue of change in classroom instruction. The use of the TPACK Theoretical Framework to design teacher professional development offers a resource for technology integration that demonstrates the connections and interactions between technology, pedagogy, and content knowledge. The purpose of this explanatory, single case study with embedded units of analysis is to examine the professional development experiences of nine teachers in a single technology-rich environment, where TPACK is used as the basis for professional development design. The study sought to better understand how and why teachers make decisions regarding instructional technology integration and to determine if their technology integration meets the TPACK model of instruction. The following questions were addressed:

1. How did participation in the *Tech & Teach Tuesday* Professional Development program influence teachers' integration of technology into classroom curriculum?
2. How and why do teachers make decisions regarding technology integration into content and pedagogical practice?
3. How did each teacher's method of technology integration in lessons meet the TPACK model of instruction?

This study seeks to gain a better understanding of how and if a professional development plan based on the TPACK framework and best practice professional

development has influenced teachers' integration of technology into their teaching practices. In Chapter Three, the specific methods for this explanatory case study will be discussed.

CHAPTER THREE

Method

Research Design and Protocol

The purpose of this explanatory, single case study with embedded units of analysis was to gain a better understanding of how and if a professional development plan centered around the ideals and focus of Mishra & Koheler's (2006) TPACK framework and influenced teachers' integration of technology into their teaching practices. The intent of this case study was to gain insights into the decisions teachers make regarding how, why, and to what purpose technology is utilized for instruction. The study sought to answer the following research questions:

1. How did participation in the *Tech & Teach Tuesday* Professional Development program influence teachers' integration of technology into classroom curriculum?
2. How and why do teachers make decisions regarding technology integration into content and pedagogical practice?
3. How did each teacher's method of technology integration in lessons meet the TPACK model of instruction?

This chapter presents the explanatory case study research design selected for the study and the supporting literature for that design. The chapter also provides detailed information regarding the participants, the setting of the study, the timeline in which the study was conducted, the data collection and sampling processes, and finally the data analysis procedures.

Case Study Design

Creswell (2013) defined case study as a “qualitative approach in which the investigator explores a real-life, contemporary, bounded system or multiple bounded systems over time, through detailed, in-depth data collection involving multiple sources of information and reports a case description and case themes” (p. 97). Yin (2014) defines a case study in two parts. The first component describes a case study as, “an empirical inquiry that investigates a contemporary phenomenon (“the case”) in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident” (p.16). The second part of Yin’s twofold definition states that, “case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result benefits from the prior development of theoretical propositions to guide data collection and analysis” (p. 17). This explanatory case study meets both Yin and Creswell’s requirements.

This study met multiple aspects of Yin and Creswell’s case study recommendations in the following ways. First, the purpose of this study was to investigate a contemporary phenomenon as it took place in a current real-world setting. The phenomenon of interest was the integration of technology into classroom instruction by teachers in a contemporary public high school classroom. This particular case study was “bound” by the setting and time, as the participants in the study all taught at the same public high school, were provided the same professional development opportunities, and had access to the same 1:1 technology device and resources. Additionally, the study met

the case study definition in that it was an in-depth study that sought to investigate the internal motivations or thoughts and decisions made by the teachers regarding technology integration in the classroom. In this case study there was little control over the autonomous decisions made by teachers as to “how” or “why” they chose to integrate technology into their classroom instruction. An explanatory study was appropriate in this case due to the “how” and “why” questions that the study sought to investigate. The study posed research questions sought to answer the “how” and “why” teachers made decisions about technology integration as viewed through the TPACK framework lens in order to better understand the phenomenon of individual teachers’ decisions regarding technology integration.

The nature of data collected in the study closely followed the recommended methods for valid case study research. Creswell (2013) recommended multiple sources for data collection in a case study including the sources that were used in this study, which involved observations, interviews, field notes and artifacts. An a priori framework directed the collection and coding of data. The researcher began using open codes associated with the TPACK Theoretical Framework including Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK) and Technological Pedagogical Content Knowledge (TPACK). After the initial coding process emerging themes were identified and analyzed.

Finally, this case study sought to transparently follow an explanatory, single case study design with embedded units of analysis in an effort to determine how or why the phenomenon occurred. Due to the nature of the study being conducted in an active high school setting and teachers made autonomous decisions regarding instruction, case study

was the best fit for the research design as the researcher had little or no control over the behavioral event in the contemporary setting (Yin, 2014).

Participants and Setting

Creswell (2013) explains that purposeful sampling is used in qualitative research because the researcher can select individuals or sites that are able to “purposefully inform an understanding of the research problem and central phenomenon in the study” (p.156).

This study utilized a single case study design with embedded units of analysis.

Participants in the study were all teachers at a public high school in Central Texas who participated weekly in the *Tech & Teach Tuesday* Professional Development trainings and were chosen to inform the case study through criteria based, random purposive sampling. Teachers in the core areas of English, Mathematics, Social Studies, Science and (LOTE) Languages other Than English participate in the *Tech & Teach Tuesday* sessions. These core area teachers also completed the Technology Proficiency Self-Assessment for 21st Century Learning (TPSA C21) Questionnaire as part of the campus training (Appendix A). Teachers selected for the study had varied years of teaching experience at Central Texas high school but had taught for at least one year prior to the study.

There were two considerations for the purposive criterion sampling. The first consideration was the result of each teacher’s response to the self-reported technology efficacy questionnaire, the TPSA C21. The second consideration was each teacher’s years of experience at the particular site of the study, which also included his or her years of participation in the *Tech & Teach Tuesday* Professional Development. All teachers in the high school who participated in the *Tech & Teach Tuesday* Professional

Development, approximately 83 individuals, completed the TPSA C21 questionnaire to provide information regarding their personal beliefs regarding technology and their ability to utilize it in the classroom setting. The TPSA C21 data was used to determine if teachers had high, moderate, or low technology efficacy in comparison to the rest of the sample. Based on each teacher's response to the questionnaire, the results were sorted low to high in rank and the group was divided into thirds and high, moderate, and low technology efficacy groups were named. After the efficacy groups were named, each participant's years experience in the *Tech & Teach Tuesday* Professional Development was used to further stratify the group. There were three categories created to identify teachers' experience. The groups created were teachers who had one year working at the high school, teachers who had two-three years experience at the high school, and teachers who had four or more years experience teaching at the high school.

To randomly sample the group, the teachers were then divided into each of the high, moderate, and low efficacy levels. The investigator then randomly selected one from each of the 1 year, 2-3 years, and 4 or more years experience groups within each efficacy group. The teachers were numbered from 1 to 83, and their representative number was entered into an online research randomizer tool, www.randomizer.org. With a total of 83 surveys originally collected there were adequate numbers in each category to randomly select a teacher who matched each of the two part criteria. A total of nine teachers were selected for the study. All nine of the teachers agreed to participate in the interview portion of the study. Eight of the nine teachers fully participated in all parts of the study. One teacher agreed to the interview, but declined being observed.

The setting for the study was a public school located in central Texas, with a current enrollment of 2450 students in 9th -12th grades and a staff of 155 classroom teachers. In 2013, the community passed a school bond, which secured over \$10,000,000 in funds for improving district technologies. The most visible technology initiative created by the bond was the implementation of a 1:1 mobile device environment. This initiative provided all students and teachers in the district an iPad Air. Teachers at the high school received the device several months before students to ensure they had familiarity with the function and workflow of the device. Additionally, teachers received training conducted by district instructional technologists on instructional apps and classroom management techniques, as well as just-in-time technology support from additional campus personnel.

All teachers in the core areas of Math, Science, English Language Arts, Social Studies, and Languages Other than English (LOTE) have a conference period and a non-teaching period each school day. The non-teaching period was for professional development and collaboration with their Professional Learning Community (PLC) members. During these PLC periods teachers who teach like content meet to discuss student data and progress, Response to Intervention (RTI) topics, general curriculum planning, self-directed professional development topics and technology integration professional development.

Research Context

All core subject teachers, including the case study teachers, participate in PLCs, which provides a 45-minute professional development time embedded within each school day. One day a week, during the PLC period, teachers attend *Tech & Teach Tuesday*

where they receive training on purposeful technology integration. The training follows the TPACK Framework, which focuses on pedagogy or instructional strategy, followed by technology tools that naturally pair with the strategy, and then time for teacher groups to discuss specific content that fits with the pedagogy and tool.

In the *Tech & Teach Tuesday* time, the trainer for the day may be a campus instructional technologist, a campus administrator, a campus or district content specialist, or a teacher on the campus. The trainings are designed in three and four week blocks. The first day of instruction begins with a pedagogical idea or best practice strategy such as formative assessment or collaborative grouping. The instructor designs activities that model the practice and provides research based information on the strategy for the teacher group. The second day of instruction, which occurs the following Tuesday, provides information regarding technology tools that fit the instructional practice and requires the participants to interact with the strategy in a more hands on way. Campus instructional technologists design engaging activities where teachers are able to participate in the practice of using the tool and share with other teachers their ideas about how and when the practice might work in their content area. Teachers are able to access and manipulate a variety of tools that fit the pedagogy while the campus instructional technologists are present for just in time support and step-by-step instruction if needed. Again teachers are asked to share between their PLC group and other content area groups how and when the particular practice best fits their content area and needs. The final day in the training sequence is a planning time for each PLC group to take the pedagogical idea, their preferred technology tool and create lessons or student samples using their own content materials. Teachers are given time to create content related artifacts using

the technology tools and are able to peer coach and share resources with one another. Teachers are then expected to incorporate the strategy and technology into a lesson.

Data Collection

Creswell (2013) states that all forms of qualitative data can be “grouped into four basic types of information: observations (ranging from nonparticipant to participant), interview (ranging from closed-ended to open-ended), documents (ranging from private to public), and audiovisual materials (including materials such as photographs, compact discs, and video tapes)” (p. 159). In the current study, data was collected from a variety of sources for triangulation and validity purposes. Creswell explains that qualitative researchers use triangulations as a means to provide corroborating evidence for their study. Creswell goes on to state that, “when qualitative researchers locate evidence to document a code or theme in different sources of data, they are triangulating information and providing validity to their findings”. (p. 251).

The first data source is the one-on-one teacher interviews. Yin (2014) stated, “One of the most important sources of case study evidence is the interview” (p. 110). The interviews conducted in this study followed a protocol described by Yin as a “shorter case study interview” (p. 111). The interviews only lasted approximately an hour, the questions asked were open-ended and assumed the conversational manner of a case study interview question, but due to the time limit the questions were focused on the researcher’s case study protocol (Yin). The interview questions fell into four categories Demographics, Personal Technology Use, Technology Efficacy, and Curriculum (Appendix B). Teachers were interviewed using a semi-structured interview process to gain general demographic information as well as teachers beliefs about technology

integration, the effectiveness of the *Tech & Teach* professional development and their general attitudes and tendencies regarding the use of technology in the classroom. The nine teacher interviews were conducted in each of the teachers' classrooms and were captured with video recorded with an iPad. Interviews were conducted in the spring of the 2018 school year at the teachers' convenience. There were nine total interviews conducted throughout the study.

The second source of data was teacher observations. Following the teacher interview, two observation days were set up with the teacher. A total of sixteen observations were conducted over the course of the spring of 2018. One of the teacher participants was not comfortable being observed as a new teacher to the campus who was using instructional technology for the first time in his teaching career. The other eight participants were all observed twice. Each teacher provided the researcher the best days and class periods to observe their instruction. The teacher and the researcher agreed upon the observation times. Field notes were taken during each observation to record teacher actions, student actions, content and pedagogy considerations, technology integration, and a general description of the classroom environment. Following each classroom observation the researcher used the *Technology Integration Observation Instrument* (TIOI) (Appendix C) to rate each lesson (Hofer, Grandgenett, Harris & Swan, 2011). The TIOI has an interrater reliability coefficient (.857) as computed using Intraclass Correlation and a score agreement (84.1%) procedure. The rubric has a reported internal consistency (using Cronbach's Alpha) of .911. The test-retest reliability (score agreement) was 87.0%. Additionally, the authors report that "five TPACK experts also confirmed the instrument's construct and face validities (Harris et al., 2010).

A third data source was teacher and student physical artifacts presented or created during each observation. Yin (2014) states that artifacts, when relevant, may allow the researcher a broader perspective beyond what mere observation can reveal to the researcher. Artifacts included lesson plans, instructional information for class technology projects, and student projects created in response to technology integrated activities. The artifacts were examined for the frequency and depth of technology integration within each lesson. The frequency of instructional strategies and integrated technology was also noted through the presence of artifacts.

The three data sources of observation, interview and artifacts were utilized to triangulate the study and provide corroborating evidence of the findings as a result of the pattern matching process of data analysis.

Data Analysis

Yin (2014) identifies pattern matching logic as “one of the most desirable techniques to use” for case study analysis (p. 143). Pattern matching logic compares empirical data, collected throughout the study with predictions made prior to the study based on existing theory (Yin). “If the empirical and predicted patterns appear similar, the results can help a case study strengthen its internal validity” (p. 143). Because the study followed an a priori design, theoretical propositions from the literature, specifically the TPACK framework, were used to generate codes that were utilized for the pattern matching process. Data analysis began with the a priori categories derived from the components identified in Mishra and Koehler’s TPACK theoretical framework including Pedagogical Knowledge (PK), Content Knowledge (CK), Technology Knowledge (TK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK),

Technological Pedagogical Knowledge (TPK), and finally Technological Pedagogical Content Knowledge (TPACK). After the initial pattern matching process and constant comparative analysis, process was used to confirm emerging themes in the data.

Glaser and Strauss (1967) originally utilized constant comparative method for grounded theory research. “However, researchers frequently use the analysis procedures outlined in grounded theory without taking on board the whole methodological approach to research design. Grounded theory analysis is inductive, in that the resulting theory ‘emerges’ from the data through a process of rigorous and structured analysis” (Lacey & Luff, 2007). In the constant comparative method utilized in this study concepts or categories emerging from individual units of analysis were compared to other units of analysis and then the data from the groups that emerged, and constantly compared until “theoretical saturation” was reached (2007).

Validity and Reliability

Creswell explained that qualitative researchers use triangulations as a means to provide corroborating evidence for their study. Creswell (2013) proceeded to state, “when qualitative researchers locate evidence to document a code or theme in different sources of data, they are triangulating information and providing validity to their findings” (p.251). Yin (2014) recommends four principles of data collection to overcome issues with construct validity including; using multiple sources of evidence, creation of a case study database, maintaining a chain of evidence and exercising care when using data from electronic resources. This qualitative study will collect three forms of data field notes from observation, interview question responses, and artifacts from the teachers. The

three sources will be coded using a pattern matching process, which will provide validity through triangulation.

Additionally, the researcher will create a case study database for organizing and documenting the data collected, as well as creating and maintaining a chain of evidence for purposes of increasing the reliability and validity of the study.

Procedure

In January 2018, an Institutional Review Board (IRB) application and a district consent form (Appendix D) was submitted and approved for the study. All teachers at the high school completed a Technology Proficiency Self-Assessment (TBSA C21) for 21st Century Learning. The questionnaire identified teachers as having high, moderate, or low technology efficacy. A purposive, criterion sampling was conducted to select participants, three from each area totaling nine. Teachers, who qualified as participants for the study, received an email invitation to participate in the study (Appendix E). Teacher informed consent forms were collected from the participants (Appendix F). All possible participants were participants in weekly *Tech & Teach Tuesday* professional development training throughout the school year.

Each member of the selected group of teachers was interviewed and then observed twice during the spring semester. The researcher captured observation evidence by video and recorded field notes. The researcher utilized the *Technology Integration Observation Instrument* following each observation to rate the observation.

Initial semi-structured interviews were conducted at the beginning of the spring semester with each participant to gain insight into each teacher's thoughts and decisions regarding the professional development trainings, how they make decisions about

technology integration, and their knowledge of the TPACK framework. The interviews were video recorded with an iPad and the researcher took written field notes.

Artifacts were collected during the spring semester and included lesson plans, instructional handouts hard copies, either given as paper electronic copies posted on the class Schoology site, and physical and electronic copies of student projects. The artifacts were analyzed and field notes taken.

The a priori theoretical framework, TPACK, provided the preliminary codes for the pattern matching process utilized to analyze the data followed by a constant comparative method which led to identification of emerging themes.

Conclusion

Chapter three presented the case study research design, the research questions, the participant selection process, the setting of the study, the method for data collection, and the analysis methodologies. The purpose of this explanatory single case study with multiple units of analysis was to gain a better understanding of how and a if a professional development plan centered around the TPACK framework influenced teachers' integration of technology into their teaching practices. The study also sought to gain insights into the decisions teachers' make regarding how, why, and to what purpose technology is utilized for instruction. Chapter four and five will provide the results of the study and the implications and suggestions for future research.

CHAPTER FOUR

Results

The current study utilized an explanatory single case study design with embedded units of analysis to gain a better understanding of how and if a professional development model based on the TPACK framework and best practice professional development design influenced teachers' integration of technology into their teaching practice. The intent of the study was to provide details and insights into the decisions teachers' made regarding how, why, and for what purpose technology was utilized in a lesson and if their integration of technology fits the TPACK framework.

Through interviews, observation field notes, use of the Technology Integration Observation Instrument (TIOI), and classroom artifacts collected from nine teacher participants, the researcher sought to answer the following research questions:

1. How did participation in the *Tech & Teach Tuesday* Professional Development program influence teachers' integration of technology into classroom curriculum?
2. How and why do teachers make decisions regarding technology integration into content and pedagogical practice?
3. How did each teacher's method of technology integration in lessons meet the TPACK model of instruction?

When conducting a case study, Yin (2014) notes that determining the unit of analysis is one of the essential components in the research design. Bounding the case is also an important consideration for the research as it helps to define the research questions and how they will be addressed. This case study seeks to understand the impact

of a professional development program based on the TPACK framework and then to understand how and why teachers make decisions regarding technology integration into their instruction. For this reason, this study was setup as a single explanatory case study with the teacher participants as embedded units of analysis within the bounded setting of the location, a Central Texas high school with access to the *Tech & Teach Tuesday* professional development program.

This chapter will discuss the participants of the study, the findings derived from the interviews, observations, artifacts and TIOI scores for each participant, and the findings as they address the research questions. The pattern matching analysis method based on codes identified in the TPACK framework and the constant comparative analysis used to identify emerging themes will also be discussed.

The Participants

Random purposive sampling was utilized to select participants who were teachers at the Central Texas high school and participants in the weekly *Tech & Teach* Technology training. Each of the teacher participants (Table 1) are identified in this chapter, as they are the embedded units of analysis within the case study and will enhance the researcher's insight as to how and why teachers make instructional decisions related to technology integration.

Yin (2014) clarifies the importance and role of units of analysis in a case study by stating, "Within the single-case study may still be incorporated subunits of analysis so that a more complex (or embedded) design is developed. The subunits can often add significant opportunities for extensive analysis, enhancing the insights into the single case. However, if too much attention is given to these subunits, and if the larger, holistic

aspects of the case begin to be ignored, the case study itself will have shifted its orientation and changed its nature” (p. 56). This study utilized those units of analysis to gain insight into the larger case study by examining the subunits and looking for patterns that emerge.

Table 1

Participants

Teacher Name	Subject Taught	Years of Teaching Experience	Years of Participation in Tech & Teach Tuesday	Technology Efficacy Group
Teacher A	English I	5 years	3 years	Low
Teacher B	Pre-AP English I AP English IV	34 years	5 years	Low
Teacher C	AP Calculus Geometry	2 years	2 years	High
Teacher D	World Geography	8 years	2 years	Moderate
Teacher E	Biology Pre-AP Chemistry	3 year	1 year	High
Teacher F	Pre-AP Spanish III AP Spanish IV	14 years	5 years	High
Teacher G	Spanish I Pre-AP Spanish I	26 years	5 years	Moderate
Teacher H	Pre Calculus Geometry	6 years	1 year	Low
Teacher I	Resource English I-IV Co-Teach English II	3 years	1 year	Moderate

Participant 1–Teacher A

Teacher A taught secondary English Language Arts for five years. Three of those years teaching were at the Central Texas high school where she attended the *Tech &*

Tech Tuesday Trainings. Although she has only five years of teaching experience, she had other professional experiences to draw upon including previous careers of serving as a Police Officer, a youth sports coach, and a city Parks and Recreation Program Coordinator responsible for community youth activities. Teacher A's self-rated technology efficacy questionnaire placed her in the lower third of all teachers who participated in *Tech & Teach Tuesday*. She said she did not consider herself tech savvy and went so far as to say, "I'm an old dog learning new tricks."

Teacher A reflected that the *Tech & Teach Tuesday* training had been invaluable to her because it had shown her how to implement technology in the classroom. She reflected on where she had started when first receiving her school-issued iPad and the process the training had taken her through which allowed for varied levels of learning and pacing so that even novice teachers could grasp the concepts and tools. Teacher A relied not only on the differentiated *Tech & Teach* training but also on her peers in the Professional Learning Community group for her continued growth. She stated, "Having people [in her PLC group] that are tech savvy helped a lot." She admitted that she would not utilize technology for instruction as much without the *Tech & Teach Tuesday* training.

When reflecting on her own process for choosing and utilizing technology in a lesson, she stated the collaborative PLC group looked at the lesson plans that they utilized the year before for previous content and activities and then considered tools or methods that were introduced in *Tech & Teach Tuesday* that would integrate technology to "spice up" the lesson. The PLC then collectively decided whether or not to add technology tools to the lesson. When asked how technology has influenced her

instructional pedagogy or how she teaches, in general, she stated that the collaborative nature of technology tools and the creative aspects have changed the types and varieties of the products that teachers ask students to produce.

Two observations were conducted in Teacher A's English I classes. The first observation began with students completing a paper-based quiz over a previous selection from the novel they were reading as a class. As students completed the quiz they continued reading the novel, typed in their Reading Log using the *Numbers* App an Apple Spreadsheet tool, to reflect on what they read as it aligned to Literary Devices. Students also completed a Flip Chart, paper-based graphic organizer. The Flip Chart was a teacher made, paper based resource that prompted students to fill in pertinent information from a specific chapter of the reading. Although it was paper-based, the teacher took pictures of each page of the chart and uploaded it to Schoology so that students could go back and verify that they had all of the essential information. The Reading Log project was an entirely digital format. Students utilized their iPad and the *Numbers* App. In this instance, the spreadsheet tool worked well as an organizational device for the students' reflection piece. Students created separate tabs within the spreadsheet to identify and reflect on their reading through the lens of specific literary devices. A study of the literary devices was ongoing throughout the semester. Each tab in the spreadsheet identified a different literary device used by the author. When a student found an example of the literary device within the chapter they noted the page number, paraphrased the example of the literary device, summarized why the character spoke or acted in a particular way or why the author wrote a particular way, and then wrote a reflection on how the event connected to their personal life by giving a real world

example. The *Numbers* App Reading Log was eventually turned in to the teacher through the learning management system, Schoology. The teacher posted all of the resources provided for the students on Schoology. Scores from the TIOI are listed in Table 2 followed by an explanation of the scores.

Table 2

Technology Integration Observation Instrument, Teacher A, Observation 1

Curriculum Goals & Technology	Instructional Strategies & Technologies	Technology Selection(s)	“Fit”	Instructional Use	Technology Logistics
Partially Aligned (2)	Supports (3)	Appropriate, but Not Exemplary (3)	Fit Together (3)	Effective (3)	Operate Well (3)

Both the teacher and students were observed utilizing technology in this lesson. The teacher provided both digital and non-digital tools to help students organize their thoughts and produce final projects. The teacher did this through a paper-based graphic organizer, a database of electronic documents to be used as resources through the Learning Management System, Schoology, and examples of the student product using the *Numbers* App. The students utilized paper copies of the class novel, a paper-based Flip Chart for recording information they read, Schoology for document access, and their iPad and the *Numbers* App to record the literary devices they found in the reading selection.

Using the TIOI, the researcher found that the majority of technologies within the observation were related to the organization of resources, graphic organizers for reading, and assisted in chunking of material. The students and teacher easily accessed and utilized the technologies and the technologies "fit" together nicely with the activities

planned. One or two students were without an iPad, preferred a paper copy, or misplaced a paper-based resource, but overall the logistics of the projects and resources were carried out without issues. In five out of six categories the integration of technology rated a 3 on a 4-point scale. The category, which rated lower in this observation, was the area of Curriculum Goals & Technologies. In this observation, the technologies were partially aligned with curriculum, but primarily aligned with instructional strategies of chunking, using graphic organizers, and tables for sorting information. The technology was less dependent on the particular curriculum or objective of the lesson to be taught. Teacher A's first observation scored 17 on a 24-point scale. Her technological pedagogical knowledge (TPK) proved to be stronger than her technological content knowledge (TCK).

The second observation of Teacher A's English class was one week following the first and fell near the deadline for students to turn in their multiple week project of reading the class novel and turning in their Flip Chart and *Numbers* App Reading Log. Many of the curricular and instructional pieces were the same as the previous observation. Due to the nature of the class being closer to the deadline for completing, a few more students needed the teacher to help troubleshoot their final project to make sure it was ready to submit. The teacher had multiple stages of activities going on in the room due to the individualized pacing of each project. Some students were finished with everything and others struggled to complete all of the components of the project. For this reason, the Technology Logistics rating fell by one point due to the need for the teacher to "fix" several student issues with project submissions. The ratings were identical to the first observation in all other areas resulting in a score of 16 out of 24 on the TIOI.

Teacher A’s use of technology as an instructional strategy tool (TPK score) surpassed her use of technology as a curricular tool (TCK score) in the second observation as well (Table 3).

Information from Teacher A’s interview, her class observations, and collected artifacts were used to address the research questions.

Table 3

Technology Integration Observation Instrument, Teacher A, Observation 2

Curriculum Goals & Technology	Instructional Strategies & Technologies	Technology Selection(s)	“Fit”	Instructional Use	Technology Logistics
Partially Aligned (2)	Supports (3)	Appropriate, but Not Exemplary (3)	Fit Together (3)	Effective (3)	Operate Adequately (2)

Research Question 1: The Influence of Tech & Teach Tuesday on Teacher A’s classroom technology integration. Throughout Teacher A's interview, she acknowledged how "invaluable" the *Tech & Teach* trainings had been to her implementation of technology in the classroom. She stated that she felt like she "was an old dog learning new tricks" and was "not tech savvy at all." However, she felt that the training presented information in a "very approachable, very helpful way", and with the added format of the training being with her peers in the English PLC group, she felt that she had people with whom she trusted to help her with implementing technology and new ideas. She reported utilizing technology "very little" in the classroom before coming to teach at the Central Texas high school and participating in *Tech & Teach Tuesday*. Following the *Tech & Teach* training she reported using technology "big time." Moving from "hardly any" to

incorporating what she called "most of the technology they showed us." In the discussion of her change in technology integration, she referenced not only the digital tools that were presented in training but also the instructional strategies that led each unit, for example; chunking, graphic organizing strategies, as well as collaboration strategies. This is reflected in her TPK score.

Research Question 2: How and why did Teacher A make decisions regarding integration of technology into classroom curriculum? Teacher A stated that she did not believe that she would use technology as much if she did not have the influence of *Tech & Teach Tuesday* training. She spoke of how exposure to a new idea, strategy or digital tool can be taken back to the PLC planning time and considered for integration in a lesson. When creating a lesson she worked closely with her PLC English I group to refer to the campus curriculum, then looked at lessons from previous years used to teach a particular concept, and then reflected on the new things the team learned in *Tech & Teach Tuesday* to "spice up" old lessons or strategies for teaching. When devising a lesson she began with the written curriculum, worked with her PLC team of teachers, and then sought out strategies both digital and non-digital to bring the content to students. For content purposes, Teacher A relied heavily on the district curriculum, but her technology integration considerations are more focused on the strategies or pedagogy she would use to teach the content. This is another example of a stronger connection with her Technology Pedagogy Knowledge (TPK) than with Technology Content Knowledge (TCK).

Research Question 3: How did Teacher A's method of technology integration meet the TPACK model of instruction? Through observation and collection of artifacts, it was evident that Teacher A's method of technology did meet the TPACK Framework in several areas. Utilizing the TIOI tool to score her integration of technology, she rated higher on the rubric in the areas of *Instructional Strategies & Technologies* than in the area of *Curriculum Goals & Technology*.

Summary – Participant 1 – Teacher A. Teacher A is relatively new to the field of teaching, this being her 5th year to teach and her 3rd year at the study high school. She rated herself on the Technology Efficacy tool having low technology efficacy compared to her peers. She spoke of how her participation in *Tech & Teach Tuesday* training had been “invaluable” to her utilization of technology in the classroom and how ideas from the training surface within the planning process she participates in with her PLC team. Her rating on the TIOI verified that her technology integration does meet the TPACK framework model. However, she rated slightly lower in the area of *Curriculum Goals & Technology* integration. When considering Teacher A's integration, it is possible that her years experience as a teacher and collaborative planning may influence her utilization of technology for curricular purposes. Her reliance on paper-based resources for curricular ideas may be tied to the campus alignment with a provided curriculum that does not provide digital content. The English I PLC group met weekly to align lessons between all of the English I teachers and the ability to have autonomy to deviate from the prescribed English standards may create an inflexible environment for the teacher and her PLC team. The teacher and her team did take actions to vary the instructional strategies utilized in a lesson, and they looked for ways to "spice up" lessons as they met weekly to

plan. The ideas presented during *Tech & Teach Tuesday* are not necessarily content specific as the training is presented to mixed content area groups. Teacher A's TPK presents much stronger than her TCK in both interview and observations.

Participant 2–Teacher B

Teacher B has been an English Language Arts teacher for 34 years. Twenty-eight of those years were served at the study high school where she currently teaches 9th grade English and 12th-grade Advanced Placement Literature. She has participated in *Tech & Teach Tuesday* for the past five years, since it began. Teacher B reflected on the time she spent teaching when there were no technology devices in the hands of all students and teachers. She was at the study high school when the district began the 1:1 initiative and had participated in all staff development since that time. When rating herself on the TPSA C21, technology efficacy questionnaire, she fell in the lower third of all teachers who participated in the *Tech & Teach Tuesday* professional development.

When asked what she hoped to get out of the *Tech & Teach Tuesday* professional development she stated, “ How to integrate technology into my classroom in a meaningful way, not just for the sake of saying I use technology.” Teacher B said that prior to *Tech & Teach Tuesday* training she did utilize technology in the classroom but did not make as conscious an effort to do so and the technology utilized was primarily for presentations, specifically, PowerPoint and Prezis created by the teacher. After, attending the training Teacher B reflected that technology integration has become "more student-centered." She considers technology when thinking about student products and assessments of knowledge. No longer is the technology the medium for the teacher to present to the class but rather the students' opportunity to create a product to present their

understanding of a topic to the teacher or class. Students are given opportunities to choose the technology tool they will use to demonstrate their knowledge and many go beyond the tools that the teacher recommended to find something that better fits their individualized interest, creativity or purpose.

Regarding the planning or decision-making process she used when deciding about technology integration in a lesson, Teacher B said, "I think about how I can get the content delivered to the student in the fastest way and what can I do to make the English content less boring for students." She looks for ways to get students involved in the lesson using discussion boards or outlets for creative projects. When asked how technology has influenced her instructional pedagogy Teacher B explained,

I think I have gone from being an all about me, a teacher-centered classroom, to more of a student-centered classroom. And I'm not just saying that because that's a good thing to say. Students learn faster if they have to do it themselves, they just do. If I'm standing up here telling them, they're only going to catch about 25% of the information. But if they've looked it up, they've created something, they've had to study and put it together, even if they've worked in groups of two or three, which is collaboration and critical thinking and creativity, that's what you want to do because they are going to remember that. They'll remember that when they're in 10th grade and they're talking about new works, because those teachers will say, "Remember when you read *The Glass Menagerie*?" and the students will say "Oh, yeah. Laura was Blue Roses..." Bam, they'll remember that. And just like the kids remember what we did for *Canterbury Tales* and those things that they created themselves. They remember the one poet that they had to teach more than they remember anything else presented to the class.

Teacher B continued to discuss about new technology integration ideas that would be appropriate for lessons she was planning to revamp the coming year. She planned to continue with the tools that had paired well with her current lessons and activities and look for more strategies and tools to utilize with her Advanced Placement (AP) classes. Teacher B had already looked at the previous year's AP Literature Test results and

determined that the area of poetry was a lower achieving area for her students. She had already begun to focus on integrating more technology for projects and resource building within the class. Teacher B had never claimed to be tech savvy, but her instructional ideas lead her to ask questions of the Instructional Technologists and other teachers with technology savvy in order to find and utilize tools that were appropriate for a particular learning strategy or lesson.

Two observations were conducted in Teacher B's classroom, one in Pre-AP English I and the other an AP English IV class. The researcher first observed the Pre-AP English I class where students were reading a play, *The Glass Menagerie*. The stated objective was for students to understand, make inferences, and draw conclusions about the structure and elements of drama and provide evidence. The lesson began with students reading an act from the play. The front of the room was staged with furniture and areas taped off to replicate the surroundings in the scene. Two students acted out the scene as they read the lines, while the rest of the room followed along in their text. The teacher stopped the readers from time to time to discuss the events or the meaning of what had been read. When the end of the selection was reached, the class was divided into purposely-selected cooperative groups of three or four. Students arranged their desks in pods to be able to work as a cooperative group. The teacher gave instructions for the next assignment and displayed a sample of the project she had made on the class television using Apple TV from her iPad. Student groups were assigned a character in the book, and they were to collectively decide on a symbol that would represent the character. Students were to make a slide, which would be, used a page in a book the class was creating. On their slide, they were to find images through an Internet search to

represent their symbol, then find direct quotes from their character in the text, and finally write a justification as to why the symbol represented the character. The students discussed and debated what symbol might represent the character and how they would justify it. They built the slide and then sent it to the teacher. The teacher then compiled all of the slides into one book on the *Book Creator App*. The book was then shared with the whole class. As the teacher created the digital book, the students resumed reading the next section of the play with two students reading aloud at the front of the room. As class drew to a close, the teacher reviewed the scene and asked guiding questions about the significance of what had been read. The teacher displayed the slides created by each group on the television via her iPad and Apple TV and then asked reflective questions. She asked, "What's the purpose?" "What did we do today?" The students replied, "We talked about symbols." The teacher then pointed out that analyzing characters, looking for symbols, and then finding evidence to support those ideas are all part of writing an analytical literary essay. This essay was the activity they would begin the following day and the book, they created as a class, would serve them as a resource when they analyzed and wrote their essays.

The teacher and students utilized digital and non-digital tools throughout the lesson. A variety of instructional strategies combined to deliver the lesson and accomplish the objective. The technology utilized within the lesson strongly aligned with the content and allowed students to search for resources that matched the symbolism chosen for each character. The slides created would summarize the character and were shared with the rest of the class. The instructional strategies were varied and the technology aligned with the purpose of the lesson. The technology used by both the

students and teacher was well matched and “fit” the purpose of the lesson and the upcoming analytical writing. In this lesson, the teacher demonstrated technology incorporated in a lesson that met the TPACK model. The teacher scored 24 on a 24-point scale on the TIOI (Table 4).

Table 4

Technology Integration Observation Instrument, Teacher B, Observation 1

Curriculum Goals & 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)	Operate Very Well (4)

The second observation took place in the AP English IV classroom. The AP Exam was several weeks away and the students were working on a poetry unit. The objective written on the board stated that students would understand elements of poetry and provide evidence, and evaluate changes in sound, form, and figurative language. Students began class by annotating on a paper copy of a John Dunne poem, "The Broken Heart." The teacher asked students probing questions about the poem and what they believed to be the purpose, the time in the author's life the poem was written, and what might have been the reason for his writing this poem. The students moved to the next part of the assignment by writing a literary analysis of the poem. Students are asked to obtain their iPad and join a class discussion board on *Schoology*. They were to write the introduction to their literary essay on the discussion board post. As they wrote the teacher encouraged them to use literary elements to analyze the poem and interpret tone and meaning. The

students could view their classmates' introductory paragraphs on the discussion board. The next step was for students to "comment" on two other students' posts and then reply to a person who commented on their introductory paragraph. As students began to read and comment, the teacher continued to encourage them verbally to think more deeply about the comments. She stated, "Some of you have been very insightful." As class drew to a close, she stated, "We're going to wrap up in about a minute. After reading all of the introductions, are there things you need to go back and mention when writing your introduction?" The students nodded but were still completely drawn into the discussion board. In the last few minutes, the teachers asked the class, "Is it easier to do the discussion board than it is to read your introductions out loud?" The students all agreed that the process of using a discussion board and their iPad was better than taking turns reading their introductions aloud. The teacher said, "I love being up here and seeing smiles on your faces as you are reading the comments on your screen." To conclude the lesson the teacher said, "What have you learned today?" The students commented about what the comments from their peers had reminded them about what to include when writing an analytical essay introduction.

In the second observation, the students provided technology integration. The teacher moderated the class and viewed the student comments on a discussion board, but her only interaction with technology was to set up the discussion board tool on *Schoology*, and then monitor students' responses. The technology utilized by the students aligned with the purpose of the lesson both in content and pedagogy (TPACK). The students used the discussion board to record their introductory paragraphs and then read and commented on the posts made by the rest of the class. The students interacted

through peer comments and replied and reflected on their original submission based on the peer edits. The tools utilized aligned with both curricular and pedagogical purposes. All students participated in the lesson without technology difficulties and reflected that this was better than completing the exercise with simple pen and paper because it saved time and allowed them to see the comments and posts of all students. The lesson received all points in all of the categories on the TIOI (Table 5). The lesson was indeed a TPACK aligned lesson.

Table 5

Technology Integration Observation Instrument, Teacher B, Observation 2

Curriculum Goals & 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)	Operate Very Well (4)

Research Question 1: The influence of Tech & Teach Tuesday on Teacher B’s classroom technology integration. Through the interview and observations of Teacher B’s classroom the influence of *Tech & Teach Tuesday* was seen clearly. Teacher B commented that she hoped to gain a better grasp of "how to integrate technology into my classroom in a meaningful way, not just for the sake of saying I use technology." The observations were testaments to her movement toward teaching in that manner. She also commented multiple times about *Tech & Teach Tuesday* moving her from a more teacher-centered, presentation-centered use of technology to a more student-centered use of technology. These goals were also accomplished in the lessons observed.

Research Question 2: How and why did Teacher B make decisions regarding integration of technology into the classroom curriculum? Teacher B spoke of her planning process beginning with the content, then a consideration for the best approach “to make the contest less boring for students” through pedagogy and technology formats. She spoke of the desire to get students involved in the lesson and not just sitting and listening. She reiterated several times the desire to be a more student-centered teacher. Her utilization of technology and instructional strategies were directly related to the desire for increased student engagement and student achievement.

Research Question 3: How did Teacher B’s method of technology integration meet the TPACK model of instruction? Teacher B demonstrated TPACK throughout her observation by utilizing technology in a way that enhanced both content and pedagogy. She paired technology tools through a pedagogical approach that was intentional in involving students in collaborative learning. Students participated in the *Book Creator* page. The page creation represented the character with symbols and text that supported the students’ analysis of the character. Through a discussion board, the AP students created writing samples and then read and commented on other students’ samples. The technology not only fit the TPACK model, but it enhanced the pedagogy and content in a way that a paper and pencil format could not have done. Teacher B’s lessons meet the TPACK model for technology integration.

Summary – Participant 2 – Teacher B. Teacher B was an exemplary model of technology integration in the classroom. Although Teacher B rated herself low on the TPSA C21, Technology Efficacy scale, she utilized technology, with assistance from peer

and campus support personnel, in a way that enhanced the pedagogy she chose for content delivery. As a teacher with 34 years of teaching experience, her knowledge of instructional strategies was rich, as well as her knowledge of her content area. Those strengths as well as the desire to use technology in a purposeful way, and not just for "the sake of saying you use technology", drove her instructional and technology integration decisions. The final striking piece that made Teacher B's technology integration stand out was her desire to make the classroom student-centered rather than teacher-centered. Although she was a veteran teacher, she continued to look for ways to make content relevant and engaging for learners. She believed that she could accomplish this though purposefully used technology and instructional strategies.

Participant 3–Teacher C

Teacher C recently completed his second year teaching Geometry and Advanced Placement (AP) Calculus. His undergraduate student teaching, as well as his two years experience, was all completed on the study campus. On the TPSA C21, technology efficacy survey, the teacher rated himself as a high efficacy teacher compared to the results of his peer group, placing him in the top third of all teachers participating in *Tech & Teach Tuesday*. Because of Teacher C's age and experiences he has never known teaching without technology. When asked what he hoped to gain from the *Tech & Teach* professional development, he stated that working through specific operations of apps and tools had been helpful in assisting him with troubleshooting technology for students in the classroom. *Tech & Teach* also presented resources, like apps, that he could use in the classroom but might not have had the time to search for himself. When asked about his decision and thought process for utilizing technology in a lesson he stated,

So, usually, it starts off with the organization piece for me. Is it easier to organize my thoughts or the students' thoughts with technology or on paper? From there it kind of shifts into how am I going to grade it. Is this something that technology can grade for me? Because that'll save a lot of work on my end, which means I can plan or do whatever else with that time.

I also look for ways technology can extend. Is there something that this technology opens the door for that we couldn't do without it? A lot of the times it's videotaping and slow-motion features of the app for my calculus classes, or using the calculator or specific math tools, those type of things that we couldn't actually experience without the technology.

And those are the three things I look for. So, how can I organize it, how does that help me grade, and then does it extend what they're actually doing?

When discussing how technology has influenced his instructional pedagogy, Teacher C mentioned that the mobility that the 1:1 technology has provided has changed how and from where in the room he teaches. He acknowledged that technology had also provided instructional tools that would not have been available without the technology.

The first observation conducted in Teacher C's classroom was during a Geometry class. The class was involved in a three-day insurance adjustment project where they calculated the damage caused by a natural disaster. The activity was staged in four different classrooms. The staged classrooms demonstrated damage to the classroom that could occur from fire, wind, or water. The students were placed in cooperative groups and were given the task of visiting multiple classrooms, calculating the damaged surface area, estimating the cost of the damage, and presenting an insurance claim adjustment presentation to the class. Students utilized their iPad camera, a collaborative online presentation tool and worked in a group of three or four to collect information and then present it to the class. Within the presentation, students had to identify the damage, justify why the damaged items would or would not be replaced, and then calculate the

total amount of money their insurance company would provide to replace the damaged items and structures.

Throughout the first observation, the teacher and students utilized technology. The teacher moved throughout the room to assist students with any technical difficulties. The technology fits well with the instructional strategies used in the lesson. The assignment called for collaborative groups to complete the content calculations and then create a final product and present to the group. The use of *Google Slides* as a collaborative tool allowed for any member of the group to edit the presentation. The teacher and students used *Schoology* to send and receive information. Although appropriate for the instructional strategies, the technology utilized was not needed for the content calculations. Students merely took pictures of the damage and then calculated the damages by hand. The teacher demonstrated more Technology Pedagogy Knowledge (TPK) than Technology Content Knowledge (TCK) (Table 6).

Table 6

Technology Integration Observation Instrument, Teacher C, Observation 1

Curriculum Goals & Technology	Instructional Strategies & Technologies	Technology Selection(s)	“Fit”	Instructional Use	Technology Logistics
Partially Aligned (2)	Supports (3)	Marginally Appropriate (2)	Fit Together Somewhat (2)	Effective (3)	Operate Well (4)

The second observation took place in the AP Calculus class, twelve days before the AP Calculus exam. The reminder on the board and the intensity in the room pointed to a clear focus on the AP Calculus test and students' preparation toward it. The lesson

focused on input and output equations. The teacher utilized *Schoology* to post multiple exam-type questions. Students were given the option use the app *Notability* on their iPad to work the problems or to use paper and pencil. The teacher explained the process. Students were given 10 minutes to work the problem in silence on their own, then 5 minutes to work with a partner to solve, then the class would discuss it together. The teacher set a timer and displayed it using his iPad and Apple TV. Students began working through the process. When both timers were complete, the teacher utilized *Notability*, displayed through his iPad and Apple TV as well as a document camera and paper, to work through each of the steps of the problems. The process continued until all problems were solved. The teacher then discussed best approaches for solving these types of problems on the day of the AP Calculus test.

In Teacher C's lesson, the technology used aligned very well with his instructional strategy approach and created opportunities for simplified productivity because of the technology (TPK). He and the students operated the technology with ease. The technology, however, does not necessarily connect to the content of the lesson, as some students eliminated the technology piece and worked problems on paper (TCK) as reported below (Table 7).

Table 7

Technology Integration Observation Instrument, Teacher C, Observation 2

Curriculum Goals & Technology	Instructional Strategies & Technologies	Technology Selection(s)	“Fit”	Instructional Use	Technology Logistics
Partially Aligned (2)	Supports (3)	Marginally Appropriate (2)	Fit Together Somewhat (2)	Effective (3)	Operate Well (3)

Research Question 1: The Influence of Tech & Teach Tuesday on Teacher C's classroom technology integration. Teacher C is in a unique group of teachers regarding his use of technology in the classroom and exposure to the *Tech & Teach Tuesday* professional development program. He began student teaching at the study high school in the 1:1 environment and attended trainings during his intern year as well as the two years he has been teaching in his classroom. Teacher C's ratings of his technology efficacy placed him in the higher group of all teachers at the high school. Throughout interviews and observations, his focus for technology in the classroom has been for improved productivity and efficiency. His comments regarding participation in *Tech & Teach Tuesday* were centered on learning new apps and finding ways to simplify his work or being able to grade and get results back to students faster.

Research Question 2: How and why did Teacher C make decisions regarding integration of technology into the classroom curriculum? Teacher C was very clear in his process for planning to utilize technology in a lesson. He stated three primary purposes for incorporating technology. First, he considered the organization of a lesson or assignment and asked himself if the technology would assist him or his students in better organizing a lesson or project. The next consideration was geared toward assessment. He considered if technology would help him in grading or assessing students and provide the fastest turn around for results. Finally, he looked for ways that technology might extend a lesson or provide some tool or format that paper and pencil could not provide students.

Research Question 3: How did Teacher C's method of technology integration meet the TPACK model of instruction? Teacher C's lessons do meet the criteria of the

TIOI. The areas that rank three out of four tend to be the areas of Technology Pedagogy Knowledge and general ease of use with the technology utilized. The use of technology to fit curricular goals (TCK) is not as high as the use of technology to fit productivity or strategy goals (TPK).

Summary – Participant 3 – Teacher C. Throughout observations and conversations with Teacher C, it was evident that he was comfortable using technology and looked for ways to implement technology that would advance his teaching and student learning. His primary considerations for utilizing technology tended to be driven by productivity or workflow and timely student feedback on quizzes and assessments. As a second year teacher who has always taught in a 1:1 environment, he has always utilized technology in the classroom. The final consideration he named for utilizing technology in instruction was to extend learning beyond what pen and paper could do. He has not yet demonstrated implementation of this idea as it relates to curricular technology usage.

Participant 4–Teacher D

Teacher D has been teaching and coaching for eight years. He taught World Geography and coached at the study high school for two years. He attended *Tech & Teach* professional development for two years, but brought some experience with him from a previous district, which was also an iPad 1:1 environment. Teacher D's TPSA C21 technology efficacy questionnaire placed him in the middle third of teachers, which identified him as a moderate technology efficacy teacher. He also mentioned that his age made him very comfortable with technology and he felt he was tech savvy and often an early adopter of new technologies.

When asked about what he hoped to gain from the *Tech & Teach* trainings, he stated that he looked for small pieces that would fit into what he was already doing and that he always looked for ways to "make what I'm doing more efficient than it already is." He believed that the "point of technology" is to find out how we can do more with what we have and to make what we're doing more efficient. When asked about how much technology he incorporated into lessons before *Tech & Teach* training he referenced how he utilized note taking apps and the learning management system, *Schoology*, to make his class more efficient. Since participating in the training, he believed his technology integration has increased primarily in the area of giving quizzes. The formative assessment trainings assisted him in creating quizzes and collecting data without having to sit down and grade each student's response. The efficiency aspect of utilizing online quizzes was very beneficial. When asked about his decision-making process for determining what instructional technology he might consider when preparing a lesson he explained,

It's [technology] going to be for everything. The note delivery is going to come through there. Students with modifications and accommodations that ask for electronic delivery notes will get them electronically. If it's better for everyone to get it that way anyway, you might as well give the notes electronically to all students. Now and again, we try to encourage students to open those notes up in *Notability* so you can add something in addition to the PowerPoint, so it's not just follow along while I'm reading the notes or while I'm talking through the notes, we want that participation aspect as well.

It's the same thing with vocab. If we push out vocab to them, it's going to go out through Schoology [the learning management system], so they can open up in *Notability* and do the assignment.

Almost every day we start out with *CNN Student News*, and I'll assign a writing prompt from that. [Writing the response to the prompt] is probably the only thing that I don't approach with a technology aspect. I've thought about letting them type it, but to me, I just don't feel like they do a lot of writing anymore. I feel like it's a needed skill and it just feels like it's a skill that's going away. So that's something I have students complete without technology. The

journal response is the only reason they have a notebook for my class. But, everything else, it begins and ends with technology.

When asked about how technology had influenced his instructional pedagogy, he responded with how technology had changed his delivery system for teaching. He posted notes electronically, students watched current event news feeds and then wrote about them, the quizzes were electronic, and worksheets that were sent, completed, and turned in through *Schoology*. Teacher D added that he was glad for this change in instruction because he "feels like it falls right into my wheelhouse."

The two observations conducted in Teacher D's classroom were both World Geography classes. The first class began with students watching a video clip from *CNN Student News*. Students were told they would be writing on a prompt after watching several global issue stories on the news feed. Students were asked to write a paragraph regarding what they would need as assurance if they were a world leader meeting with another world leader who promised to bring peace to a lengthy political conflict between two countries. Most of the students jotted notes down on paper, with two students utilizing the iPad and a note-taking app to script their comments. Students in the class then volunteered to share their written comments aloud. The teacher guided a class discussion based on the answers given. The next instructional activity was note taking over the content unit. The teacher displayed his PowerPoint notes to the class on the television, and several students accessed *Schoology* on their device to pull up the PowerPoint of the notes. Students could move the PowerPoint into the Notability App, which would allow them to write on the PowerPoint and take notes with the slides as the teacher lectured. Very few students utilized this additional app. The majority of students followed along on the PowerPoint on their device without taking notes or watched the

television screen as the teacher lectured. Following the lecture and PowerPoint, students began work on a country project in which they worked with a partner to locate country demographic information utilizing a predetermined website and then completed a worksheet template with the required information.

The teacher and some of the students utilized technology throughout the first observation. The teacher utilized *CNN News*, as well as a PowerPoint, to provide information. As students took notes on the chapter, they had the option of utilizing technology to write more information, but very few students elected to do this. Students also utilized a predetermined website to collect information for their country project which was then transferred to a digital form of a worksheet. The teacher and most of the students used Schoology to send and receive information. Although appropriate for the instructional strategies, the technology utilized did not rise to the level of a three or four on the TIOI rubric (Table 8). In most cases it did not provide anything more than a piece of paper would have. Technologies utilized to provide information to the students were productivity related rather than having a curricular purpose. A paper copy would have provided the same information. Within the observation, the teacher demonstrated Technology Pedagogy Knowledge (TPK) by providing information via video and PowerPoint through Schoology, as well as accepting assignments through Schoology. The teacher's application of Technology Content Knowledge (TCK) was limited to playing a video of current events and posting notes of the PowerPoint lecture, but not receiving or interacting with students via technology.

Table 8

Technology Integration Observation Instrument, Teacher D, Observation 1

Curriculum Goals & Technology	Instructional Strategies & Technologies	Technology Selection(s)	“Fit”	Instructional Use	Technology Logistics
Partially Aligned (2)	Supports (3)	Marginally Appropriate (2)	Fit Together Somewhat (2)	Minimally Effective (2)	Operate Well (3)

The second observation took place two weeks later, and the students in World Geography had begun a new unit on the physical geography of North and South Korea. The class began with another *CNN Student News* clip regarding an issue of child labor for cobalt mining in the Democratic Public of the Congo. The teacher asked students to write their thoughts on child labor laws and if they were needed in our society. Students used paper to write their thoughts and then the teacher led a class discussion. Following the discussion, the teacher displayed a PowerPoint of the notes on the physical geography of North and South Korea. Following the lecture and viewing of the slides, students began work on a vocabulary assignment. The assignment was a worksheet posted on Schoology. Students were also given a North and South Korea scavenger hunt worksheet. The worksheet required them to look up demographic information regarding the two countries. It was also posted on *Schoology* and students were able to work in pairs to find the information which came from a predetermined website, the textbook, or PowerPoint notes. In this case, the students moved the worksheet into the *Notability* app to allow them to record their answers on the digital worksheet. They submitted their completed work through Schoology.

Throughout the second observation, the use of technology was a means for disseminating and receiving information. This use of technology could be aligned to the Instructional Strategies & Technologies category of the rubric (TPK). The use of technology toward curricular goals was minimally used (TCK) as reported in Table 9. The teacher and students possessed the skills needed to send and receive documents through *Schoology*.

Table 9

Technology Integration Observation Instrument, Teacher D, Observation 2

Curriculum Goals & Technology	Instructional Strategies & Technologies	Technology Selection(s)	“Fit”	Instructional Use	Technology Logistics
Partially Aligned (2)	Supports (3)	Marginally Appropriate (2)	Fit Together Somewhat (2)	Minimally Effective (2)	Operate Very Well (4)

Research Question 1: The Influence of Tech & Teach Tuesday on Teacher D’s classroom technology integration. In the interview, Teacher D repeatedly stated that his purpose for utilizing technology within a lesson was to make what he did as the teacher more efficient. Regarding *Tech & Teach Tuesday* he said his goal was to, "try and look for small things that I can add in that make what I'm doing more efficient than it already is." This belief was stated in his interview as well as observed in his teaching that the primary purpose of technology is to “make what we're doing more efficient, and better." For those reasons, his most significant takeaways from professional development were geared toward productivity and efficiency.

Research Question 2: How and why did Teacher D make decisions regarding integration of technology into the classroom curriculum? Teacher D repeatedly stated that when making decisions about utilizing technology for instruction, he considered it for everything. He provided notes electronically and utilized *Schoology* for disseminating materials and for receiving student work. He had also begun utilizing technology for vocabulary quizzes, although those were not observed. When discussing the implementation of technology into instruction, his primary focus continued to be productivity and efficiency, particularly as it related to the teacher and time spent preparing and grading.

Research Question 3: How did Teacher D's method of technology integration meet the TPACK model of Instruction? Teacher D utilized forms of technology throughout his lesson. The areas of technology integration fall under the Instructional Strategies and Technologies category (TPK) most often due to the use of *Schoology* for a workflow from teacher to student. There is only a slight connection of content to the technologies, which made the integration of TPACK weak.

Summary – Participant 4 – Teacher D. In the interview, Teacher D represented himself as a person who was very comfortable with technology due to his age and experience in two different school districts who adopted a 1:1 iPad environment. His self-rated technology efficacy placed him in the moderate group compared to other teachers. His answers to interview questions regarding technology, as well as classroom observations, revealed a teacher who was comfortable with technology and particularly with the workflow of electronic documents through *Schoology*. His primary purpose for

using technology to make processes and workflow more efficient, was repeatedly stated and observed. His application of technology in the area of pedagogy (TPK) is higher than the application of technology for a curricular purpose (TCK).

Participant 5–Teacher E

Teacher E has three years of teaching experience. She served one-year as a science teacher at the study high school and one year in the *Tech & Teach Technology* professional development. Her responses on the TPSA C21, technology efficacy questionnaire placed her in the top third of all teachers who attended the training, which labeled her as a High Technology Efficacy teacher.

When asked what she hoped to get out of the *Tech & Teach Tuesday* trainings she stated, "Just knowledge of how to connect to the students really." She also hoped to learn about working with students on digital citizenship, due to the new nature of her teaching in a 1:1 environment. Before coming to the study high school, she did not teach in a 1:1 setting and the majority of her technology application came from lab equipment or students utilizing their devices for quizzes or resource searches. Since participation in the study, Teacher E explained that having access to the technology and the training "changes the way that you think about creating something." Assignments aren't necessarily pen and paper or merely writing down notes. She stated that students in this environment are accustomed to making collages or videos or other creative projects. When thinking about planning and the process of incorporating technology into a lesson, Teacher E noted that she relied heavily on her PLC biology and chemistry teams to bring the content and activities to the planning sessions. As a team, the group reviewed what was in the curriculum and decided if there was an activity or technology tool available

that would enhance the lesson. One question that she stated that she asked herself when planning activities, was how will this affect me as the teacher? She considered if the activity will be time-consuming or time-saving because the quizzes were graded automatically. When contemplating how technology had influenced the instructional pedagogy she stated,

It puts more accountability on [the student] because [the assignment or product] does not go away. They think if they hand in the paper, and it's the same answers, I'm not going to catch it or something, but on the computer, I think they feel like they have more accountability on it, and then also just the timestamp if you turn it in. And then also, they're more accountable to their parents, too. Their parents can go in at any time, and say, oh, here's your score. I saw that you were absent this day, or so on and so forth.

Teacher E focused on the newness of teaching in a 1:1 environment during the interview and was open to finding new ways to manage the classroom and assignments with the technology in the hands of students. Although she rated herself with high technology efficacy her management of the devices and incorporating the technology into instructional practice, was a concern for her.

Teacher E was observed two times once in her Pre-AP Chemistry class and a second time in her Biology Class. The first observation began with students working through a warm-up assignment posted on the TV through the worksheet under the document camera. Students attempted to work through three equations on the worksheet that had to be balanced. After a few minutes of attempting them, the teacher came to the front to lead the class through the problems. The students utilized *Schoology* to access the worksheet on their device and then utilized a piece of paper or *Notability* to make notes and work through the calculations of the problems. As the teacher worked through each of the equations, the students became confused and asked many clarifying questions.

When students asked clarifying questions, the teacher directed them to go back to the notes from the previous day. The students' questions and frustration began to increase, and in response, the teacher asked students if they wanted to do another problem together before moving on the next part of the lesson. Most students agreed that another example would be helpful. After ten minutes the teacher left the warm-up problems and moved on to the mini-teach portion of the lesson. The students took notes via *Notability*, which allowed them to access teacher notes that were provided on *Schoology* and then notate on their own on the handout. Students worked through the bracket method for balancing reactions of oxidation and reduction equations. Notes regarding the method were posted in *Schoology*. Once the teacher finished demonstrating how to solve the sample questions, the students were allowed to move forward with their homework, which included more problems. Students were to upload their assignment to *Schoology* when complete. The teacher conducted a formative assessment to check for understanding by saying, "Raise your hand if you see it?" after she completed a practice problem.

During the first observation in Teacher E's Pre-AP Chemistry class the teacher and the students utilized technology. The teacher used hardware, such as the document camera and the class television, to project her work on the assignment and posted the worksheet for her students to access digitally in *Schoology*. The students were able to access the worksheet on their iPad and then moved the document into the *Notability* app, which allowed them to "write" on the worksheet with their finger and make notes, or calculations that were saved to their copy. The technology utilized was merely for workflow or productivity and not necessarily content related. For this reason, Teacher E

scored higher in the area of Instructional Strategies and Technology (TPK) than in the area of content related technology (TCK) (Table 10).

The next observation occurred in Teacher E's 9th grade Biology class. The class took place in a different setting than the daily classroom environment. For this lesson Teacher E reserved a "Connect Lab" which was a recently opened flexible furniture room in the high school. The room is equipped with tables and chairs that can be arranged in any setting. There were dry erase writing surfaces on all of the walls and tabletops, as well as a 50-inch touch screen monitor connected to a laptop and Apple TV, which allowed teachers to access websites or their iPad to project and manipulate information for students.

Table 10

Technology Integration Observation Instrument, Teacher E, Observation 1

Curriculum Goals & Technology	Instructional Strategies & Technologies	Technology Selection(s)	"Fit"	Instructional Use	Technology Logistics
Partially Aligned (2)	Minimally Supports (2)	Marginally Appropriate (2)	Fit Together Somewhat (2)	Minimally Effective (2)	Operate Well (3)

Additionally, 30 Chrome Book laptops were reserved in the room. Teacher E used the space to group tables into stations. The technology provided was not utilized. This observation took place a week before the Biology End of Course State assessment. The objective of the lesson was to review seven different objectives that would be tested on the state assessment. Each student was given a fill in the blank handout to complete at each station. All of the objectives were set up at different tables, and students moved in

groups to work through the materials on each table which would assist them in filling in the blanks and answering questions on the handout. Students rotated as the teacher told them to move from each station. When all students had completed the seven stations, they were asked to go back to their seat and log in on their iPad to complete a *Socrative* quiz. To access the quiz, students opened the *Socrative* app and then entered the teacher code, which was written on one of the dry erase boards. The teacher instructed students to put their handout aside, not to talk, and that they were not allowed to use any notes. The teacher moved about the room and verified that all the students were taking the quiz without their notes. She heard a camera capture sound and went over to a student to make sure he had not taken a picture of his notes before beginning the quiz. Students completed the quiz just before the end of class. Results were collected via the *Socrative* app but not shared with the students during the class period.

In the Biology class observation, the teacher utilized technology as a means to assess students at the end of the lesson. This is an application of an instructional strategy that demonstrates her TPK. However because she never revealed the results of the formative assessment to students or utilized the data to reteach or review at the end of the class, the assessment became more summative. For this reason, she rated a 2 in the Instructional Strategies and Technologies category. The fit and instructional use of the technology utilized did not take advantage of the real-time grading results that technology can provide within a formative assessment. The remainder of the class was spent utilizing a paper manipulative and handouts with no technology used.

Again in this observation Teacher E's technology application was minimal and did not take advantage of the enhancements that technology could provide through real-

time feedback or access to additional instructional resources. Teacher E continued to focus on the security of the learning or testing environment and had concerns that students might misuse or chose to cheat with the technology. In the observations her TPK is slightly higher than her TCK with the minimal amount of technology that was utilized (Table 11).

Research Question 1: The influence of Tech & Teach Tuesday on Teacher E’s classroom technology integration. Teacher E stated that what she had hoped to get out of *Tech & Teach Tuesday* was knowledge of how to connect to students including ideas regarding digital citizenship. She believed that technology could change the way a student thinks about creating a project and make learning the content more real world for students. Her observations did not necessarily align with these types of creative projects.

Table 11

Technology Integration Observation Instrument, Teacher E, Observation 2

Curriculum Goals & Technology	Instructional Strategies & Technologies	Technology Selection(s)	“Fit”	Instructional Use	Technology Logistics
Partially Aligned (2)	Minimally Supports (2)	Marginally Appropriate (2)	Fit Together Somewhat (2)	Minimally Effective (2)	Operate Well (3)

Research Question 2: How and why did Teacher E make decisions regarding integration of technology into the classroom curriculum? Teacher E identified several ideas she considered when incorporating technology in a lesson. She began by revealing that it is not only her, but the team of Biology teachers that write and design the lessons. She stated that the group looks for ways to enhance the content and activities they have.

Her next primary consideration was how much work will there be for her as the teacher, "if we take a grade off of a quiz then it's like I don't have to grade that quiz and they automatically get their data from it." Technology reduces the amount of time the teacher has to spend grading. The teacher's final consideration for technology integration was, the security and accountability of the information or grading using technology. Many times she mentioned making students accountable to a deadline by referring to the electronic submission time stamp or being able to identify if copies of assessments could have been used to cheat. She talked about the teacher, as well as the parent, being able to hold students accountable for on time and original work.

Research Question 3: How did Teacher E's method of technology integration meet the TPACK model of Instruction? Teacher E met the TPACK model of instruction minimally. The technology she utilized was primarily focused on the teaching or recording information strategy and less for student presentations, feedback, or learning. She could have replaced the technology activities with pen and paper. Her TPK is slightly higher than her TCK but neither utilized technology to enhance the learning activity.

Summary – Participant 5 – Teacher E. Teacher work and accountability were the focus of implementation of teaching with technology for Teacher E. The reasoning behind why technology could enhance learning was presented as a student-centered, real-world learning experience, but her concern of accountability, classroom management, and cheating accusations may have hindered her implementation of technology. The technology incorporated in the lesson could have easily been replaced by paper and pencil. The technology used was not utilized in a manner that expanded the lesson or

activity. Teacher E, although a high technology efficacy teacher, has significant concerns regarding the implementation of technology into instruction and demonstrated a limited knowledge of teaching strategies within the lessons of the two observations.

Participant 6–Teacher F

Teacher F has been teaching for 22 years. The last 14 years were served at the Central Texas high school as a Pre-AP and AP Spanish IV teacher. She was teaching at the high school before the 1:1 iPad initiative and has participated in *Tech & Teach Tuesday* professional development for five years. Teacher F’s responses to the TPSA C21, technology efficacy questionnaire ranked her in the top third of all teachers attending *Tech & Teach Tuesday* professional development, which identified her as a high technology efficacy teacher.

When asked what she had hoped to gain from *Tech & Teach Tuesday* she said, “Actually, it’s far exceeded my hopes because I was very basic when I came to it [technology], but I found that I use technology greatly. I’m very creative with what we develop in the training because we’re asked to be, so I have created new lessons and thought differently about things as a result of the *Tech & Teach*”. When considering if she utilized technology for instruction before the training, she explained that she utilized some technology but has never considered herself an expert user. However, she has always tried to utilize technology. Since participating in the *Tech & Teach Tuesday* trainings, Teacher F stated,

Oh, I mean, it’s totally revolutionized my classroom. Nothing is the same that it was 20 years ago for sure. They have to have their iPads not only to create and we do, a lot of creating. We share out *iMovies*. We share out projects. We share out thoughts on things. We share out *Padlets* to review for the AP exam and things like that. Products and resources that we could never have done before are

available because of the technology tools. But, even beyond the creative aspect of it, or the instructional aspect of it, we also use it for homework. Students don't know what my homework is if they don't have their iPad or they can't get on the Internet and find out because it's posted on *Schoology*.

Everything is uploaded on *Schoology*, or on their *Vista* [digital textbook] website. The fact that they can go home and work on things and get immediate feedback, because the *Vista* website tells them that it's wrong, and then they get another chance to go back in and figure out what might be right, is just phenomenal. We save lots of time in the classroom not having to go over things like that because they've already figured it out themselves.

When asked about her process for planning and implementing technology, she discussed how the technology and the content are connected through the textbook and language resources. There is not a vocabulary assignment that is not tied to an online resource. Individual products or *Padlets* with collections of resources are created by the students and then made available for the whole class to use to study for the AP exam. The classroom also includes a drop-down language lab. The lab allows the teacher and students to communicate with each other via a teacher driven computer software that controls each student's audio headset and microphone. The teacher can record, replay, and partner students through an operation panel on her computer to allow the students to practice conversation and then replay and provide feedback on they or their peer's work assignments. The classroom activities are, or most of the activities, involve some type of content or pedagogical link to the technology (TPACK).

When asked how technology integration has changed her instructional practice Teacher F stated,

Well, I think that I turn to it now. And you know, in a foreign language, you're goal really is authentic communication and technology in addition to everything that I've just told you about makes it so much more accessible for me to actually bring that authenticity to my classroom via YouTube videos, things like that. The access to technology allows us to bring resources of a Hispanic country, a Latin American country, or Spain and see traditions and examples of the culture into our classroom. We've also used technology to communicate with younger Spanish

speaking students in our district. This year I hope to communicate in some way with people from other countries like a pen pal but utilizing *FaceTime*. These resources and authentic experiences wouldn't be available without technology.

The first observation in Teacher F's classroom was her AP Spanish IV class. The teacher and students were preparing for an upcoming AP exam by building and reviewing content that would be tested on the exam. The objectives of the class were to practice speaking and work on a cultural unit, which aligned with the AP Spanish IV standards. The teacher began class with verbal directions given to the students in Spanish. The students had been studying independent cultures and pulling out ten significant things unique or essential to the Spanish speaking country or region. The students collected the information in spiral notebooks and then recorded the information on a *Padlet* page that included narrative, videos, and pictures from their research. The *Padlet* was then submitted to the teacher through Schoology and ultimately became a part of a *Google Sheet* list of all student work that could be used by all students as a resource to review for the AP Exam. The teacher moved through the room while the students worked and checked the homework practice that had been assigned the night before through *Vista* the online textbook. As students completed their *Padlet* information, the teacher numbered the students 1-4. The students formed groups with their numbered partners and began their assignment. Each person spoke in Spanish to the group about what they wrote on their "Culture" *Padlet*. The teacher timed each speaker and monitored or redirected conversations until all members of the group had an opportunity to speak. The teacher verbally called on one member of the group to share with the class about information shared by one of their partners. When the activity finished, all students returned to their seat and were asked to pick up their headsets. The teacher partnered the students virtually

via the Language Lab headphones and gave instructions for the interpersonal speaking portion of the lesson. A verbal prompt was given to students over the headsets, based on the work they had done previously in the textbook. The students were given a moment to think about their response and the teacher gave a countdown to recording the students via their headset. Each student independently responded to the prompt and was recorded by the Language Lab software. The teacher then gave instructions for each student to listen individually to their response and find three things they could correct. She replayed the student response back for the students to assess themselves. Following the second replay of their own recording and dictation of their corrections, the teacher asks the students to trade headphones with their partner. The partner was to listen to their peer's comments and find three errors that they could help them correct. The partners returned the headset to the original owner and then talked to one another about the mistakes they identified and what could be changed to correct it. The final transition in the class was to return the headsets to the trays and then discuss the homework assignment on the digital textbook that would be completed that evening.

Throughout the first observation the teacher utilized a variety of instructional strategies, some including technology and others not. The technology and pedagogical practice well-supported student learning and the content presented (TPACK). The lesson provided an opportunity to introduce authentic resources of content, self-assessed and peer assessed formative assessments of practice, and creative opportunities to build class resources for the AP exam using technology tools. All products and interactions were focused on the identified objectives; to practice speaking for the verbal portion of the exam and to build content knowledge of the cultural objectives covered by the exam. The

teacher and students utilized technology to research, create, post, share and communicate within the lesson. All aspects of technology used in the observation was purposely aligned with an instructional strategy and best-fit technology for the job (TPACK) as reported in Table 12.

Table 12

Technology Integration Observation Instrument, Teacher F, Observation 1

Curriculum Goals & Technology	Instructional Strategies & Technologies	Technology Selection(s)	“Fit”	Instructional Use	Technology Logistics
Strongly Aligned (4)	Optimally Supports (4)	Selections are Exemplary (4)	Fit together Strongly (4)	Maximally Effective (4)	Operate Very Well (4)

The second observation took place in a Pre-AP Spanish III class. The students entered the room and joined the warm-up. The warm-up was to sing along with a YouTube recording being played on the classroom television. The YouTube recording was of a Spanish artist singing the song *Corre*. The words rolled across the bottom of the screen, and the students sang along. The posted objective stated to begin work on the poetry research unit. The students utilized their iPads to conduct the research and all information regarding the unit and posting of information was provided for students in a folder on *Schoology*. The first activity of class involved utilizing the language lab headsets. All students were assigned a partner and the teacher gave a verbal prompt for the students to discuss. The teacher asked the first partner to respond, then stopped the time and asked the second partner to respond. The teacher continued with another prompt and the partners took turns speaking to one another on the prompt.

To conclude the activity the students put away the headsets and the teacher called on individuals in the class to share their response or their partner's response to the questions. The next activity was an introduction to the poetry unit. The teacher walked students through the resources provided on *Schoology*. The unit had multiple projects that students could choose to complete. Several of the projects involved research, utilizing technology to create a digital product and then posting the project to *Schoology*. The first assignment that all students must complete was discussed. The teacher provided multiple examples of student products from previous years and provided tips to the students for completing the project. The project involved students creating an original poem using nouns, verbs, and adjectives and then creating artwork that reflected the meaning of the poem. The medium for the artwork was left to student choice. The next portion of the lesson focused on grammar. The students practiced identifying, writing, and speaking present perfect tenses. The teacher played a short video clip from the textbook of examples and paused the video to check for understanding and to ask students to practice speaking some of the examples. The teacher then gave a mini-lesson on specific examples of the present perfect tense. Next, students opened the class hardcopy of the textbook resource to a page given by the teacher and reviewed the list of present perfect tense words. The teacher gave the students 30 seconds to look over and memorize as many words as they could. Students were then asked to recite the words to a partner and then switch. They repeated the exercise several times. The teacher transitioned to the next activity by asking students to open *Conjuguemos*, an online language education website of lessons and formative assessment tools, and then complete the past participle activity assigned. The formative assessment tool helped the students with memorization of the

words and the context in which they are used. The final activity before class concluded was to discuss the homework assignment on *Vista*. The students were asked to complete the assignment on their own before the following day.

The second observation again demonstrated a deep link between the content, pedagogy, and technology selected for each activity (TPACK). The teacher and students utilized technology throughout the class to verbally communicate and listen before providing feedback, to practice grammar rules using formative assessment, and to create original poetry products utilizing their content knowledge. The technology and instructional strategies were diverse and purposefully used to fit the content and learning needs (TPACK) as reported in Table 13.

Table 13

Technology Integration Observation Instrument, Teacher F, Observation 2

Curriculum Goals & Technology	Instructional Strategies & Technologies	Technology Selection(s)	“Fit”	Instructional Use	Technology Logistics
Strongly Aligned (4)	Optimally Supports(4)	Selections are Exemplary (4)	Fit together Strongly (4)	Maximally Effective (4)	Operate Very Well (4)

Research Question 1: The influence of Tech & Teach Tuesday on Teacher F’s classroom technology integration. Teacher F stated that participation in *Tech & Teach Tuesday* influenced how she thinks about and uses technology. She has always tried to incorporate technology as a teacher but during her time in *Tech & Teach Tuesday* she was expected to be more creative about the ways she utilizes technology in the classroom. She referred to the way she now thinks about utilizing technology being

different than it was before. She reflected that the way Spanish was taught 20 years ago and the resources available today are vastly different. Today she expects students to create, build resources, and practice the language using technology, and recognized that you have to think differently as a teacher to be able to do that.

Research Question 2: How and why did Teacher F make decisions regarding integration of technology into the classroom curriculum? Teacher F believes that the process of choosing technology to utilize was not even a conscious thought for her or her students at this point in their technology journey. When she developed lessons, assigned homework, provided spoken language practice, or assigned projects both she and the students understand that technology tools will be incorporated in all aspects. She stated that the goal of the upper-level Spanish courses was to create opportunities and experiences that are authentic and technology provides this authenticity. This authenticity could never have been accomplished in a classroom utilizing a hard copy of a textbook. She implemented technology in all aspects of her teaching.

Research Question 3: How did Teacher F's method of technology integration meet the TPACK model of instruction? Teacher F provided strong examples of the connection between content, pedagogy, and technology. Teacher F planned multiple instructional activities within a single lesson that utilized the technology as a medium that tied directly to the content objectives. She met the TPACK model in all categories of the rubric.

Summary – Participant 6 – Teacher F. Teacher F has embraced technology in all aspects of her teaching. She has an in-depth knowledge of instructional strategies that she utilizes to teach her content. Her experiences as a teacher and her efficacy for using technology in the classroom setting may attribute to her willingness to utilize technology for instruction. She spoke of a desire to teach differently than she taught 20 years ago and how technology has revolutionized the language classroom. She utilized technology for instruction and expected students to utilize technology to research, create, communicate and assess their Spanish language content. Her classroom instruction and activities demonstrate a rich connection of TPACK.

Participant 7–Teacher G

Teacher G has been teaching for 26 years and 11 of those years were served at the Central Texas high school as a regular and Pre-AP Spanish I teacher. Teacher G was a teacher on the high school campus before the 1:1 initiative and participated in all of the *Tech & Teach Tuesday* professional development. Her responses on the TPSA C21, technology efficacy questionnaire ranked her in the middle third of all teachers who attended the training, which identified her as a moderate technology efficacy teacher.

When asked about her expectations for *Tech & Teach Tuesday* professional development she said she hoped to gain “lots of new skills, practice using the iPad and gain knowledge about how to use them with students.” She also looked for instructional ideas and teaching strategies. When reflecting on how much she used technology before the *Tech & Teach* training, she stated that she used it but not as efficiently. Since participating in *Tech & Teach Tuesday* the change that Teacher G has seen in her instruction is that the technology integration has moved her from utilizing technology for

teacher presentations to a more student-centered use of technology for practice, products and interactions. When asked about how she made decisions to incorporate technology in a lesson she said,

It depends on which kind of lesson it is. I think first of all if they need to practice just wrote memorization sometimes, we'll go to *Conjuguemos* [an online website for vocabulary practice]. If they need to practice the more complicated grammar structure, we'll go to *Vista* [the online interactive textbook]. And if they need to practice oral question and answer, then we'll be in the Language Lab headsets.

The tools she utilized were specific to the content as well as the instructional need. Teacher G transitioned quickly from one activity to another and provided a wide variety of activities for practice, assessment, and authentic conversation. When reflecting on how technology has influenced the instructional pedagogy she explained,

I do think that our formative assessments have significantly improved. We used to give all these little mini quizzes over the vocabulary. When I first came here, it was all paper and pencil. To learn the vocab, the kids wrote the words out three times. It was like three times, Spanish, English, Spanish, English, Spanish, English. And then we had these little quizzes of vocab, but it was straightforward wrote memorization. Here's a list in English, you write the words in Spanish and there's your quiz. And we'd give three quizzes over each vocab list.

I don't think it was that effective. Because the kids would just memorize it for the moment and then it would be gone. It wouldn't be in their heads. But the technology that we have right now, they get to do that more on their own time at their own pace using tools like *Conjuguemos*. It's so much better than just memorizing it for a quiz and then losing it out of your head. Or even the writing it three times. On the *Conjuguemos* they have to get it right to move on. And it'll tell them the right answer eventually, and then they can use that for the future. With the *Vista* they practice in the same manner. It just, it really helps them to improve. It's built to help the kids improve their language instead of like, a gotcha thing. The resources are just a lot better than just what we used to do.

The first observation in Teacher G's classroom was a regular academic Spanish I, class. The class took place in one of the Language Labs, which was equipped with the teacher software to manipulate the hardware headsets for each student. She began class by telling the students to put away their iPads and pick up a headset. The first activity

was to present student *Book Creator* projects, which required students to research and then create a travel brochure of a Spanish speaking country. The teacher utilized her iPad and the Apple TV connected to the classroom television to display the projects. The *Book Creator* App allowed students to post pictures, videos, narrative and a voice-over recording about each destination. The written portion and spoken language had to include the grammar component of present progressives. After viewing the projects, the teacher then asked students to take out the paper worksheet of the homework they completed over *Estar* and the present progressive tense. She virtually grouped students in sets of three using the headsets and students began to go over the responses to the worksheet. Students read each statement aloud in Spanish to one another and compared answers. The teacher moved virtually from group to group to monitor the conversation of each team and provided feedback if students were struggling. After visiting each group, she connects all headsets and said if you made 100% clap three times. The teacher acknowledged the students' progress and moved to the next activity. Next, the students were grouped virtually with one partner. The teacher published a fill in the blank statement on the television screen. The teacher instructed students that they could use their hardcopy of the vocabulary sheet and then read the prompt aloud on the television and the students responded verbally to each statement. Following the activity, students removed their headsets and listened for instructions. The students worked through a paper copy of the content that would be on the test the following day. The teacher encouraged students to write down information that they did not know. The final component of the review was to work again with a partner via the headsets. Students put the headsets back on and spoke to each other about the review. The teacher checked on each partner set via

the Language Lab headset and retaught if students were confused about a concept or word. With a few minutes left until the end of class, the students put away their headsets, played another formative assessment review game on the classroom television and turned in hard copies of the homework papers.

Throughout the observation, the teacher and students utilized technology for instructional purposes. The technology used "fit" strongly with the instructional need and content. All aspects of technology usage were maximally effective and aligned exactly with the TPACK model (Table 14).

Table 14

Technology Integration Observation Instrument, Teacher G, Observation 1

Curriculum Goals & 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)	Operate Very Well (4)

The second observation took place in Pre-AP Spanish I classroom. The posted objective was to assess student knowledge of preterit forms of verbs. Students in the class were preparing for an exam the following day. Class began with a *Quizlet* Live review game. Students logged in to the online game via their iPad and were grouped in random sets of four to five people. The team competed as a group to respond on their iPad with the answers to the questions posted on the television screen. The teams raced against one another to win the first round. After students completed the first round, they were regrouped and physically moved to join another group of students to compete again

against the other teams of students in the room. Following each round, the teacher reviewed the answers to each question and asked students why a person might choose a different response than the right answer. Reteach opportunities occurred after questions that did not have unanimous correct responses from each group. Following the group activity, students returned to their seats and joined a second formative assessment gaming website, *Kahoot*. Students began answering the *Kahoot* questions individually on their iPad. This time the teacher could see individual responses and called on individual students to clear up misunderstandings. The teacher again stopped and clarified why some answers might have been chosen over the correct answer. The application and the activities of the Preterit form of verbs were reviewed.

The second observation in Teacher G's class also revealed strongly aligned curriculum, pedagogy, and technology goals. The technology tools utilized in the lesson enhanced the pedagogy through formative assessment, which addressed the specific language content. The interweaved connection of content, pedagogy, and technology in the lesson was an exemplary demonstration of the TPACK framework as reported in Table 15.

Table 15

Technology Integration Observation Instrument, Teacher G, Observation 2

Curriculum Goals & 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)	Operate Very Well (4)

Research Question 1: The influence of Tech & Teach Tuesday on Teacher G's classroom technology integration. Teacher G indicated that her integration of technology had changed significantly since attending *Tech & Teach Tuesday* and having access to student devices. The primary area of growth that she recognized was in her own use of technology as a teacher presentation tool to a more student-centered tool. She stated, "I think I've gone from me just presenting...to presenting and kids using the iPads for things...Student production I guess I should say".

Research Question 2: How and why did Teacher G make decisions regarding integration of technology into the classroom curriculum? When discussing the decision making process for integrating technology in a lesson, Teacher G indicated that she is entirely reliant on the objective and purpose of the lesson or content. She gave an example, "if they [students] need to practice just wrote memorization sometimes, we'll go to *Conjuguemos*. If they need to practice the more complicated grammar structure, we'll go to *Vista*. And if they need to practice oral question and answer, then we'll be in the [Language] lab". She utilizes technology specific to the instructional strategy needed for students to learn the content.

Research Question 3: How did Teacher G's method of technology integration meet the TPACK model of instruction? The examples of technology integration mentioned in Teacher G's interviews and observed in her classroom were exemplary models of an interweaved connection of content, pedagogy, and technology, TPACK.

Summary – Participant 7 – Teacher G. Teacher G provided very strong instructional examples of TPACK. There was an interdependent connection between content, pedagogy, and technology. She utilizes technology to advance her teaching and reflects that her integration of technology has changed over the years from a teacher presenter, teacher-centered purpose, to a student-centered purpose. Although she does not rate herself in the highest third of technology efficacy, she modeled technology integration that closely aligned with both the pedagogy and content taught within her lessons.

Participant 8–Teacher H

Teacher H has been teaching for six years. She just completed her first year as a Pre-Calculus and Geometry teacher at the study high school. Teacher H participated in the *Tech & Teach Tuesday* Training for the first time this year. Her responses to the technology efficacy ranked her in the lower third of teachers who attend the *Tech & Teach* training, which identified her as a low technology efficacy teacher. Her previous teaching experience was not on a 1:1 environment campus.

When discussing what she hoped to gain from the *Tech & Teach Tuesday* professional development, she stated, "Just more about the Tech. I've used iPads before but never in the classroom. So just different creative ways to use the technology other than note taking on *Notability*". After participating in *Tech & Teach Tuesday*, Teacher H reflected that she had taken away some new ideas that her PLC group implemented into lessons. When asked about how she goes about making decisions to incorporate technology into instruction she said,

I feel like most days there's always just the understanding that students are going to use *Notability* [note taking app] because in math, doing problems and working problems is a big part of it and so having the app is really just replacing paper, and so that's just like a given. If the lesson is going to be something different than that, a couple of days ahead, the PLC group considers the application activity and asks, what can we do? Then we look for things that we can do that are different than just *Notability*.

When Teacher H considered how technology integration has changed her instructional pedagogy, she explained,

I feel like a lot of things aren't different, but I feel, and I don't know if it's the technology as much as it's just like being at this high school. I feel like I've changed to doing a lot more hands-on things with the kids. Like having them pick up a broken plate and find the diameter of the plate before it was broken and things like that. So I'm not sure that is influenced by the technology... but then I feel like part of that is just this school. This school does a lot more activities, and I really have enjoyed most of them, and I think this is a great way to do that with the kids. But now I'm like, okay well what activity can I do with this [concept] and then I'm thinking back to the previous question. Well, can I do this with the iPad? So I feel like it's a little bit of both. A little bit of just being new to this school and a little bit of well now that I'm doing this, what can I do with the iPad too.

The first observation in Teacher H's class involved students presenting their Geometry insurance claim adjustment project. All teachers in the department completed this project, so the details were familiar to the researcher. The students stood in the front of the room and mirrored their Google slides project from an iPad onto the classroom television via the Apple TV. Within the presentation, students showed pictures of the "damaged" rooms, their estimates of the space that needed to be replaced, and the cost it would take to replace it. They justified what parts of the "damage" their insurance company would pay and were questioned by the teacher as to why they chose to replace some parts and not all. All members of the group took part in creating the presentation via the collaboration aspect of the *Google Slides* tool and had a role in presenting the information to the class.

In scoring the first observation on the TIOI rubric (Table 16), Teacher H’s classroom activity appeared, at first glance, deeply intertwined with technology. Her students manipulate the technology well and have utilized a collaborative tool to complete the project (TPK). However, the connection to the curriculum is not deep. Students did the majority of the measurement and calculations without technology tools, and the project did not require a great deal of research utilizing technology or real-world access. The majority of information was given to students in a handout. The role of technology in this lesson was primarily for workflow and presentation. The use of TPK was much higher than the use of TCK. The technology served a purpose but was not connected closely to the curriculum.

Table 16

Technology Integration Observation Instrument, Teacher H, Observation 1

Curriculum Goals & Technology	Instructional Strategies & Technologies	Technology Selection(s)	“Fit”	Instructional Use	Technology Logistics
Partially Aligned (2)	Supports (3)	Appropriate, but not Exemplary (3)	Fit Together Somewhat (2)	Effective (3)	Operate Well (3)

The second observation also took place in a Geometry classroom where students were taking notes on a new concept, finding the area of 3-dimensional shapes. The worksheet students used to take notes on were posted on *Schoology*. Students opened the note page and then moved it into the *Notability* app to add their hand written calculations and notes. The teacher modeled this practice for students as she worked the problems from the front of the class. The teacher was able to write out her calculations and draw

shapes with a stylus on her iPad, which was projected to the classroom television via Apple TV, as she talked the students through the process of solving the problems. Students followed along making notes on their own devices. When the direct teach portion of the lesson was over, the teacher reminded students that they had homework that evening on *ConnectEd*, the online textbook with embedded math exercises. Students utilized the remainder of class time to begin work on the homework and asked the teacher questions if they had misunderstandings.

This lesson involved both teacher and students utilizing technology. The use of the iPad to take notes is useful and convenient for students to access for workflow purposes. The technology used does support the instructional strategy of note taking (TPK). The technologies in the lesson may also be connected in a minimal way to the content (TCK). However, when the technology utilized could easily have been replaced with paper and pencil. The technology utilized does not have a strong connection to pedagogy or content (TPACK) (Table 17).

Table 17

Technology Integration Observation Instrument, Teacher H, Observation 2

Curriculum Goals & Technology	Instructional Strategies & Technologies	Technology Selection(s)	“Fit”	Instructional Use	Technology Logistics
Partially Aligned (2)	Supports (3)	Appropriate, but not exemplary (3)	Fit Together Somewhat (2)	Minimally Effective (2)	Operate Well (3)

Research Question 1: The influence of Tech & Teach Tuesday on Teacher H’s classroom technology integration. Although not new to teaching, Teacher H is new to the

1:1 learning environment. Her interests in the technology trainings were primarily to learn more about the device and what was available for students to access. She recognized that she learned new apps and tools in the *Tech & Teach Tuesday* trainings.

Research Question 2: How and why did Teacher H make decisions regarding integration of technology into the classroom curriculum? Teacher H indicated that the content and purpose of the lesson drives the technology used. She stated, "I feel like most days there's always just the understanding that they're probably going to use *Notability* as a standard because it's... math. Doing problems and working problems is a big part of it and so having the iPad, it's really just replacing paper, and so that's just like a given. If it's [the lesson] going to be something different than that, a couple of days ahead we ask, "what can we do?" and then we look for things that we can do that are different than just using *Notability* to take notes.

Research Question 3: How did Teacher H's method of technology integration meet the TPACK model of instruction? Teacher H and her students utilized technology in the classroom for instructional purposes. However, the technology used was little more than a pen and paper to the students. She does meet the rubric category of using technology appropriate for the instructional strategy (TPK), but the technology is not aligned or even needed to teach or learn the curriculum (TCK).

Summary – Participant 8 – Teacher H. Teacher H is an accomplished teacher of six years but is teaching for the first time in a 1:1 environment. She recognized that either the technology or environment at the high school is different than other places where she has taught. She spoke of a more hands-on approach to teaching math where application

activities play a significant role in introducing and interacting with new math concepts. Although she has utilized some technology previously in her classroom instruction, she stated it was never a daily occurrence. She rated herself as having low technology efficacy but also showed great interest in incorporating more technology in her classroom. She utilized technology in both classes observed, but what she used could have easily been replaced by pen and paper. Her TPACK is developing.

Participant 9–Teacher I

Teacher I had been teaching for three years. This year he completed his first year teaching at the study high school as a Special Education English Resource teacher. He participated in *Tech & Teach Tuesday* for the first time this year. This was his first year to teach in a 1:1 environment and his first year to teach Special Education Resource Level classes. Teacher I's response on the TPSA C21, technology efficacy survey ranked him in the middle third of teachers participating in the training, which identifies him as a moderate technology efficacy teacher. Teacher I considered himself tech savvy due to his age and experiences; however, teaching utilizing technology was a new experience for him this year.

When asked what he hoped to gain from the *Tech & Teach Tuesday* professional development he spoke of learning about new apps to use in the classroom and having time set aside to practice using those apps, as well as hear other teachers' ideas for integrating technology. Before teaching at the study high school, Teacher I did not have a great deal of access to technology in the classroom. Regarding participating in *Tech & Teach Tuesday* and teaching in the 1:1 environment he stated, "I've made it a point this year, because of never having it before, to try to embrace technology. Some of my kids

use it every day because they're typing on it". When asked what he considered when planning a lesson that may integrate technology Teacher I stated,

I generally try to think about a lesson, just kind of see how I'm going to implement it, and if I can do something with technology, because I generally find it's easier to integrate technology than have to do everything by paper, then I try to use it. But I also have to keep my students in mind, some of the specific ones I have, to make sure that it's [the technology] not going to hinder them more than it's going to help them, so it just depends.

When asked how technology integration has influenced his instructional pedagogy

Teacher I explained,

I would say that it has changed the way that I think about the day-to-day class. Especially when you are doing a lot on the iPads. You've got to make sure that you're monitoring a lot differently than you would than if they're writing because of the aspect of being online. The *Apple Classroom* [management app] has helped a lot with that. It's helped me monitor better.

But I think it's made me be a more active teacher, getting up, moving around a lot more, because you're making sure they're where they need to be. I think it also makes me more interactive because you're able to do more in a certain situation because you're not just giving a lecture for 20 minutes. You can be more interactive with something like a game, or something like that. It's nice not to have to stand and click a button when you're doing a PowerPoint.

When approached about participation in the study, Teacher I was not comfortable being observed in his Resource English classroom. Rather than eliminate him from the participant sample, the researcher felt it important to represent Teacher I's unique perspective. Teacher I was a young teacher with only three years teaching experience, was new to the campus and a 1:1 environment, and teaching in a special education setting. For this reason, the only data collected from Teacher I was his interview.

Research Question 1: The influence of Tech & Teach Tuesday on Teacher I's classroom technology integration. Teacher I participated in his first year of *Tech & Teach Tuesday* this year and commented about his enjoyment in hearing about new apps and how other teachers have used them in the classroom.

Research Question 2: How and why did Teacher I make decisions regarding integration of technology into the classroom curriculum? Teacher I spoke of his consideration for the content as the first step in planning and then thought about how technology might make a lesson easier instead of using paper. He also noted that he takes into consideration how his students might interact with the technology and whether it will enhance or hinder their learning.

Research Question 3: How did Teacher I's method of technology integration meet the TPACK model of instruction? Because Teacher I did not participate in the observation components of the study, the researcher did not have an opportunity to score the TIOI rubric.

Summary – Participant 9 – Teacher I. Teacher I was a young teacher who is new to the 1:1 environment. He is comfortable using technology himself, but was in the beginning stages of utilizing technology as a daily part of instruction. His consideration for the content need and learning strategies were a high priority as he considered integrating technology into his lessons. Teacher I's students required guided and specific instruction and adding technology components to this new teaching position and environment could be quite overwhelming for a younger teacher.

Emerging Themes

Each of the nine participants responded to interview questions, were observed utilizing technology in their teaching practice, and then rated on the TIOI observation instrument to determine their level and application of the Technological Pedagogical

Content Knowledge model. The participants TPACK application was analyzed using a pattern matching process. Additionally, a constant comparative method was utilized to identify emerging themes and patterns. The emerging themes identified through the constant comparative process and a summary follow in this section.

Teacher-Centered to Student-Centered

The three teachers who scored highest on the TIOI reflected that technology integration in the classroom has caused them to become a more student-centered teacher. Teacher B stated, "It's become a more student-centered classroom where students have more responsibility to create something rather than the teacher using technology." In her classroom students are asked to utilize technology to create projects to demonstrate their knowledge and often teach what they've learned to the class. Students are given an open choice to utilize whatever technology best fits their need and purpose. Teacher G stated, "I think I've gone from more of just presenting with technology, using PowerPoint to present information, to now more of students presenting or using the iPad for things...student production I guess I should say". Teacher F stated, "Since participating in Tech & Teach Tuesday and teaching in a 1:1 environment, technology integration has revolutionized my classroom. Nothing is the same as it was 20 years ago, students have iPads to create, to share out information with the class as an *iMove* or on *Padlet*." Teacher F named multiple resources that students use daily to access content and post assignments including *Schoology*, their online textbook through *Vista*, which included interactive quizzes and information.

Teacher B summarized her thoughts by saying, "I think I have gone from being an all about me, teacher-centered classroom to more of a student-centered classroom. And

I'm not just saying that because that's a good thing to say. Students learn faster when they have to do it themselves. If I'm standing up here telling them, they're only going to catch about 25% of the content. But if they've looked it up, they've created something, they've put a project together using the 4 C's [Collaboration, Critical Thinking, Communication, & Creativity], that's what you want to do [as a teacher] because students are going to remember that".

Technology for Creativity and Collaboration

The three teachers who spoke of students utilizing technology for creative projects and as a collaboration tool were those that scored highest on the TIOI rubric. The three teachers not only addressed the use of technology for student creativity and collaboration, but also demonstrated these activities in their observations. Throughout the six observations, students collaborated through *Schoology* discussion boards, on formative assessment games, through collaborative face-to-face groupings, and through groups assigned utilizing the Learning Lab audio headsets. Students in these classrooms have produced creative projects to share with their classmates including *Book Creator* pages, *Padlet* resource pages, and digital multimedia brochures.

Influence of Technology on Pedagogy

All teachers in the study used technology paired with an instructional strategy in some way. The teachers who scored lower on the TIOI rubric utilized technology primarily as a note-taking tool. The lower scoring teachers' primary model of teaching was direct instruction through lecture or modeling while the students utilized their iPad, *Schoology*, and sometimes the *Notability* app to download, upload and annotate notes on

digital worksheets. These teachers utilized fewer instructional strategies in a lesson than the teachers scoring higher on the TIOI rubric. The three highest scoring teachers utilized many types of interactive instructional strategies in each observation. The pedagogy knowledge of the teachers allowed for technology to be utilized in a variety of ways. Examples of the strategies used include student collaboration: both digital and face-to-face; formative assessments: both digital and live; and creative projects including *Book Creator* pages and *Padlet* resource pages.

Influence of Technology on Content

The teachers scoring highest on the TIOI rubric utilized content-related technology tools throughout their lessons. Online resources, research projects, interactive textbooks, as well as pre-existing and teacher created content assessment tools were integrated into classroom instruction. The teachers reflected in their interviews about the change in the way they taught their content due to increased technology devices and the access that students have to authentic resources. The teachers utilized student technology access to facilitate student research, to assign student projects with the intent of students presenting content information to their peers, and to provide access to written, audio, and visual information. These strategies would not have been possible without the aid of technology.

Continuous Growth Mindset

The teachers scoring highest on the TIOI rubric spoke of the change that has come about in education since the integration of technology tools. The group of teachers scoring highest on the TIOI was comprised of teachers from the low, moderate and high

technology efficacy groups. Although they rated themselves at different levels of technology proficiency, they all spoke of their growth and desire to learn new tools that made student learning more engaging, collaborative, and provided opportunities for creativity. One teacher stated that she wanted to integrate technology into the classroom in a meaningful way; not just for the sake of saying I use technology. Each of the teachers spoke of their desire to continue to learn new ways to utilize technology to present their content in a way that students would learn. The teachers referenced the professional development through *Tech & Teach Tuesday*, their peers, and technology specialists on the campus as the resources they go to for information and assistance as they try new tools and strategies in the classroom.

Conclusion

In the current chapter, the nine participants' demographics as well as the data collected from the teacher interviews, sixteen observations, and the corresponding 16 TIOI scores were presented. A pattern matching analysis based on the a priori codes identified in the TPACK framework were applied to the data and revealed that three of the nine participants met the TPACK model of instruction. The data collected was then utilized to address the three research questions in the study for each participant. A second analysis using the constant comparative method was utilized to identify emerging themes from each of the nine participants and emerging themes among the teachers who scored highest on the TIOI rubric. These themes included; moving from a teacher-centered to a student-centered method of instruction, utilization of technology for creativity and collaboration, the influence of technology on a teachers' pedagogy change, the influence of technology on instructional content, and the teachers' continuous growth mindset.

Chapter five will present conclusions, implications, and recommendations for further study.

CHAPTER FIVE

Discussion and Implications

Over the last three decades, schools have experienced increased investments as well as increased expectations to integrate technology into instructional practice presumably as a catalyst for change in the educational environment. This integration of technology is expected to produce students who are creative, have the ability to problem solve, can work collaboratively, and possess the skills to communicate their ideas effectively. These competencies along with academic knowledge have been identified as the skills that will make students successful in a 21st century marketplace (Culp et al., 2005; Lim, Zhao, Tondeur, Chai, & Tsai, 2013). The trend of increased focus on educational technology does not seem to be slowing as recent changes in legislation and federal funding through ESSA, Titles II and IV, provide for targeted spending on Education Technology and technology-facilitated opportunities for professional learning and coaching. Regardless of the expectations or investments made in instructional technology, a shift from the traditional teacher-led classroom setting to a student-driven learning environment, rich with opportunities for students to utilize technology tools to locate and analyze information, solve problems, and communicate or collaborate with others, has yet to be realized. The possibilities for transformational change through technology integration in education are great, but the reality of this taking place in schools has not yet widely occurred (United States Department of Education, 2016).

The digital divide in education was once defined by access. The divide was a separation between the *haves* and *have-nots*. Today that gap, students with technology access and those without access, has nearly been eliminated. Still, the use of technology as a transformative learning tool for all students has not yet been realized.

A second *digital divide* has emerged between students who use technology for passive, entertainment or “consumption” and those who utilize technology for learning activities (Banister & Reinhart, 2011; Becker, 2000; Dolan, 2016; Hohfield, Ritzhaupt, Barron, & Kempner, 2008; Reinhart, J., Thomas, E., & Toriskie, J., 2011). The questions surrounding the new *digital divide* call attention to which students have access, how students use the technology, how teachers utilize the technology in the classroom, and how teachers locate and use instructional materials (DiMaggio et al., 2001; Valadez & Duran, 2007).

The new *digital divide* presents a complex issue related to how students utilize technology and the Internet as a tool for learning. Research suggests that the issue of technology implementation in schools may be “only as effective—or ineffective—as the schools that adopt them” (Goodwin, 2011, p. 2). This may mean that the success of utilizing technology for learning is not dependent on the technology provided or the tech-savvy of students, but rather each teacher’s knowledge and willingness to adopt new technologies and practices into the instructional environment.

The Ritzhaupt, Dawson, and Cavanaugh (2012) study found that “teacher use of technology strongly and positively explained classroom technology integration and student use of technology” (p. 247). The study goes on to state, “these findings reinforce the importance of teachers appropriately modeling the use of technology in their

classrooms and provide[s] the important evidence that a teacher can directly influence their students' use of technology through their own professional practice” (p. 247).

The existing research indicates a need for technology integration professional development that focuses on how technology can be used for instruction and not on the technology itself (Carr, Jonassen, Litzinger & Marra, 1998; Mishra & Koehler, 2003). In 2006, Mishra and Koehler introduced the Technological Pedagogical Content Knowledge framework (TPACK) for technology integration. TPACK was an expansion on an earlier construct published by Lee Shulman (1986). Shulman's work introduced the idea of Pedagogical Content Knowledge (PCK). Shulman claimed that for teachers to be successful instructors, they need expert knowledge in both content and pedagogy. Shulman explained that the intersection of pedagogy and content creates the opportunity for teachers to present subject matter in a variety of ways that will make it more accessible to all learners. The TPACK model takes into account the knowledge teachers need to “teach specific content-based material, using technologies that best embody and support it, in ways that are appropriately matched to students' needs and preferences” (Harris & Hofer, 2011, p. 213). The TPACK Framework is not a professional development model itself, rather a framework for teacher knowledge that can be useful for teacher professional development by identifying what teachers need to know about technology, pedagogy and content and their interconnected relationships (Harris, Mishra & Koehler, 2009).

Transformational educational change through technology has little to do with the technology itself; instead, it is dependent on the pedagogical knowledge of the teacher and the context of the professional development provided to teachers. In this explanatory

case study, the researcher sought to gain a better understanding of how and if a professional development model based on the TPACK framework and best practice professional development design, influenced teachers' integration of technology into their teaching practice. The study included nine teacher participants in a 1:1 technology environment, who participated in weekly *Tech & Teach Tuesday* professional development. The participants had varying levels of teaching experience, varied years of participation in the professional development program and varied levels of technology efficacy.

The remaining sections of chapter five will interpret the data gathered from interviews, observations, and the Technology Integration Observation Instrument rubrics. This chapter will share the study's significant findings as they relate to the primary research questions as well as significant emerging themes from the constant-comparative analysis. Chapter five concludes with the implications of the study and recommendations for future research.

Interpretation of the Data

The purpose of this study was to gain a better understanding of how and if a professional development model based on the TPACK framework and best practice professional development design influenced teachers' integration of technology in the classroom. The research questions were designed to gather details and insights into the decisions teachers made regarding how, why and for what purpose they utilize technology in a lesson and if their integration of technology fits the TPACK framework. The following research questions were posed:

1. How did participation in the *Tech & Teach Tuesday* Professional Development program influence teachers' integration of technology into classroom curriculum?
2. How and why do teachers make decisions regarding technology integration into content and pedagogical practice?
3. How did each teacher's method of technology integration in lessons meet the TPACK model through instruction?

Research Question 1: How Did Participation In The Tech & Teach Tuesday Professional Development Program Influence Teachers' Integration Of Technology Into Classroom Curriculum?

Through analysis of interview and observation data three significant findings emerged when teachers were asked how *Tech & Teach Tuesday* influenced their integration of technology into instructional practice:

- Teachers acknowledged an increased use of technology in their instructional practice due to their exposure to strategies and technology tools introduced in the training.
- Teachers acknowledged a change in the way they think about instructional planning and pedagogy or learning activities.
- Teachers recognized a change in their instructional practice moving from a teacher-centered classroom to a more student-centered classroom.

Tech & Teach Tuesday influenced an increased use of technology in the classroom. Six of the nine participants spoke of an increase in the technology they use in their classroom due to their exposure to pedagogical ideas and strategies that were paired with technology tools in the *Tech & Teach* training. Teacher A indicated she had gone from "hardly any" technology use to "constantly using it or at least trying anything they modeled in *Tech & Teach*." Teacher C indicated that because of his practice using the apps in *Tech & Teach* training he felt more comfortable using the technology in the classroom and was more confident in his ability to troubleshoot issues should they arise.

Teacher F said the *Tech & Teach* training had far exceeded her hopes of learning how to implement classroom technology. She indicated that teaching is not the same as it was twenty years ago because of the availability of resources for students, the tools for formative assessment, and tools for creative and cooperative projects have advanced over time. Teacher F stated, “*Tech & Teach Tuesday* has encouraged [me] to be creative and utilize the tools that are available to students.” Teacher I indicated that the *Tech & Teach Tuesday* training provided him with information on what technology or strategies would be beneficial for the students in his specialized classroom but also provided an opportunity for him to hear other teachers’ ideas about how they were applying the technology tools in their classroom.

Similarly, in a study of experienced secondary social studies teachers conducted by Harris and Hofer (2011), the teacher participants received professional development that addressed content-focused, TPACK- based learning activity types. Following the professional development teachers stated they realized they had “gotten in a rut” with their teaching practices and that the range of learning activity types presented in training assisted them in learning new activities as well as naming old activities which lead to a “whole new toolbox” of resources for the teachers to draw upon (p. 225).

In the current study, the pedagogies experienced through *Tech & Teach Tuesday* training were not always new to the teachers but served as reminders of effective strategies that they had not used in some time or in particular contexts. The exposure to best-practice pedagogies and instructional technology tools was a primary focus of the *Tech & Teach Tuesday* training. Participants indicated that the modeling of tools and

pedagogies, as well as the time allowed to collaborate with their peers on the tools, increased the frequency and variety of technology tools they used in their classrooms.

Tech & Teach Tuesday influenced a change in the way teachers think about instructional planning and learning activities. *Tech & Teach Tuesday* training presented a wide variety of pedagogical approaches, which were paired with multiple technology tools that teachers could choose for their content needs. Teachers indicated that the presentation of these pedagogies and paired technology tools influenced the way they think about instruction. Teacher E stated, “It [*Tech & Teach*] changes the way you think about creating something.” Teacher E reflected that because of the exposure to new technology tools and teaching strategies when considering what to assign as a student product she no longer asks students to write something; instead, she asks students to create a visual representation with an app or make a video to demonstrate their understanding. She believes these types of products provide a more real-world environment for students. Teacher F believes that she has become very creative with her use of instructional technology because the environment encourages creativity. She attributes her thinking about lessons differently to her participation in *Tech & Teach* training. Teacher D indicated that *Tech & Teach Tuesday* training was the primary reason he began using technology tools for formative assessment.

In the Harris and Hofer (2011) study involving secondary social studies teachers, after the teachers received professional development addressing content-focused, TPACK- based learning activity types, all of the participants “described thinking more consciously and strategically about both choosing learning activities to implement and the technologies to use to support them (p. 225).

Teachers in this study align closely to previous findings in that they indicate that *Tech & Teach Tuesday* has influenced their instructional planning practice through exposure to differing pedagogies and technology tools causing them to change the way they think about learning activities within their classroom instruction.

Tech & Teach Tuesday influenced a change from a teacher-centered classroom to a more student-centered classroom. Teacher B reflected on her practice stating, "It's become more student-centered, where the students have more responsibility to create something than I." She indicated that students frequently become the teachers in the classroom. The teacher provides opportunities for students to access information and create a presentation to turn around and teach their peers. When assigning projects, Teacher B has given students a starting point for the technology they can use to present their information but leaves it open to any technology tool that they wish to use. She reflected that many of the projects were superior to what she would have created to teach the content herself. Teacher F explained how her classroom has become more student-centered and how students find and share information and resources. She stated, "Students do a lot of creating. We share out movies. We share out projects. We share comments on things. We create resource databases of reviews for major exams. We could never have done this without technology". Teacher G had similar experiences moving from a teacher-centered creator and provider of all information to a more student-centered method of teaching. She reflected, "I think I've gone from me just presenting to more of students presenting and using the iPad for things...student production I guess I should say". Teacher G spoke of her instructional change caused by the exposure to different learning activities and aided by student technology access.

Tech & Teach Tuesday training intentional presented more learner-centered pedagogies that supported the competencies, which have been deemed essential for 21st Century learners; critical thinking and problem solving, communication, collaboration, and creativity and innovation. This is not a new concept in the educational technology world. Harris (2005) states, “Since Papert’s publication of *Mindstorms* in 1980, leaders in the educational technology community have advocated student-centered, authentic (often problem-based) application of educational technologies that emphasize the development and application of higher order thinking skills and practices” (p.118). When the teachers from the current study reflect on a change from teacher-driven instructional ideas to those that are learner-centered, they demonstrate the desired growth progression that has been encouraged by educational technology leaders for nearly thirty years.

As stated by Linda Darling-Hammond, “professional development is an important strategy for ensuring that educators are equipped to support deep and complex student learning in their classrooms” (2017, p. 23). The *Tech & Teach Tuesday* professional development model was based on the best-practice design elements identified by Darling Hammond et. al. (2017), which included being content focused, incorporating active learning strategies, engaging teachers in collaboration, the use of modeling, providing expert support beyond the professional development, including time for reflection, and providing sustained, on-going training throughout the year. This design model paired with the content focus of the TPACK framework was reported to be influential on teachers in regards to the amount of instructional technology they used in the classroom, a change in their thinking regarding how to use technology and teachers’ movement toward more learner-centered activities.

Research Question 2: How And Why Do Teachers Make Decisions Regarding Technology Integration Into Content And Pedagogical Practice?

Through analysis of interview and observation data regarding the second research question significant findings emerged. When teachers were asked how and why they make decisions regarding technology integration into their instructional practice:

- Teachers identified a clear sequence for planning that began with *Content* followed by *Pedagogy* and lastly considered *Technology*
- Teachers indicated that access to technology tools and *Tech & Teach Tuesday* training has changed their consideration and implementation of student learning activities
- Two divergent groups emerged; those with teacher-centered approaches and those with student-centered approaches to instruction

Decisions made regarding technology integration follow a clear planning sequence that considers content first, then pedagogy, and finally technology. Data collected through interview questions regarding planning revealed six of the nine participants utilize a linear sequence of consideration when planning classroom instruction. The six teachers referred to their content or curriculum as their first consideration in the planning process. This step was followed with a consideration for how they would teach the concept or how they would engage students in the content. Finally, teachers thought of the technology that would pair well with the strategy they planned to use. Teachers said they reflected on technologies they knew or had experienced through *Tech & Teach Tuesday* training that might “fit” or “extend” the instructional activity.

This process is a logical sequence for planning and parallels similar findings in other studies regarding teacher professional development through TPACK. Harris and Hofer (2011) conducted a study of experienced social studies teachers’ planning to

discover the nature and development of how teachers' TPACK application was expressed in their planning processes. The study revealed a similar consideration sequence for planning. Harris and Hofer found that when planning instructional units, the social studies teachers first consider the content, and then predicted what would engage the student to learn the content while factoring in the time available to the teacher, resources available to students, and any other contextual constraints. Harris and Hofer report, "Though most of the teachers described these steps in sequence, further analysis revealed that these are, instead, ordered priorities that the teachers considered concurrently" (p. 225).

This finding in the decision-making process or lesson planning sequence is familiar and logical, however it may present a barrier for instructional technology in that regardless of how tech-savvy a teacher may be, their pedagogy knowledge may considerably limit student access to instructional technology. In this study, teachers with fewer years of experience spoke of and demonstrated less frequency and variety of learning activities in classroom instruction. If a collection of instructional strategies to draw from is not abundant in a teacher's "toolbox" of skills, the use of instructional technology may be limited.

Access to technology tools and Tech & Teach Tuesday has changed their consideration of student learning activities. When considering how she makes decisions, Teacher A commented that the availability of technology and the *Tech & Teach* modeling of strategies and tools have given teachers another avenue for consideration when planning with instructional technology. She stated that the "collaboration aspect" as well as the "creativity piece" of using technology provides teachers the opportunity to "think

outside of the box” when planning learning activities and allows students more opportunities to make choices about their products. Teacher B stated that her primary goal when planning a lesson was "to try to get the students involved, get them to create something, get them to do more than just sitting there listening to me, have them actively participate in the lesson." To accomplish this, she asked students to research content and then create a product or a presentation. They may also share or communicate what they have learned or new ideas with the class. Within the observations the teacher asked students to work collaboratively in small groups to create visual representations of charters within the play they were reading that would ultimately be shared via a book creator app to the entire class to be used as a study guide. Teacher H who has only been on campus for two years and had not taught in a 1:1 environment prior to coming to the school had interesting insight into the planning and technology integration as it happened on the campus. When asked how she considered technology in her planning process, she ultimately shared that her pedagogy had changed. Teacher H stated, “I feel like a lot of things are different, but I feel, and I don't know if it's the technology as much as it's just like kind of being at [this school]. I feel like I've changed this year to doing a lot more hands-on things with the kids. Like having them pick up a broken plate and find the diameter of the plate before it was broken and things like that. So I'm not sure that's [technology]... but then I feel like part of that is just [this school]. Because [this school] does a lot more activities and I have enjoyed most of them, and I think this is a great way to do that with the kids". The PLC group with which the teacher plans have implemented multiple activities that call for collaboration with peers and creative aspects of presenting student knowledge. Although Teacher H is in the beginning stages of integrating

technology into her instruction, she recognizes a change in the pedagogical practices of teachers at the school compared to other places she has taught.

The *Tech & Teach Tuesday* training offered a range of pedagogies that targeted 21st Century skills and active learning strategies. Active learning involves students being engaged in their learning. Handelsman, Miller, & Pfund explain that active teaching strategies provide opportunities for students to do more than take notes or follow directions. Students are able to participate in activities and construct their own new knowledge (2007). Teacher feedback suggests that the focus on active teaching strategies through the TPACK lens was influential in the types of activities teachers plan.

Decisions made regarding technology integration reveals two divergent approaches. The final theme brought about by the research question of how and why teachers' made decisions regarding technology integration into instructional practice revealed two divergent approaches. One group identified decision-making considerations that pointed to a teacher-centered environment; the other group had more learner-centered considerations.

The teacher-centered group included Teachers C, D, E, and I. Three of the four teachers had less than three years teaching experience, and all four teachers had been at the school and participated in *Teach & Teach Tuesday* training for two years or less. All members of the group rated themselves as having moderate to high technology efficacy. When asked how and why they considered technology integration for instructional use, they stated the following reasons: classroom management concerns such as cheating or monitoring of student behavior, if the technology would make assignments easier or quicker for the teacher to grade, if the technology would provide greater efficiency in

managing paperwork, and if the using the technology tool would create more work for the teacher in planning and creation of the lesson. These instructional considerations were very different from the second group.

The student-centered group included Teachers B, F, and G. The teachers in this group have 34, 22, and 26 years of teaching experience respectively. All teachers had taught at the high school for more than ten years and participated in *Tech & Teach Tuesday* professional development since it began five years earlier. All of the teachers were at the school site before the 1:1 implementation. All three teachers indicated a focus on student outcomes in their instructional planning considerations. When asked how technology has influenced how she plans, Teacher B stated, "I have gone from being an all about me, a teacher-centered classroom to more of a student-centered classroom. And I'm not just saying that because that's a good thing to say, but students learn faster if they have to do it themselves, they just do. If I'm standing up here telling them, they're only going to catch about 25% of that. But if they've looked it up, they've created something, they've had to study and put that together, even if it's with two or three ... even if they've collaborated and used the four Cs...that is critical thinking, that is collaboration and they've had to use their creative juices. That's what you want to do because they are going to remember that." In this group, all three teachers indicated that they consider which instructional strategies and technology tools will be most effective for student knowledge acquisition. The teachers mentioned the use of online formative assessment tools for vocabulary practice that provide immediate student feedback and opportunity to improve, the use of creative projects utilizing technology tools to demonstrate research on specific curricular subjects that are presented or shared with classmates, and opportunities to

collaborate with other students face to face or virtually to produce an end product and teach one another. The teachers in student-centered environments use the curriculum as a guide to facilitate hands-on student learning activities. Bonwell and Eison (1991) explained that active learning involves instructional activity where a student is not only active but thinking about what and why they are doing the activity. The teachers demonstrated these types of activities as they provided more significant opportunities for student-led activities where the teacher facilitates learning and the students can construct their knowledge and understanding.

Through analysis of current literature and the findings of this study, there are several emergent themes for consideration as professional development is designed for teachers. First, there is a clear sequence of lesson planning identified in the current literature and this study, which follows the hierarchy of content, pedagogy and then technology. Veteran teachers may show more concurrent consideration than novice teachers. Next, it is reported that exposure has changed how teachers think about learning activities within their lesson. Finally, teachers' planning considerations reveal two divergent schools of thought, those who are teacher-centered and those who are learner-centered in their instructional planning approaches.

Research Question 3: How Did Each Teacher's Method Of Technology Integration In Lessons Meet The TPACK Model Through Instruction?

The final research question was designed to examine how each teacher's instructional practice met the TPACK model of instruction. To capture each teacher's application of technology integration in the classroom, the researcher utilized the Technology Integration Observation Instrument developed by Hofer, Grandgenett,

Harris, & Swan (2011). Two observations were conducted in each teacher's classroom, excluding participant 1, and the TIOI rubric was utilized following each observation.

The table below presents each teacher's score in all categories as well as their overall score of the two combined observations. The emerging themes are derived from the rubric and observation notes and are presented by the researcher in three groups; the highest overall scoring Group (perfect total score of 48), the moderate overall scoring group (total score between 30-47) and the lowest overall scoring group (total score below 29).

Highest Scoring Group Themes

- Instructional activities within the lesson were varied and numerous (four or more)
- The instruction was primarily student-centered/student-led; teacher facilitator
- Greatest number of years teaching, longest tenure on the campus, and most years experience in *Tech & Teach Tuesday*
- Varying levels of Technology Efficacy

Moderate Scoring Group Themes

- Instructional activities planned within the lesson were varied but not numerous (2-3)
- Technology within the lesson was used for instruction but primarily for productivity purposes (note-taking, collecting work, digital worksheets)
- Primarily teacher-led environment; including cooperative groups which were led by a teacher-scripted rubric

Lowest Scoring Group Themes

- Few instructional activities planned

- Instruction was primarily teacher-centered, not active learning strategies
- Technology was utilized for teacher presentation and students note-taking purposes

Highest scoring teachers' methods of integration viewed through the TPACK model rubric. Three teachers demonstrated instructional practices that fully met all components of the TIOI scoring instrument. These teachers have decades of experience in the classroom, have served as teachers on the current campus for at least ten years each and has participated in the *Tech & Teach Tuesday* training since they began five years earlier.

Table 18

Technology Integration Observation Instrument, All Scores

Participant	Obser #	Curr. Goals & Tech.	Instructional Strategies & Tech.	Tech. Selection	"Fit"	Instructional Use	Tech. Logistics	Score
A	1	2	3	3	3	3	2	17
A	2	2	3	3	3	3	2	16
B	1	4	4	4	4	4	4	24
B	2	4	4	4	4	4	4	24
C	1	2	3	2	2	3	4	16
C	2	2	3	2	2	3	3	15
D	1	2	3	2	2	2	3	14
D	2	2	3	2	2	2	4	15
E	1	2	2	2	2	2	3	13
E	2	2	2	2	2	2	3	13
F	1	4	4	4	4	4	4	24
F	2	4	4	4	4	4	4	24
G	1	4	4	4	4	4	4	24
G	2	4	4	4	4	4	4	24
H	1	2	3	3	2	3	3	16
H	2	2	3	3	2	2	3	15
I	1	0	0	0	0	0	0	0
I	2	0	0	0	0	0	0	0

Note: Obser.= Observation; Curr. = Curriculum; Tech. = Technology

The emerging themes that surfaced from classroom observations and use of the rubric exposed each teacher's use a wide variety of instructional strategies that were numerous and intentional. In the English class, the teacher used cooperative grouping, role-play, class discussion, small group discussion, research skills, creative student demonstrations of concepts, and group presentations as she facilitated seamless transitions through both technology-based and non-technology based activities. She and her students utilized technology, but the goal and objective of the lesson was content driven, and the technology was an extension of each learning activity. In the Spanish Language classrooms, the same patterns were repeated. The teachers moved from one instructional activity to the next without pause and integrated technology as an extension of the environment. Students were engaged in small group or peer conversations using the language lab headphones, created research-based projects that were published to digital resources, presented content to their classmates, and participated in both formative and summative assessments within the lessons. The lessons were fast-paced and focused on content objectives. The environment was student-centered and the teacher led as a facilitator. The use of technology in these classrooms accompanied the best practice strategy and was a part of everyday practice. All teachers in this group scored a 4 out of 4 in every category of the rubric as their understanding of the content; their in-depth knowledge of instructional activities, and knowledge of the technologies best "fit" for learning was evident.

Moderate scoring teachers' methods of integration viewed through the TPACK model rubric. Teachers in the moderate scoring group have less experience in education than the first group, but show great promise for growth in the areas of technology

integration as their content, pedagogy and technology knowledge deepen. Teachers in this group have two to five years of teaching experience and have been on the campus for three years or less.

Teachers in this group carried out multiple instructional activities both with and without technology. The activities planned to utilize technology tended to be for productivity purposes such as workflow, dissemination or collection of material and could have been easily replaced with a piece of paper. The instructional activities were lacking in content connection, which led to a lower score in the content technology alignment categories. In one instance, the math teachers in the group provided opportunities for students to collaborate on a project through a Google slides presentation. However, the lesson did not utilize technology to research or connect with the content, it was merely a form of reporting or a presentation of answers. This example represents some Technology Pedagogy Knowledge but lacks Technology Content Knowledge where a tie between the best-practice pedagogy for the particular content is present. The project utilizing Google slides did incorporate cooperative grouping and a presentation, but a rubric scripted elements of the project and left little to creativity or student need for collaboration. The activity itself has great potential to become an activity that strongly supports all areas of TPACK.

Lowest scoring teachers' methods of integration viewed through the TPACK model rubric. The final group of teachers have varying levels of teaching experience but only taught on the campus and participated in *Tech & Teach Tuesday* training for one or two years. The teachers' pedagogy knowledge evident in the instructional activity types observed was limited to primarily lecture and note taking.

In both classrooms during four observations technology was utilized by the teacher as an instrument for the presentation of lecture PowerPoint, the presentation of a video, or to model completion of an equation. The technology usage was teacher-centered and limited to one-way communication of information. In all observations students took notes of the lecture or presentation in varying forms; ranging from the use of the Notability app, a piece of paper, or by simply viewing the teacher's digitally posted material on the student device without any additional notes. In one instance there was a formative assessment that occurred after the note taking through a Socrative Quiz; however, the teacher did not go back and review the information collected from the quiz to reteach or reinforce concepts. The remaining instructional activities involved students completing a worksheet either digital or hard copy with information from the lecture or additional teacher-provided materials. Activities were lacking in variety, collaboration among students, communication of understanding, and creativity or problem-solving opportunities.

As the study measured each teachers' Technological Pedagogical Content Knowledge through the TIOI rubric, patterns indicate that those teachers who implement technology to the highest levels indicated on the rubric are those who use a greater frequency and variety of instructional strategies, utilize active learning or student-centered activities where the teacher is primarily a facilitator of learning, have the greatest number of years of teaching experience, exposure to the *Tech & Teach* training, and have varying levels of technology efficacy.

Summary of Significant Findings

This case study considered the influence of a training model on classroom technology integration, the decision-making processes that teachers consider in planning, and how each teacher's practice of technology integration met the TPACK framework. Following a review of the findings from each of the research questions, several overarching themes emerged from the data.

- The training model of *Tech & Teach Tuesday* Professional Development did influence teachers' integration of technology.
- There is a distinct progression that teachers utilized when planning and that planning process is influenced by their teacher-centered or learner-centered ideology.
- Teachers who fully meet all categories of the TPACK framework based on the TIOI rubric are; well versed in active learning strategies, learner-centered in their planning and implementation of instructional strategies, have the greatest number of years experience and exposure to the training model, and have varying levels of technology efficacy.

The Influence of Tech & Teach Tuesday Professional Development

The *Tech & Teach Tuesday* design model which incorporated the seven elements of effective professional development including content focus, active learning strategies, teacher collaboration, modeling, expert support, time for reflection and ongoing training (Darling-Hammond, 2017) paired with the content focus of the TPACK framework was reported to be influential on teachers' integration of technology into classroom instruction. Teachers reported an increase in their technology integration, a change in their thinking regarding how to use technology, and several teachers' movement toward more learner-centered activities.

How and Why Teachers Consider Technology Integration in Their Planning Practice

The data collected from this study indicates that there is a clear linear sequence of lesson planning identified by teachers, which begins with a consideration of content, then pedagogy and then technology. However, veteran teachers show a more concurrent consideration of these factors than novice teachers. This may be due to their deep knowledge and experience with the content they teach or their previous years experiences working with numerous pedagogical methods to teach the content. Teachers also report that exposure to the *Tech & Teach Tuesday* professional development has changed how they think about learning activities within their lessons. Most significantly, teachers' planning considerations reveal two divergent schools of thought, those who are teacher-centered and those who are learner-centered in their instructional planning approaches.

Teachers Meeting the TPACK Models Through Technology Integration

Teachers in this study who demonstrated the best example of Technological Pedagogical Content Knowledge as measured by the TIOI rubric, demonstrate similar patterns in regards to their instructional technology integration. These teachers use a great frequency and variety of instructional strategies, utilize active learning or student-centered activities where the teacher is primarily a facilitator of learning, have the greatest number of years of teaching experience and exposure to the *Tech & Teach* training, and have varying levels of technology efficacy.

Discussion of Additional Significant Findings Beyond the Research Questions

A constant comparative method analysis of the interview and observation data revealed additional significant findings related to the influence of technology on active learning, the influence of technology on content, and teachers' growth mindset.

Technology to Support Active Learning

The three teachers who spoke of students utilizing technology for active learning such as creative projects and as collaboration tools were those that scored highest on the TIOI rubric. The three teachers not only addressed the use of technology for student creativity and collaboration, but also demonstrated these activities in their observations. Throughout the six observations, students collaborated through *Schoology* discussion boards, on formative assessment games, through collaborative face-to-face groupings, and through groups assigned utilizing the Learning Lab audio headsets. Students in these classrooms have produced creative projects to share with their classmates including *Book Creator* pages, *Padlet* resource pages, and digital multimedia brochures.

Influence of Technology on Pedagogy

All teachers in the study used technology paired with an instructional strategy in some way. The teachers who scored lower on the TIOI rubric utilized technology primarily as a note-taking tool. The lower scoring teachers' model of teaching was direct instruction through lecture or modeling while the students utilized their iPad, *Schoology*, and sometimes the *Notability* app to download, upload and annotate notes on digital worksheets. These teachers utilized fewer instructional strategies in a lesson than the teachers scoring higher on the TIOI rubric. The three highest scoring teachers utilized

many types of active learning strategies in each observation. The pedagogy knowledge of the teachers allowed for technology to be utilized in a variety of ways. The use of technology within the learning strategies enhanced the activity beyond what would have been used without the technology tool. Examples of the strategies used include student collaboration, which occurred face-to-face but also utilized technology through shared collaborative documents or projects with language lab headsets to quickly form discussion groups.

Another example was the formative assessments utilized in multiple classrooms, which allowed students to access and assess their knowledge in an area through questioning that provided immediately individualized feedback for each student — a final example of technology used as the medium for creative projects. By incorporation of technology tools for student-created work or projects, the teacher creates an environment of exposure and authenticity beyond the classroom walls. Projects are published and shared on classroom discussion boards, through hyperlinks, or on class databases that can be accessed by students or the community for which the resource was intended.

Influence of Technology on Content

The teachers scoring highest on the TIOI rubric utilized content-related technology tools throughout their lessons. Online resources, research projects, interactive textbooks, as well as pre-existing and teacher-created content assessment tools were integrated into classroom instruction. The teachers reflected in their interviews about the change in the way they taught their content due to increased technology tools and the access that students have to authentic resources. Teachers reported that the tools now available have caused a change in their students' access to authentic resources. The

teachers utilized student technology access to facilitate student research, to assign student projects with the intent of students presenting content information to their peers, and to provide access to written, audio, and visual information. These strategies would not have been possible without the aid of technology.

Continuous Growth Mindset

Dr. Carol Dweck coined the phrases *fixed mindset* and *growth mindset* to describe people's beliefs about learning and intelligence (2016). A growth mindset is an understanding that abilities and intelligence can be developed. The teachers in the highest scoring group demonstrated this attitude about their learning. This group of teachers spoke of the change that has come about in education since the integration of technology tools. The group was comprised of teachers from the low, moderate and high technology efficacy groups. Although they rated themselves at different levels of technology proficiency, they all spoke of their growth and desire to learn new tools that made student learning more engaging, collaborative, and provided opportunities for creativity. One teacher stated that she wanted to integrate technology into the classroom in a meaningful way; not just for the sake of saying she uses technology. She was a thirty-year veteran teacher and began her teaching career long before any technology was available in the classroom.

Regardless of their technology efficacy, each of the teachers spoke of their desire to continue to learn new ways to utilize technology to present their content in a way that best served the learning needs of their students. The teachers referenced the professional development through *Tech & Teach Tuesday*, their peers, and technology specialists on

the campus as the resources they go to for information and assistance as they try new tools and strategies in the classroom.

Implications and Recommendations

The current case study intended to gain insight into the effectiveness of a professional development model based on the TPACK framework and gain a deeper understanding of how and why teachers make decisions regarding technology integration into classroom instruction. The study presented unique perspectives that few other studies have to date, in that the professional development model for technology integration training was developed around the ideals of the TPACK framework while also utilizing the elements of effective professional development. The elements of effective professional development include content focus, active learning strategies, collaboration among teachers, the use of modeling by trainers, expert support during and beyond the training, planned time for reflection, and weekly training sustained throughout the school year (Darling-Hammond, 2017). The study also presented perspectives of teachers with varying levels of experience teaching, pedagogy knowledge depth, and technology efficacy. Unlike many previous studies that utilized participants who volunteered for additional technology training programs, the TPACK modeled professional development at the study site has been ongoing for five years, and all core teachers participate in the training weekly. This allowed the researcher to randomly select a purposive sample group that would provide insight into teachers' skills and thoughts from varying levels of experience, technology efficacy and pedagogy knowledge.

For these reasons, the small case study provides insights into possible correlations between effective professional development models, teacher technology knowledge,

teacher pedagogy knowledge, teacher content knowledge and teachers' willingness to grow. The findings suggest the following implications and recommendations for technology-related professional development and future research.

Implications

First, the study found that a teacher's technology efficacy does not correlate with the effective integration of technology into teaching practice. Multiple examples of this were present in the study. The teachers whose scores met the highest categories in the TIOI rubric, which came from observations of their classroom instruction, were in the low, moderate, and high categories of technology efficacy. Likewise, those teachers who scored themselves as having high technology efficacy did not practice integrating technology in ways that fully met the TPACK framework. In this study, a teacher's experience in the classroom and length of time involved in *Tech & Teach Tuesday* training more closely correlated with the results of the TIOI rubric scores. Harris, Mishra, & Koehler (2009) reiterate that "learning about technology is different from learning what to do with it instructionally" (p. 402). A teacher learning about technology or having technology savvy in isolation does not provide the adequate knowledge to utilize technology to teach (TPK), how technology relates to content (TCK), or how to "help students meet particular curriculum content standards while using technologies appropriately (TPACK) in their learning" (Harris et al., 2009, p. 402). Teacher technology efficacy does not correlate to effective classroom integration of technology.

Additionally, the findings of the study suggest a positive correlation between pedagogy knowledge and best practice use of technology integration in the classroom. It is evident that, as stated by Harris and Hoffer (2011), "To effectively integrate

educational technologies into instruction, K–12 teachers’ planning must occur at the nexus of curriculum requirements, students’ learning needs, available technologies’ affordances and constraints, and the realities of school and classroom contexts” (p. 211). It is imperative that instructional technology professional developments not focus on technology tools, but rather improving the pedagogy knowledge and a connecting of the teacher’s content knowledge to pedagogy and technology tools. Teachers who had deep pedagogy knowledge, due to their years' experience and their participation in *Tech & Teach Tuesday*, presented more instructional activities with integrated technology in their classroom observations. These teachers used varied and frequent, active-learning strategies. Due to their pedagogical knowledge, the teachers spoke of varying ways and types of instructional strategies they use to teach content. Alternately, teachers in the study with less experience had less pedagogical knowledge, which presented itself through the limited amount of instructional activities in the classroom. A limited pedagogical knowledge allows for minimal methods of classroom instruction and superficial use of technology. To quote Abram Maslow (1966), “I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail” (p. 16). It is imperative that pedagogy be a focus of technology professional development in order to increase teachers' "toolbox" of strategies.

The third implication of the study is that a teacher-centered versus learner-centered mindset will affect the use of technology in the classroom. Teachers who were learner-centered in their planning focus found ways to incorporate technology using best practice strategies regardless of their technology efficacy. The study found that the highest scoring group of teachers implemented active-learning strategies with greater

frequency and variety than their peer groups. These teachers identified student engagement, creativity, collaboration and exposure to authentic resources as their considerations and focused on planning. The opposite was true of teachers who revealed a more teacher-centered planning philosophy. The teacher-centered group presented fewer and less variety in the observed instructional strategies and identified planning considerations for using technology which included ease of grading, classroom efficiency in paperwork management, and time spent by the teacher creating resources. The majority of their instructional strategies were not those considered active learning.

Recommendations

For these reasons, the researcher recommends that technology integration training follow effective professional development design outlined by Darling-Hammond et al. (2017). This design includes a connection to content, incorporation of active learning strategies, collaboration with other teachers, modeling of strategies, access to support from an expert or coach, and included time for reflection and training that is ongoing or sustained throughout the school year. This design was implemented in the *Tech & Teach Tuesday* professional development design and teachers' reflected on the importance of collaborating with their content peer group, the exposure, and modeling of technology tools, and their reliance on the trainers as their coach when they needed help with implementing new tools.

Additionally, technology professional development should be modeled after the TPACK framework to enhance understanding of the interconnections between technology, pedagogy, and content. As professional development designed for technology integration, it is essential that the focus is on how technology can be utilized

for instruction and not the technology itself (Carr, Jonassen, Litzinger & Marra, 1998; Mishra & Koehler, 2003). Mishra and Koehler provide a framework, TPACK that demonstrates the interconnected relationships of technology, pedagogy, and content knowledge, when they are used for instruction. The study revealed a linear planning process used by teachers to create lessons. Deficits in a teacher's pedagogy knowledge led to a disconnect between the content and technology integration. Teachers need exposure to the TPACK framework, which identifies the interdependent relationships of content, pedagogy, and technology in order to enhance their planning of lessons, which involve the interweaved components.

Furthermore, technology professional development must consider a pedagogical training focus that incorporates and models learner-centered, active learning strategies. Findings from the study revealed two divergent groups of teacher planners, those who had a learner-centered mindset and those with a teacher-centered mindset. The learner-centered group incorporated active learning strategies, which focus on student engagement, creativity, collaboration, and critical thinking. These active learning strategies utilized instructional technology to enhance the environment, products, and resources used for instruction. When teachers' pedagogical knowledge was limited, the variety of instructional activities and those involving active learning strategies were missing. This presents a need not only for targeted pedagogical training for teachers involving active learning strategies, but perhaps a database of pedagogies that link directly to specific content objectives allowing novice teachers a database resource of teaching and technology tools.

Finally, as professional developers begin creating best-practice technology integration professional development models, it is imperative that they understand the strengths and weaknesses of their training participants. Teaching is a complex activity that “depends on access to rich, well-organized and integrated knowledge from different domains, including knowledge of student thinking and learning, knowledge of subject matter, and increasingly, knowledge of technology” (Koehler & Mishra, 2009, p. 61). In this small study there was great variety in the knowledge and strengths teachers possessed. Because of the complex considerations needed to integrate instructional technology, there is a need to identify the specific strengths and weaknesses of each teacher as they take on the complex and interrelated activity of planning and teaching with technology. The researcher calls for a survey tool to determine teachers’ preconceived ideas and skills as they relate to pedagogy knowledge, content knowledge, and technology knowledge. This data may better inform professional developers of individual teachers’ professional development needs. Darling-Hammond et al. (2017) states that regardless of the particular model of professional development employed “it should also be linked to identified teacher needs, should ensure that teachers have a say in the type of learning they require to best support their students, and should be regularly evaluated so that quality can be continually improved” (p. 23). A survey of teacher technological, pedagogical and content knowledge would inform professional developers of teacher needs and allow for differentiated professional development.

Conclusion

Funding and access to technology tools continue to increase with the expectation that technology will be a transformational agent for change in modern education.

Literature and this study suggest that access to technology tools in the classroom has done and will do very little to enhance student learning. It is increasingly evident that the change sought in teaching and learning will only come about by a change in the pedagogical practice of teachers who are appropriately prepared with student-centered learning activities and content knowledge that utilizes technology as an instructional tool in order to facilitate and impact learning.

APPENDICES

APPENDIX A

Technology Proficiency Self-Assessment for 21st Century Learning (TPSA C21)

Technology Proficiency Self-Assessment for 21st Century Learning (TPSA C21)

I feel confident that I could...	SD	D	U	A	SA
1. ...send e-mail to a friend.	1	2	3	4	5
2....subscribe to a discussion list.	1	2	3	4	5
3. ...create a distribution list" to send e-mail to several people at once.	1	2	3	4	5
4....send a document as an attachment to an e-mail message.	1	2	3	4	5
5....keep copies of outgoing messages that I send to others.	1	2	3	4	5
6. ...use an Internet search engine (e.g., Google) to find Web pages related to my subject matter interests.	1	2	3	4	5
7. ...search for and find the Smithsonian Institution Web site.	1	2	3	4	5
8. ...create my own web page.	1	2	3	4	5
9. ...keep track of Web sites I have visited so that I can return to them later. (An example is using bookmarks.)	1	2	3	4	5
10. ...find primary sources of information on the Internet that I can use in my teaching.	1	2	3	4	5
11. ...use a spreadsheet to create a bar graph of the proportions of the different colors of M&Ms in a bag.	1	2	3	4	5
12. ...create a newsletter with graphics.	1	2	3	4	5
13. ...save documents in formats so that others can read them if they have different word processing programs (eg., saving Word, pdf, RTF, or text).	1	2	3	4	5
14. ...use the computer to create a slideshow presentation.	1	2	3	4	5
15. ...create a database of information about important authors in a subject matter field.	1	2	3	4	5
16. ...write an essay describing how I would use technology in my classroom.	1	2	3	4	5
17. ...create a lesson or unit that incorporates subject matter software as an integral part.	1	2	3	4	5
18. ...use technology to collaborate with teachers or students, who are distant from my classroom.	1	2	3	4	5
19. ... describe 5 software programs or apps that I would use in my teaching.	1	2	3	4	5
20. ...write a plan with a budget to buy technology for my classroom.	1	2	3	4	5

21. ...integrate mobile technologies into my curriculum.	1	2	3	4	5
22. ...use social media tools for instruction in the classroom. (ex. Facebook, Twitter, etc.)	1	2	3	4	5
23. ...create a wiki or blog to have my students collaborate.	1	2	3	4	5
24. ...use online tools to teach my students from a distance.	1	2	3	4	5
25. ...teach in a one-to-one environment in which the students have their own device.	1	2	3	4	5
26. ...find a way to use a smartphone in my classroom for student responses.	1	2	3	4	5
27. ... use mobile devices to connect to others for my professional development.	1	2	3	4	5
28. ... use mobile devices to have my students access learning activities.	1	2	3	4	5
29. ... download and listen to podcasts/audio books.	1	2	3	4	5
30. ... download and read e-books.	1	2	3	4	5
31. ... download and view streaming movies/video clips.	1	2	3	4	5
32. ... send and receive text messages.	1	2	3	4	5
33. ... transfer photos or other data via a smartphone.	1	2	3	4	5
34. ... save and retrieve files in a cloud-based environment.	1	2	3	4	5

Adapted by R. Christensen & G. Knezek based on the TPSA created by and used with permission of Dr. Margaret Merlyn Ropp.
TPSAC21 v 2.0

APPENDIX B

Interview Protocol

Demographics

1. How long have you been teaching?
2. How long have you been teaching at _____ High School?
3. What subjects do you teach?
4. How long have you taught in a 1:1 environment?
5. Do you have a PLC group with other teachers of the same subject?

Personal

1. How long have you participated in the Tech & Teach Tuesday Professional Development training?
2. What have you hoped to get out of the professional development?
3. What is your knowledge of TPACK?
4. How do you utilize technology to prepare or manage your instructional activities?
5. In what ways do you utilize technology for productivity?
6. What professional development curricular or technology related have you attended outside of the Tech & Teach Tuesday trainings?

Efficacy

1. Do you believe technology plays an important role in your own personal/professional life? Please explain.
2. Do you believe technology plays an important role in the lives of students both at home and in the academic setting? Please explain.
3. Is it important for all students to have access to technology and 21st Century Skill practice? Please explain.
4. Do you believe technology has a role in closing the achievement gap?

Curriculum

1. Before attending the Tech & Teach Tuesday trainings did you utilize technology in your classroom? Please describe the ways you used or didn't use technology for instruction.

2. Since participating in the Tech & Teach Tuesday trainings how has technology integration changed in your classroom?
3. Do you utilize technology on a regular basis or do you use it occasionally?
4. Do you use technologies that are content specific or tools that can be used across the curriculum? Please give examples.
5. How do you decide to use technology when you are preparing a lesson? Walk through your thought and planning process.
6. Has technology influenced how you prepare to teach? Can you give examples?
7. How has technology influenced your instructional pedagogy or how you teach in general? Please explain.
8. How does the content you teach influence the technology you incorporate?
9. Do students respond differently when technology is utilized in a lesson? Explain why.

APPENDIX C

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 Instrument³¹

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

(over, please)

³¹Adapted 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 <u>maximally effective</u> in the observed lesson.	Instructional use of technologies is <u>effective</u> in the observed lesson.	Instructional use of technologies is <u>minimally effective</u> in the observed lesson.	Instructional use of technologies is <u>ineffective</u> in the observed lesson.
Technology Logistics (Operating technologies effectively)	Teachers and/or students operate technologies <u>very well</u> in the observed lesson.	Teachers and/or students operate technologies <u>well</u> in the observed lesson.	Teachers and/or students operate technologies <u>adequately</u> in the observed lesson.	Teachers and/or students operate technologies <u>inadequately</u> in the observed lesson.

Comments:

ⁱ “Technology Integration Observation Instrument” by Mark Hofer, Neal Grandgenett, Judi Harris & Kathleen Owings Swan is licensed under a [Creative Commons Attribution-Noncommercial-No Derivative Works 3.0 United States License](http://creativecommons.org/licenses/by-nc-nd/3.0/us/).



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APPENDIX D

Proposal to Conduct Research

RELATIONS WITH EDUCATIONAL ENTITIES:
COLLEGES AND UNIVERSITIES

GNC (LOCAL) ADMIN GUIDE
EXHIBIT A

Proposal to Conduct Research

Please use this form for all research requests. This form should be submitted to the Office of Curriculum and Instruction. The District shall provide feedback regarding the status of the proposal to the submitting party within fifteen (15) working days from the date of submission. This form must be accompanied by a comprehensive project proposal or an executive summary that details involvement by the campus or classroom in the project.

Contact Person: Becky Odajima Date: November 27, 2017

Educational Institution Represented: Baylor University

Research Project Title: A Case Study of How and If a Professional Development Model Based on the TPACK Framework Builds Teacher Capacity for Technology Integration

Proposed Location for the Research Project: Midway High School

Participants Targeted for Study: Nine High School Teachers with PLCs who participate in Tech & Teach Tuesday

(Number and Description)

Proposed Beginning and Ending Dates for the Project: January - March 2018

Please answer the following questions in the space provided:

1. What is the potential direct or indirect impact on student improvement in Midway ISD?

The study has potential to impact technology professional development and teacher utilization of technology in classroom instruction.

2. What is the expected time frame for completion of the portion of the research project that will be conducted in a Midway ISD facility?

Teacher surveys, classroom observations and follow up interviews will be conducted January - March of 2018. Each teacher would participate in a survey, 2 observations and follow up interviews after the observations.

3. What loss of instructional time will be necessary for the gathering of data, if any? What data gathering activities will be conducted that will result in a loss of instructional time, i.e., administration of a reading inventory as a pre/post test.

No loss of instructional time is necessary to conduct the study.

Approved: 08/17/10

4. What information defined by FERPA as confidential student information will be necessary for the completion of this research project? How will you ensure that confidentiality is maintained throughout the project and in any written documents related to the project?

No student data will be collected as part of the research. Teacher participants will be given pseudonyms in any published material.

5. How will the results of the research project be shared with Midway ISD? Is the intent for this research project to be published? If so, in what manner?

All results will be shared with Midway ISD. The data collected is intended to be used as part of a dissertation project.

6. Will the proposed research occur at any cost (direct or indirect) to MISD?

The study creates no cost for MISD.

Consensus of Review Committee:

Project Approved

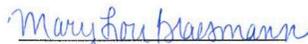
Project Disapproved

Reason:

Further information necessary prior to approval:

Committee approval:


Asst. Superintendent, C & I, Chairperson


Assistant Superintendent, HR


Rotating Committee Member

Rotating Committee Member

Approved: 08/17/10

APPENDIX E

Email to Potential Participants

Teacher Name,

As part of my dissertation work, I will be conducting a study in the Spring 2018 Semester to learn more about how teachers make decisions regarding technology integration for instructional purposes.

If you choose to participate in the study, your privacy will be protected at all times. Data collected from the study will protect names and subjects areas taught. There is no risk involved in participating in the study.

The study involves completing a survey regarding your personal thoughts and use of technology in the classroom, two classroom observations and two follow up interviews to confirm and understand more deeply information recorded in the observations. You will be able to view and clarify all of the data collected.

If you are interested in participating in this study please reply to this email. Thanks in advance for your time and consideration in participating in the study.

Becky Odajima

APPENDIX F

Informed Consent

Baylor University
Curriculum & Instruction

Teacher Consent Form for Research

PROTOCOL TITLE: How and If a Professional Development Model Based on the TPACK Framework Builds Teachers' Capacity for Technology Integration

PRINCIPAL INVESTIGATOR: Rebecca Odajima

SUPPORTED BY: Baylor University

Purpose of the research: The purpose of this study is to better understand why teachers make decisions and implement instructional technology in the classroom after participating in the Tech & Teach Tuesday Professional Development training. We ask that you to take part in this study because you are a teacher who participated in the training and implemented technology in your classroom.

Study activities: If you consent to be in the study, complete a questionnaire and agree to be observed and interviewed by the researcher.

Risks and Benefits:

To the best of our knowledge, there are no risks to you for taking part in this study. Others may benefit in the future from the information that is learned in this study.

Confidentiality:

A risk of taking part in this study is the possibility of a loss of confidentiality. Loss of confidentiality includes having your personal information shared with someone who is not on the study team and was not supposed to see or know about your information. The researcher plans to protect your confidentiality.

We will make every effort to keep your records confidential. However, there are times when federal or state law requires the disclosure of your records.

Authorized staff of Baylor University may review the study records for purposes such as quality control or safety.

Compensation:

There is no compensation for participating in this study.

Questions or concerns about this research study

You can email or call us with any concerns or questions about the research. Our information are listed below:

Rebecca Odajima

Rebecca_Odajima@baylor.edu

254-761-5650

If you want to speak with someone not directly involved in this research study, you may contact the Baylor University IRB through the Office of the Vice Provost for Research at 254-710-1438. You can talk to them about:

- Your rights as a research subject
- Your concerns about the research
- A complaint about the research

Taking part in this study is your choice. You are free not to take part or to stop at any time for any reason. No matter what you decide, there will be no penalty or loss of benefit to which you are entitled. If you decide to withdraw from this study, the information that you have already provided will be kept confidential. Information already collected about you cannot be deleted.

By signing below, you are providing consent.

Signature of the Subject

Date

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