Exploring the Tensions between Teacher Beliefs about Integrating Technology: A Case Study

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Exploring the Tensions between Teacher Beliefs about Integrating Technology: A Case Study

A Dissertation

Presented to the Faculty of the

College of Education and Social Work

West Chester University

West Chester, Pennsylvania

In Partial Fulfillment of the Requirements for

the Degree of

Doctor of Education

By

Monica S. Frank

May 14, 2022

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Dedication

“Go confidently in the direction of your dreams! Live the life you have imagined.”

-Henry David Thoreau

This dissertation has been a goal of mine for many years, and I could not have made this accomplishment without the support of my family, which is why I am dedicating this dissertation to my family. There are so many people in my life that helped me become the person I am today. A few of those people are not here with us today but will always be in my heart. The first is my mom, who always pushed me to reach for the stars and did not let me forget about my dreams. She has always been my biggest cheerleader. Today is bittersweet without you, but I know what this day would have meant for you. So today, I say, “Mom, I did it!” and I can hear you say, “Yes, you did.” To my mother-in-law, you who never got tired of hearing about my journey and would often ask about it. Thank you for being by my side and being one of my biggest cheerleaders.

To my husband, thank you for putting your weekends on hold for the last three years so I could spend my weekends writing. Without your love, support, and patience, I could not have done this. Now we can plan our next trip. To my son, you are a big part of my reason for completing this program. Never forget to go after what is important to you and never let anyone stop you from reaching your dreams. You are indeed one of the best blessings I have been given. To my dad, words can never express how much your love and support have meant to me. You never tired of hearing my updates and letting me know how proud you were. You kept me going when I was discouraged. So many family and friends have supported and encouraged me along this journey, and today, I thank you for being by my side.
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Abstract

This single case study examines teachers’ beliefs and attitudes toward technology integration during the COVID-19 pandemic. The study focuses on how teachers’ beliefs have shifted since schools pivoted to virtual learning in March 2020 as a result of the COVID-19 pandemic, with many schools continuing some form of virtual learning, such as a hybrid model. The single case study design incorporated a survey instrument and semi-formal interviews during the two-phase study. The 20-question survey collected data on the participants’ demographics, teachers’ knowledge of technology integration, and their beliefs and perspectives on technology integration’s impact on student learning. The study participants were 13 full-time teachers and two administrators employed by the parochial high school since the 2019-2020 school year. The data collected from the semi-formal interviews were coded using first and second-cycle coding. A priori coding was used during the first-cycle coding with predetermined codes using the six components of TPACK. After first and second cycle coding, seven themes emerged. The first four major themes were: (a) training to integrate digital resources, (b) recounting the benefits of technology integration, (c) uncertainty if integrating technology increases, and (d) leveraging the power of technology that answered the first sub-question. The last four major themes were: (a) reflecting on integrating technology, (b) going back to pre-COVID-19 instructional practices, and (c) managing internet issues and other technology concerns which answered the second sub-question.

Keywords: case study, TPACK, technology integration, beliefs
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Chapter I: Introduction

The 2019-2020 school year began like many other school years but was disrupted in March 2020 as the COVID-19 pandemic initiated a national health crisis when “schools across the United States began to face what would become an unprecedented period of challenge” (Minkos & Gelbar, 2020, p. 416). As a result of the global pandemic, 48 states, “4 U.S. territories, the District of Columbia, and the Department of Defense Education Activity recommended school building closures that would continue for the remainder of the 2020 academic year” (Minkos & Gelbar, 2020, p. 416).

During the initial planning phase of the pivot to virtual learning, some schools were not prepared and had teachers put together paper packets to use alongside some types of digital learning and conferencing (Black et al., 2020). Teachers needed to adjust their teaching strategies and re-imagine the core standards in the curriculum at the beginning of the pivot to virtual learning, which increased their workload (van der Spoel et al., 2020). Teachers and administrators worked together to develop virtual learning using digital tools and learning management systems (LMSs) without the expertise or organization that would have occurred if there was more time to plan (Black et al., 2020; Shamir-Inbal & Blau, 2021; van der Spoel et al., 2020). Schools needed to quickly create a plan to pivot to virtual learning to continue to support student learning for the remainder of the 2019-2020 school year.

When the COVID-19 pandemic hit the United States in March 2020, schools moved to emergency remote teaching (ERT), which is a change in instructional delivery mode, and begin teaching online because of a circumstance that does not allow schools to open physical facilities for an extended time (Peterson et al., 2020). ERT “is based on the assumption that distance
learning can be an effective, supportive routine during the time of disruption” (Shamir-Inbal & Blau, 2021, p. 3). Regardless of years of experience, all teachers were challenged by a lack of preparation time for the pivot to virtual learning (Al-Taweel et al., 2020; Morgan, 2020). The shift to ERT quickly showed that schools were not prepared to move to virtual learning.

The COVID-19 pandemic revealed that schools have not fully integrated technology in the classroom and were experiencing challenges with pivoting to virtual learning (Shamir-Inbal & Blau, 2021). Teachers had less than two weeks to shift all of their in-person curriculum to an online platform when school buildings closed (Abramson, 2020). Some teachers may have had to learn new digital resources during this two-week period in order to move their instruction to a digital modality. In the event that another pivot to virtual learning was to occur, Shamir-Inbal & Blau (2021) encouraged schools to evaluate their technology integration plans, set attainable goals, and provide the training and support to allow teacher success as they integrated technology. Shamir-Inbal and Blau (2021) used a Grounded Theory approach to “explore the different aspects of challenges and benefits in conducting online distance-learning processes in times of crisis, and the pedagogical strategies teachers used during emergency report teaching (ERT)” (p. 6). Social media teacher groups distributed an online questionnaire using multiple-choice and open-ended questions to collect data about teacher practices and perspectives regarding this experience (Shamir-Inbal & Blau, 2021). After the analysis, researchers concluded that ERT allowed education to continue with a structured routine and included meaningful academic activities for students (Shamir-Inbal & Blau, 2021). In the findings, many teachers’ technology skills increased through using new digital resources as a result of ERT. Another finding the researchers made was that teachers used both asynchronous and synchronous learning
to support students. This research provided insight into how teachers adapted their instruction during the pivot to virtual learning.

The pivot to virtual learning forced teachers to see the essential need for ongoing technology integration in instructional strategies (van der Spoel et al., 2020). Virtual learning allowed teachers to create a learning environment using digital tools and increased their confidence (Al-Taweel et al., 2020; Winter et al., 2021). Educators who continued to develop their technology skills had the opportunity to provide students with a quality online and in-person learning environment (Christensen & Alexander, 2020). Teachers’ technology integration skills continue to increase as they change their pedagogy as learning facilitators for students (Ayçiçek & Karafil, 2021). Prior to the COVID-19 pandemic, Federal laws were created to support technology integration in schools.

Technology has become part of our daily lives, and many everyday activities, including work and education, may depend on technology. In an effort to support the use of technology in schools, Federal laws such as the Every Student Succeeds Act (ESSA) (2015) required the use of technology in all public schools. The ESSA plan lists specific expectations for technology integration for school districts and defines digital learning as “any instructional practice that effectively uses technology to strengthen a student’s learning experience and encompasses a wide spectrum of tools and practices” (ESSA, 2015, p. 1969). Stakeholders have discussed the use of technology in the classroom for many years.

A decade ago, many teachers recognized the importance of technology integration in the K-12 curriculum because it could support student-centered learning. While many teachers use technology as a resource for planning in their current teaching practices, most do not use digital tools to support student learning (Ertmer & Ottenbreit-Leftwich, 2013; Ottenbreit-Leftwich et al.,
Technology integration supports student-centered classrooms through effective evidence-based practices such as collaboration and authentic-learning experiences (Benade, 2015; Ottenbreit-Leftwich et al., 2010). While researchers have been investigating how teachers are integrating technology in their classrooms, few studies have focused on technology integration in regard to the COVID-19 pivot to virtual learning.

This research study investigated teachers’ beliefs about technology integration, and specifically how their beliefs shifted since the start of the COVID-19 pandemic. In this study, I aimed to understand the shift in teachers’ beliefs about technology integration in the classroom since the beginning of the COVID-19 pandemic to make suggestions on the ways teachers can continue to be supported in integrating technology to support student learning. This study used a single case study methodology bounded by teachers and administrators at one school. Creswell and Guetterman (2019) described case studies as a type of ethnographic design. Collecting data in a case study through interviewing teachers, including questions about feelings and attitudes regarding technology integration, provided me insight into teachers’ beliefs by listening to their stories.

**Purpose of Study**

In this study, I sought to examine how the pandemic has shifted teachers' beliefs about technology integration as an effective means to inform learning. This single case-study design considered the shifts in teachers' beliefs about technology integration which may have occurred because of the pivot to virtual learning caused by the COVID-19 pandemic. While classroom technology integration has been a focus in public schools for years, many teachers were still not using technology to enhance learning prior to the COVID-19 pandemic. In this study, I investigated how teachers’ beliefs about technology integration shifted because of the sudden
need to pivot to virtual learning, which forced teachers to use technology as the primary mode of educating students through using video conferencing and online recourses such as Nearpod or GoFormative.

**Problem Statement**

Many brick-and-mortar schools have expected teachers to use technology for years, and teachers have responded to this expectation by finding ways to integrate technology throughout the curriculum. However, when school districts closed their physical facilities in March 2020 as a result of the COVID-19 pandemic, teachers were immediately required to shift to full-day virtual teaching, which forced teachers to find new and different ways to instruct students (Morgan, 2020). Teachers who may have been hesitant to integrate technology before the pivot to virtual learning no longer had a choice (van der Spoel et al., 2020). When schools began to welcome students back into the building in the Fall of 2021, teachers began to reevaluate when they would use technology integration in their classrooms.

**Research Questions**

The primary research question guiding this study was *How has the pandemic shifted teachers’ beliefs about integrating technology as an effective means to inform student learning at one school?* The study included the following two sub-questions:

1. How do high school teachers integrate technology in the classroom?

2. How do high school teachers perceive their beliefs about technology integration to inform student learning, and how these beliefs might have shifted during the pandemic?
Rationale for Methods

This study utilized a single case-study method bounded by teachers and administrators at one school focused on the shift in teachers' beliefs about technology integration. These changes may have occurred because of the need to pivot to virtual learning after March 16, 2020, when state schools closed their buildings to in-person learning as a public health response to the COVID-19 pandemic. The case study approach sought to understand participants' current level of technology skills and glean an understanding of their perspectives and beliefs about using technology to inform student learning. Teachers' beliefs can develop and change as they become more familiar with technology and comfortable using it in their classrooms (Olafson et al., 2015). This case study gathered data on teachers' use of technology during the COVID-19 pandemic to gain insight into teachers' perspectives about integrating technology in the classroom to inform student learning and allowed me to examine the shift in teachers' beliefs that may have occurred during the pivot to virtual learning.

Data collection also included administrators' perspectives of the pivot to virtual learning. The most effective approach to understanding teachers' beliefs requires researchers to go to schools, talk to teachers, and give them time to tell their stories (Creswell, 2013; Olafson et al., 2015). Visiting a school and talking to teachers in their classrooms provides the researcher with the opportunity to hear and see the story teachers are telling.

A case study is an appropriate design type based on the phenomenon of this study. This case study is bound in the phenomena of teachers and administrators who worked at one particular school throughout the COVID-19 pandemic. Interviewing teachers and administrators to hear their perspectives regarding the pivot to virtual learning gave me an understanding of
their knowledge of technology integration. The survey instrument provided an understanding of teachers’ shift in belief and their technology skills.

**Significance of Study**

In an effort to slow the spread of the COVID-19 pandemic in March 2020, schools closed their facilities and immediately moved to a virtual learning model, which forced teachers to instruct their students using digital technology (Morgan, 2020). Some districts rapidly pivoted to virtual learning because they had already completed their one-to-one technology device initiative of providing one computer or iPad for every student through their technology plan. Other districts needed time to determine how the pivot to virtual learning would occur (van der Spoel et al., 2020). The current study included teachers at a school that integrated technology during the pivot to virtual learning and the steps the teachers and school administrators took to integrate technology to inform student learning. Teachers and administrators at this site quickly responded to the pivot to virtual learning and showed innovation in their instructional strategies through their integration of technology for virtual learning. The conclusion of this research interpreted the data and offered recommendations to assist teachers in integrating technology into their classrooms.

**Positionality**

I began teaching 26 years ago in a traditional brick-and-mortar classroom. At that time, student learning took place at their desks or during group work. When I taught with manipulatives in subjects such as math, it was to reinforce skills and concepts, or I might have students complete worksheets for added practice. Student use of the one computer in the classroom was a reward for completing seatwork. Computer Lab was a once-weekly elective class where students learned to make computer-based drawings or played educational games. My
first 12 years teaching were spent at a traditional brick-and-mortar school before moving to teach at a cyber school where students engaged in virtual learning in all aspects of their education. In this setting, I began to understand the positive impact technology had on learning and how students succeeded in school environments.

My son attended this same cyber school for his secondary education. I watched him engage in his education and, for the first time, take ownership of his learning through learning activities that integrated technology. The cyber school that I worked at continued to find ways to support students like my son through new initiatives in which I have been able to play an integral role. The cyber school moved from being a one-to-one school to embarking on a two-to-one device initiative, which provided a computer and iPad to every student. Through this initiative, the school became the first cyber school in the United States to receive an Apple Distinguished School designation. In order to have the Apple Distinguished School designation, a school needs to demonstrate innovation in using technology for student learning. In an effort to support teachers as they integrated iPads into their classroom, the school provided monthly professional development, and introduced them to Mishra and Kohler's (2006) TPACK framework and Puentedura's (2013) SAMR model. In addition, the school hired an instructional coach to ensure the necessary supports existed to continue integrating technology and not only have another digital tool to use to complete work. The additional training allowed teachers to see different ways that iPads could be used to support student learning and provided practical experience with the iPad before school administrators began expecting teachers to use them in their daily practices. In my 14 years at the school, I have taught classes, developed and written curriculum, and supervised teachers. In my current role as an administrator, I have had the opportunity to
observe teachers and see the impact technology integration has on student learning at the cyber school.

Limitations

The limitations of this study broadly include investigating a shift in teachers’ beliefs, discovering teachers’ baseline technology skills, and outsider status.

Shifts in Beliefs

Teachers’ beliefs are “dynamic and permeable mental structures” which may change as a result of their experiences (Muijs & Reynolds, 2015, p. 3). This study could be the first time teachers have thought about their beliefs and perceptions regarding technology, and they may not have formed a prior opinion about whether integrating technology informs student learning. Therefore, there is no baseline belief-system data for comparison. Further, the dynamic nature of both the education system, and how teachers delivered instruction during the COVID-19 pandemic, limits the ability to measure change or to establish prior baselines because the study is retroactive.

Self-Efficacy Technology Skill

The pivot to digital learning may be the first time some educators began integrating technology into their curriculum. Teachers may have concerns about honestly stating their beliefs on integrating technology as a result of conflicts with school district-level expectations. Data about teachers' technology skills and comfort levels with technology was collected using a survey instrument. Teachers’ experiences are vast, and teachers may focus on a particular moment instead of looking at their skills and comfort levels over an extended period. Teachers may also have a concern regarding honestly answering the questions because of their feelings of inadequacy toward technology.
**Outsider Status**

I had no association with the school where the study was completed except through the school principal, who had been my colleague for seven years at the cyber charter school where I am currently employed. After following this school on social media, I reached out to the school principal and sought permission to complete the study at the school. In an effort to make a connection with the teachers and administrator, I introduced my study by participating in a faculty meeting to meet the faculty and staff face-to-face and begin building a rapport to solicit participants for the study.

**Definition of Terms**

The terms in this section are commonly used in the literature when discussing technology integration and teachers’ beliefs. Defining these terms gives guidance on how the words are used throughout this dissertation.

**21st Century-Learning Skills**

The “skills, attributes and competencies that it is thought will equip [students] for the challenges of future life, and of using tools and strategies that are commonly associated with the twenty-first century, most notably the artifacts and processes of electronic technology” (Benade, 2015, p. 936).

**Brick-and-Mortar Schools**

A school where students go to a physical building for all of their education.

**Cyber Charter Schools**

A public school where students receive all of their education through a digital device.
First-Order Barriers

The “obstacles that are extrinsic to teachers (e.g., equipment, time, training, support)” (Ertmer, 1999, p. 2).

Informational and Communication Technology (ICT)

Any digital device, tool, or software used to communicate or gather information (El-Dauo, 2016).

SAMR

An acronym for a four-level model of the degrees of technology integration, including substitution and augmentation at the lower levels and modification and redefinition at the higher levels (Puenteedu, 2006)

Second-Order Barriers

The “barriers that interfere or impede fundamental change” such as technology integration, technology skills, knowledge, self-efficacy, and beliefs about how students learn (Ertmer, 1999, p. 2).

Teacher Beliefs

Assumptions that teachers have about students, instructional practices, and resources (Ottenbreit-Leftwich et al., 2010).

Technology Integration

The reliance on technology in K-12 schools for instructional purposes (Hew & Brush, 2007).

Technological, Pedagogical, and Content Knowledge (TPACK)

A framework that proposes a set of knowledge domains involved in integrating technology into teaching (Mishra & Koehler, 2006).
**Virtual Learning**

Using technology to deliver instruction when teachers and students are in physically distinct places (Black et al., 2020).

**Summary**

In this chapter, I introduced the research study regarding the shift in teachers' beliefs as a result of the COVID-19 pandemic-induced pivot to virtual learning. I also provided an overview of the study's purpose, rationale, problem statement, research questions, significance, positionality, and limitations. Finally, I defined key terminology central to studying teachers' beliefs and perceptions about technology integration and its ability to inform student learning. In the next chapter, I will review the literature regarding technology integration, teacher beliefs, and the study's conceptual framework.
Chapter II: Literature Review

In this literature review, I define 'technology integration' as the reliance on technology for lesson delivery (Bauer & Kenton, 2005). Other researchers' definitions support the definition I have identified for this study. One example includes Hew and Brush (2007), who wrote that technology integration is the "the use of computing devices such as desktop computers, laptops, handheld computers, software, or internet in K-12 schools for instructional purposes" (p. 225). Likewise, Bitner and Bitner (2002) suggested that technology integration focused on student learning rather than the technology tool. In this literature review, I will examine the body of research regarding teachers' beliefs, including teachers' pedagogy and technology integration beliefs, self-efficacy, technology integration including benefits and barriers, and the conceptual framework. Teacher beliefs play an important role in how they integrate technology. I will review the literature on the types of teacher beliefs before delving into the literature on technology integration.

Types of Teacher Beliefs

Teachers hold beliefs regarding every aspect of teaching, including students, teaching practices, learning, technology, and pedagogical situations (Koh et al., 2014; Pajares, 1992). A teacher's beliefs serve as a guide as they navigate the world around them, and those beliefs influence their pedagogical decision-making and instructional perceptions (Kim et al., 2013; Pajares, 1992; Tondeur et al., 2017). Beliefs linked to other beliefs are considered "core beliefs" (Ertmer & Ottenbreit-Leftwich, 2010). Pajares (1992) stated that a teacher's perception is "influenced by the totality of this generic knowledge structure-schemata, constructs, information, beliefs, but the structure itself is an unreliable guide to the nature of reality because beliefs influence how individuals characterize phenomena, make sense of the world, and estimate
covariation” (p. 5). Understanding a teacher's beliefs may give insight into their instructional practices and technology integration (Hsu, 2016). There is often a connection between teachers' past experiences and their beliefs.

Teachers' beliefs grow from episodic memories, which develop over the years as a student, through teacher training, and teaching in the classroom (Er & Kim, 2017). Administrators can observe and listen to teachers' episodic memories to understand their beliefs (Er & Kim, 2017; Ertmer et al., 2012). If a teacher's episodic memory is based on a particular teaching strategy that impacted their education as a learner, their belief in the power of that teaching strategy may be hard to change (Er & Kim, 2017). Teachers are not apt to change their beliefs until the beliefs are challenged and proven ineffective and unsatisfactory (Pajares, 1992). Allowing teachers to see the impact technology has on learning is a way for teachers to begin challenging their own beliefs. Administrators can accomplish this by giving teachers time to observe teachers integrating technology into their classrooms to inform learning. Looking deeper into teachers' beliefs may connect to the knowledge they have acquired over time.

When discussing teachers' beliefs, the relationship between knowledge and beliefs cannot be overlooked (Pajares, 1992). Knowledge is defined as the understanding of facts. Once teachers embrace their knowledge it can fit into their beliefs (Ertmer, 2005). Time and energy devoted to teaching content are wasted when someone is not invested or does not believe it makes a difference. Researchers have shown that technology integration allows teachers to engage students and use higher-level thinking skills (O'Neal et al., 2017). Observing teachers' instructional practices may give insight into a teacher's beliefs regarding technology integration.

Finding accurate measures of how teacher beliefs impact their performance related to technology integration can be a challenge (Ottenbreit-Leftwich et al., 2010). A hermeneutical
phenomenology study looked at the value beliefs that affect teachers' use of technology in the classroom (Ottenbreit-Leftwich et al., 2010). The findings of this case study showed a connection between teacher beliefs and their instructional practices of using technology to individualize instruction to meet students' needs (Ottenbreit-Leftwich et al., 2010). Pedagogy belief is the first type of teacher belief reviewed.

**Pedagogy Beliefs**

Van Der Ross & Tsibolane (2017) noted, "Pedagogy can refer to the various teaching practices which aim to improve the cognitive abilities of students by allowing them to engage with and solve problems independently in the long term" (p. 2). Researchers define pedagogical beliefs as educators' understandings of effective teaching and learning (Cheng et al., 2020; Tondeur et al., 2017; Van Der Ross & Tsibolane, 2017). Teachers' pedagogical beliefs guide their teaching and learning decisions, and they also include teacher-centered (or traditional) beliefs and student-centered (or constructivist) beliefs (Cheng et al., 2020; Prestridge, 2012; Tondeur et al., 2017). Teachers' pedagogical beliefs are at the center of teachers' belief systems and, therefore, influence teachers' decision-making (Cheng et al., 2020; Ottenbreit-Leftwich et al., 2010). Teachers build their pedagogical beliefs through time spent in the classroom.

Good teachers set learning goals by using their knowledge about students and reflecting on successful lessons from past years (Pierson, 2001). Expert teachers rely on their professional judgment to alter lessons that guide student learning, while veteran teachers' pedagogical beliefs are built over time based on previous classroom experiences and are not easily changed (Ertmer & Ottenbreit-Leftwich, 2010; Pierson, 2001). Teachers make value judgments regarding new pedagogical approaches, which determines how likely they are to use them in the future. (Angers & Machtmes, 2005; Ertmer & Ottenbreit-Leftwich, 2010). A teacher may have been teaching for
years but does not set learning goals or alter lessons to guide student learning of a good or expert teacher. Understanding a teacher's pedagogical beliefs may give insight into how and when they use digital technologies in the classroom.

Teachers' pedagogical beliefs may predict how a teacher uses technology and may provide insight into teachers' decision-making regarding technology integration (Ayçiçek & Karafil, 2020; Ertmer et al., 2012). Pedagogical beliefs directly affect how teachers use technology in the classroom and the amount of time spent integrating technology (Cheng et al., 2020). Tondeur et al. (2017) suggested that integrating technology in the classroom could change teachers' beliefs to align with a more student-centered classroom that encourages students to develop 21st century learning skills. When a teacher begins to see student learning increase with the integration of technology, there is a positive impact on their beliefs about technology integration. Liu (2011) discussed teachers' reliance on their pedagogical beliefs when integrating technology into the classroom to inform student learning. The next section of the review of literature will discuss the positive or negative impact that teachers' beliefs play in technology integration.

**Technology Integration Beliefs**

Teachers play a unique and critical role in integrating technology to inform learning (Chen, 2008). Considerable research on the influence of teachers' beliefs on technology use found a relationship between teachers' perception of their technology competencies and the frequency with which teachers integrate technology to inform learning (Christensen, 2002; Ertmer & Ottenbreit-Leftwich, 2010; Li et al., 2019). Teachers rely on their beliefs and prior experiences when integrating technology into their instructional practices (Chen, 2008; Van Der
Teachers who have not used technology in their instruction before may not have past experiences to rely on.

Teachers' perceptions regarding technology and skill levels may determine how effective they increase student learning through integrated technology (Bitner & Bitner, 2002; Keengwe et al., 2008). Before integrating technology, presenting teachers with facts and data regarding the impact of technology on student learning will allow them to see the importance of technology to impact learning. Schools can provide time for teachers to filter information regarding technology integration through their beliefs system. Technology integration models (e.g., SAMR) and frameworks (e.g., TPACK) support teachers as they navigate their beliefs on technology integration’s impact has on student learning.

Teachers' beliefs on technology determine how often, to what capacity, and how they use technology and teaching methods (Ottenbreit-Leftwich et al., 2010; Tondeur et al., 2017). Teachers' beliefs directly correlate with their use of technology in the classroom for instructional purposes (Tondeur et al., 2017). Showing teachers, the impact integrating technology has upon student learning allows teachers to see the value of technology. In the next section of the literature review, I will describe teachers' self-efficacy.

Self-Efficacy

Teachers' self-efficacy is the "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). A more recent definition of self-efficacy from Van Der Ross & Tsibolane (2017) is "a person's self-belief in their abilities to perform a set of actions to reach a given goal. It is this belief of personal efficacy which motivates people and influences their action" (p. 6). Hsu (2016) described self-efficacy in relation to technology as teachers understanding what they could do with technology. Self-
efficacy is a determining factor in how a teacher integrates technology to inform learning (El-Daou, 2016; Overbaugh et al., 2015). Moore-Hayes (2011) identified a connection between teachers' self-efficacy and perceptions of their ability to differentiate instruction through instructional strategies. Self-efficacy is a determining factor in how a teacher integrates technology to inform learning (El-Daou, 2016; Overbaugh et al., 2015). Ertmer & Ottenbreit-Leftwich (2010) added that positive experiences with technology, those experienced personally or observed, help develop teachers' self-efficacy. Providing teachers with support in integrating digital tools in their classrooms may increase their comfort level with technology integration.

Teachers' knowledge of specific technology-related instructional strategies is needed to build confidence in their classrooms (Ertmer & Ottenbreit-Leftwich, 2010). Additionally, teachers' technology-related self-efficacy influences the quantity and quality of ICT use in the classroom (Christensen, 2002). According to Ertmer & Offenbreit-Leftwich (2010), teacher self-efficacy regarding technology integration is more important than teachers knowing how to integrate technology. Administrators can provide teachers with support at their current level of technology integration to increase their confidence while maximizing their use of technology to engage students and inform learning (Christensen & Alexander, 2020). Teachers' technology integration skills continue to increase as they change their pedagogy as facilitators of learning for students (Ayçiçek & Karafil, 2020). In the next section of the literature review, I will discuss technology integration.

**Technology Integration**

Teachers' integration of technology into the curriculum can engage students in the learning process and inform learning. Using technology can help the "digital native," or individuals who are very comfortable with technology, master 21st century skills (Li et al.,
Integrating technology can enhance teaching and learning when teachers find new ways to communicate information to students. In this section, I will review the SAMR model, TPACK framework, explain how instructional practices have shifted, and discuss the benefits and barriers to technology integration.

Students live in a global society with many types of technology at their disposal daily. Integrating technology into the K-12 curriculum allows for extended learning, not just learning through a different modality. Acknowledging the impact that integrating technology to the curriculum will inform student learning led to policies such as the 2010 National Education Technology Plan (NETP) and Federal laws such as the 2015 Every Student Succeeds Act (ESSA). The NETP and ESSA promote technology integration in the curriculum by clarifying classroom use expectations (Korucu-Kis & Ozmen, 2019). Integrating technology into the curriculum involves more than using a computer in the classroom.

Teachers often create learning activities around technology because it is novel, not because it enhances instruction and informs learning (Angers & Machtmes, 2005; Pierson, 2001). Educators have been discussing technology integration since the 1970s, with noticeable changes occurring in the classroom in the last 20 years with increased availability of hardware, software, and internet accessibility (Liu & Szabo, 2009). Integrating technology that enhances teaching effectiveness and informs students' learning involves strategic pedagogical and curriculum changes that enhance student learning (Angers & Machtmes, 2005; Ayçiçek & Karafil, 2020; Keengwe et al., 2008). Keengwe et al. (2008) encouraged teachers to see the potential and power of integrated technology and create learning activities where students are engaged and take ownership of their learning. The human element should be remembered as
teachers play a vital role in the integration (Van Der Ross & Tsibolane, 2017). The teacher decides when and how to integrate technology to inform student learning.

Researchers have identified the positive impact technology integration can have in the classroom. These benefits include "mak[ing] the educational environment effective and efficient" (Aycicek & Karafil, 2021, p. 158). Teachers who had begun integrating technology in their curriculum before the COVID-19 pandemic were more prepared to pivot to virtual learning than teachers who did not use digital tools regularly in their classrooms (Aycicek & Karafil, 2021).

When asking teachers to integrate technology into the curriculum, providing them with frameworks and models to rely on will alleviate some of the challenges. In the next section of the literature review, I will describe two of these frameworks: Puentedura's (2013) SAMR model and Mishra and Koehler's (2006) TPACK framework.

**SAMR**

Puentedura (2013) developed the SAMR model to assist teachers with technology integration. Each letter of the SAMR represents one of four levels: substitution, augmentation, modification, and redefinition. The SAMR model is a non-research-based heuristic approach to support teachers in integrating technology in their classrooms. In the first level, substitution, the learning activity does not change, but the teacher substitutes the traditional mode of activity completion with technology. An example of substitution would be offering an online quiz instead of using paper and a pencil. In the second level, augmentation, the teacher substitutes technology for the traditional mode of completing the activity, but there is some functional improvement to the learning activity. For example, students can use an online resource such as Quizziz or Kahoot to complete the quiz. Teachers who create activities at either the substitution or augmentation levels enhance the learning activity.
At the next level, modification, the focus changes from teacher-centered to student-centered. The teacher significantly redesigns the learning activity through technology at the modification level. An example of modification would be replacing an online photosynthesis quiz with an assignment requiring students to create a Google slide presentation of the photosynthesis process. At the redefinition level, technology integration is optimized (Baz et al., 2018). The redefinition level allows for creating a new learning activity that is not possible without technology. An example of the photosynthesis quiz at the redefinition level would be collaborating with students in another location to create a presentation and model or a lab on photosynthesis. Then, those two students could present their collaboration to both classrooms using video conferencing software.

SAMR takes a teacher through the steps of using technology for a richer learning experience for the 21st century learner. The model's intention is not to be a one-directional model where students stay at the top but viewed more like a ladder where students move up and down depending on the learning activity. The SAMR framework has received criticism as a result of its lack of theoretical grounding leaving interpretation to the user. Grounding SAMR with the conceptual framework of TPACK gives the model the needed consistent interpretation (Hamilton et al., 2016). In this way, the SAMR model acts as a filter to assess learning tasks and plays a pivotal role for teachers using the TPACK framework.

**Technological Pedagogical Content Knowledge (TPACK)**

TPACK is a framework that proposes a set of knowledge domains involved in integrating technology into teaching (Mishra & Koehler, 2006). Mishra and Kohler's (2006) Technological, Pedagogical, and Content Knowledge (TPACK) framework guides teachers in creatively implementing digital technology initiatives to enrich and inform learning and knowledge, which
fits their pedagogical approach (Kurt, 2019). Mishra and Koehler’s (2006) TPACK framework "allows us to make sense of the complex web of relationships that exist when teachers attempt to apply technology to the teaching of subject matter" (p. 1044). The TPACK framework "emphasizes the connections, interactions, affordances, and constraints between and among content pedagogy, and technology is central for developing good teaching" (Mishra & Kohler, 2006, p. 1025). Administrators are encouraged to provide teachers with instructions on the components of TPACK and how to use the framework as a roadmap in their practices before expecting them to integrate technology.

Mishra & Kohler's (2006) TPACK framework ensures teachers stay focused on ensuring that the creative use of technology fits their pedagogical approach (Henriksen et al., 2016). Technology improves instruction when it is connected to the content and enhances learning (Henriksen et al., 2016). As teachers integrate technology into the curriculum, TPACK can help alleviate some of their challenges.
Mishra & Koehler (2006) described the TPACK framework as combining teachers' knowledge with the integration of technology (Koh et al., 2014). Mishra & Koehler (2006) extended Shulman's (1986) work that the intersection of pedagogical knowledge and content knowledge produced pedagogical content knowledge and thereby added a third essential category of technological knowledge (Koh et al., 2014). The following section will identify the steps required to shift instructional practices.

**Shifts in Instructional Practices**

Today's students have grown up with technology and instant communication. As students have evolved, educational practices may need to change as well. In this section, I will review
teachers' instructional practices via a historical lens before exploring their instructional practices at present. Gerstein (2014) coined the terms Education 1.0, Education 2.0, and Education 3.0 to describe education in the past and present and to explain its potential for the future.

Education 1.0 is the traditional teaching framework where the teacher delivers the instruction to the students through lectures and note-taking. Technology use was not for educational purposes and was not allowed in many classrooms; instead, teachers focused on didactic teaching of the traditional core subjects (Gerstein, 2014). Teacher evaluations based on how students score on high-stakes tests make it difficult to move away from an Education 1.0 classroom model. This model, where teachers are responsible for transferring knowledge to students, is referred to as "instructivist" or traditional teaching (Gerstein, 2014; Van Der Ross & Tsibolane, 2017). Tondeur et al. (2017) referred to this type of teacher as "an authority, supervising the process of learning acquisition and serving as the expert in a highly-structured learning environment" (p. 557). Teachers with instructivist or teacher-centered pedagogical beliefs focus on broadcasting knowledge to students (Cheng et al., 2020; Van Der Ross & Tsibolane, 2017). As teachers' instructional practices grow and integrate technology into the curriculum, they move from Education 1.0 to Education 2.0.

In Education 2.0, the teacher and student share the responsibility of learning. The teacher facilitates the learning process using a constructivist approach to learning (Gerstein, 2014; Hsu, 2010). Teachers take a constructivist approach to learning when they create student-centered learning activities that incorporate real-world problems (Prestridge, 2010, Tondeur et al., 2016). Teachers use technology to enhance traditional educational approaches to develop Education 2.0 classrooms that focus more on project-based learning (Cheng et al., 2020; Gerstein, 2014). Project-based learning consists of students taking ownership of their learning through group
work where students are solving real-world problems (Kokotsaki et al., 2016). In Education 2.0, technology integration informs the learning process and makes it more productive. Educators understand the difference between integrating technology and using technology at this stage. The more teachers create learning environments where students choose their educational direction; the more teachers move from Education 2.0 to Education 3.0.

Education 3.0 means that individualized learning takes place for students through collaboration, social networking, and responsibility-taking (Gerstein, 2014). The classroom is no longer four walls in a building, but the classroom is everywhere, and learning happens at any time. Teachers create structure in a technology-rich environment as collaborators, or guides, of the learning process (Angers & Machtmes, 2005; Gerstein, 2014). Education 3.0 lessons use 21st century learning skills such as problem-solving, creativity, and innovation (Gerstein, 2014). The next chapter discusses the benefits of integrating technology in the classroom.

Benefits of Technology Integration

Digital technologies can be tools educators use to extend the learning process and enhance the curriculum. Hew and Brush (2007) have stated that integrating technology into the curriculum can transform instruction, prepare students to master 21st century learning skills, and motivate students (Hew & Brush, 2007; Judson, 2006). The way students receive and distribute information globally has changed, so teachers must deliver information to students in these same ways (Moore-Hayes, 2011). Technology integration can inform student learning when integrating digital tools in meaningful ways.

Technology integration involves more than adding technology hardware and software into traditional teaching strategies. Teachers must draw on their knowledge repertoire of curriculum, students, and technology resources to determine how to integrate technology to
inform student learning (Angers & Machtmes, 2005). Teachers whose instructional practices include using project-based learning will create innovative ways to merge their teaching strategies with technology, engage students, and inform learning (Hew & Brush, 2007; Judson, 2006). Angers & Machtmes (2005) encouraged teachers to integrate technology into their daily instructional practices to engage students and inform learning.

Teachers who use computers to browse the internet with no set purpose or content-learning goals may not see the benefit of integrated technology (Er & Kim, 2017; Ertmer & Ottenbreit-Leftwich, 2010). With necessary training, teachers can design student-centered learning opportunities that incorporate 21st century learning skills, motivate and engage students, and inform their learning (Liu, 2011). Effective technology integration also requires teachers to adapt their pedagogical strategies to create innovative learning opportunities (Shamir-Inbal & Blau, 2021). Thus, teachers’ pedagogical practices or attitudes and beliefs toward technology may need to change in order to integrate technology and facilitate learning (Ertmer & Ottenbreit-Leftwich, 2010). Providing teachers with sample lessons and activities may assist them as they shift their instructional practices to include technology to inform learning. Technology is a way to support teachers in providing student-centered learning opportunities that give students choices and guide them in increasing their knowledge and facilitating learning (Li et al., 2019). Most students are "native" to digital tools as technology has been a part of their lives. However, using technology may be something that some teachers have had to learn since they entered the profession and could be considered "digital immigrants."

**Digital Native and Digital Immigrant.** There are controversial discussions around a teacher’s background, such as gender, age, and teaching experience, predicting teachers' use of technology (Li et al., 2019). Regardless of predicting factors, some teachers in the classroom
today are considered digital immigrants. A digital immigrant did not grow up in the digital age but learned to use technology later in life (Prensky, 2001). Opposite the digital immigrant is the digital native. For the digital native, technology brings a level of comfort that removes the fears of what they do not know and allows their curiosity to push them to higher levels of learning. The digital native also enters school with expectations around technology, including sociability (social media platform access), accessibility (having information at their fingertips), and playability (making learning fun) (Facer, 2011; Li et al., 2019).

Researchers have argued that the digital native's brain is wired differently than that of a digital immigrant. However, there is research to refute the theory that the digital native processes information differently than the digital immigrant (Helsper & Eynon, 2010). Helsper and Eynon (2010) completed a study on the fundamental aspects of the term digital native: generation, experience, and breadth of use. Their findings showed that both digital natives and digital immigrants could learn to integrate technology into their instruction. Teachers may integrate technology when creating activities that include 21st century skills such as: collaboration, problem-solving and creative thinking to support the learning needs of students.

**21st Century Skills.** Students have lived in a world where technology is available their entire lives (Blair, 2012) and have been using technology outside the classrooms since they were young. They want to learn from technology inside the classroom and from teachers who have shifted their instructional practices to become facilitators of knowledge (Blair, 2012). Twenty-first century skills assist the learner in being an active member of a global society when they leave school. The most prevalent 21st century learning skills include problem-solving, communication, cooperation, teamwork, collaboration, creative thinking, using information, and communication technologies (Tican & Deniz, 2019). Twenty-first century learning skills align
closely with digital technology use, and many employers look for these skills during the hiring process (Tican and Deniz, 2019). Recent research has shifted from calling these skills "21st century skills" to calling the skillset "21st century learning," but both terms have the same meaning and goal of preparing students to be active members of a global workforce (Howard, 2018).

Not all researchers agree on the role and importance of 21st century skills (Howard, 2018). Howard (2018) questions the goal of 21st century learning and whether it is about teaching a money code of value or a life code of value. Lucas (2019) also shared concerns with using the phrase 21st century skills. He stated, "The language of twenty-first century skills can so easily perpetuate a misunderstanding about how knowledge and skill are applied in the real world, underestimating the role of habit and context" (p. 5). The skills known as 21st century skills are valuable life skills for all students. These skills prepare students to be productive citizens in this global society.

Teachers are now encouraged to allow students to define what learning looks like instead of creating a one-size-fits-all education model (Ertmer & Ottenbreit-Leftwich, 2010). Project-based learning allows students to learn throughout the process and create a product that demonstrates individual understanding and mastery (Olofson et al., 2016). Teachers are tasked with preparing students for this global society by redesigning classrooms that support students' mastery of 21st century learning skills (Olofson et al., 2015). Integrating technology allows students to connect their learning with real-world applications (Ertmer & Ottenbreit-Leftwich, 2010). Teachers are able to provide students with more learning opportunities when they integrate technology into their curriculum. Many teachers use 21st century learning skills in their instructional practices through cooperative learning groups, critical thinking activities, and
project-based learning activities. When integrating technology in the classroom, some teachers may face barriers discussed in the next section.

**Barriers to Technology Integration**

School district stakeholders encourage and expect the use of technologies in classrooms; however, barriers can prevent teachers from using technology to enhance the curriculum and inform learning (Francom, 2020). School district decision-makers can find solutions to overcome the barriers by first understanding and identifying them.

**First-Order and Second-Order Barriers.** When reviewing barriers that prevent teachers from increasing technology in instruction, Ertmer (1999) discusses two categories of barriers: first-order and second-order. Ertmer (1999) explained that first-order barriers are external or outside a teacher's control, whereas second-order barriers are internal or within a teacher's control. First-order barriers include: a lack of technology hardware and software, technical support, relevant training, and preparation time (Ertmer, 1999; Hew & Brush, 2007; Kopcha, 2012). When looking at first-order barriers, many teachers cite lack of time as the most common barrier they face (Francom, 2020). Second-order barriers include: teachers' beliefs about technology integration, technology skills, knowledge, self-efficacy, and beliefs about how students learn (Ertmer et al., 2012).

Ottenbreit-Leftwich et al. (2018) studied four teachers over four years to determine how their technology integration knowledge, self-efficacy beliefs, intentions, and practices evolved over time and whether external barriers affected the four areas. Ottenbreit-Leftwich et al. (2018) suggested that first-order and second-order barriers exist and impede teachers from integrating technology into the curriculum if not resolved. School district investment in information and computer technologies and administrative support through professional development
opportunities can resolve first-order barriers (Ertmer, 2005; Prestridge, 2012). Second-order barriers such as teachers' beliefs and attitudes are essential factors that can positively or negatively impact the extent to which teachers are integrating technology (Cheng et al., 2020; Ottenbreit-Leftwich et al., 2010). Two of the important barriers in the following sections of this literature review are teacher beliefs and professional learning.

Professional Learning Barriers. Teachers may require more than time to change their teaching strategies (Angers & Machtmes, 2005). If schools expect teachers to integrate technology, standards must be provided to guide them. In 2008, the International Society for Technology in Education (ISTE) created standards to help teachers integrate technology into their digital-age instruction (ISTE, 2017). All states adopted common core standards to signify the standards that students should master at each grade level. Aligning instruction to the common core standards is one expectation given to teachers. While Common Core Standards (CoreStandards.org, 2021) do not specify technology standards, the standards align technology with instructional strategies and content knowledge (Kimmons et al., 2015). Tondeur et al. (2017) found that teacher preparation programs do not prepare pre-service teachers to integrate technology in schools in ways needed to inform learning (Tondeur et al., 2017). Teachers need timely support as they begin integrating technology into their curriculum. Teachers also need the latitude to make mistakes and learn from those mistakes during this process (Angers & Machtmes, 2005). School administrators can support teachers in integrating technology by providing professional development.

Professional development time helps teachers learn new technology integration strategies and process the information with their current beliefs so that change can occur (Ertmer & Ottenbreit-Leftwich, 2013). Ongoing professional development for teachers increases their
repertoire of technology tools, increasing their sense of self-efficacy about their ability to integrate technology (Moore-Hayes, 2011). Schools may have provided professional development focused on technology integration, but teachers may not have begun using the strategies in the classroom. While some teachers engaged in professional development before the pivot to virtual learning, their self-efficacy beliefs may have been insufficient to support the demands of changing their instructional strategies to digital only overnight (Shamir-Inbal & Blau, 2021). In the next section of the literature review, I will go more in-depth on the barrier to teacher beliefs.

**Teacher Belief Barriers.** Teacher beliefs have been described by Ottenbreit-Leftwich et al. (2010) as assumptions that teachers have about students, instructional practices, and resources. A teacher's belief also includes their pedagogical beliefs and beliefs regarding technology (Ertmer, 2005). Teachers' resistance to integrating technology into the curriculum may result from resistance to changing their beliefs (Angers & Machtmes, 2005). Providing examples of the impact that technology can have on student learning may help teachers as they make decisions in their lesson planning.

Teachers' beliefs significantly influence their pedagogical decision-making and instructional strategies (Chen, 2008; Ertmer, 2005; Pajares, 1992). Furthermore, separating teachers' beliefs from their knowledge can be challenging and critically impacts effective teaching, as many teachers are hesitant to integrate technology in their classrooms due to these personal barriers (Chen, 2008; Moore-Hayes, 2011). Their negative beliefs about technology often influence their decision not to change their current instructional practices to include technology (Er & Kim, 2017; Ertmer, 1999). Educators who have been teaching for years often report lower confidence regarding their technology ability and negative attitudes towards
technology integration (Vongkulluksn et al., 2018). Teachers who are not integrating technology may not understand the impact that technology could have on student learning.

Teachers' beliefs regarding technology integration require realignment with instructional practices for lasting change to occur (Bauer & Kenton, 2005). Hew and Brush (2007) suggested that schools consider teachers' skills and knowledge, assessment, subject culture, and administrative support to successfully facilitate changes in teachers' beliefs and attitudes. Inconsistencies between pedagogy, practice, and teachers' beliefs may be related to barriers such as time constraints and a lack of technology competencies (Ertmer, 2005; Liu, 2011). School districts can support teachers by giving them time to evaluate their pedagogical strategies to align with technology integration.

Administrators often create initiatives that focus on informational and computer technology (ICT) equipment and professional development to increase teachers' technology skills without determining teachers' beliefs toward technology integration (Hew & Brush, 2007; Van Der Ross & Tsibolane, 2017). Teachers' understanding of the benefits of technology integration will increase the desire to change instructional practices to integrate the technologies into their curriculum (Ertmer et al., 2012). Therefore, school districts can support teachers by building professional development opportunities for their technology initiatives. In the next section, I will discuss the conceptual framework for this study.

**Conceptual Framework**

When constructing a research project, it is essential to create a foundation that will guide and support the study found in the conceptual framework. The conceptual framework is vital for grounding, guiding, and structuring this research, providing the study the support and roadmap needed throughout the research process (Grant & Osanloo, 2016). The COVID-19 pandemic
created a need to pivot teachers' instruction to virtual learning. Teachers resistant to integrating technology into their curriculum prior to the COVID-19 pandemic may also have had negative beliefs about technology integration. The pivot to virtual learning may have caused tension for teachers between integrating technology and teachers' beliefs about technology and its impact on student learning. The Technological, Pedagogical, and Content Knowledge (TPACK) framework "helps to make sense of the world and allow us to make inferences about the world" (Mishra & Koehler, 2016, p. 1044). Including Mishra and Kohler's (2006) TPACK framework provides teachers with a tool as they shift their beliefs to align instructional practices with technology integration. When asking teachers to adapt their instructional practices to include a new aspect such as technology, one needs to be mindful of how teachers learn. The conceptual framework shows the tension teachers may have between their beliefs and integrating technology through the implementation of TPACK to impact learning (see Figure 2). The conceptual framework thematizes possible tensions between teachers' beliefs and integrating technology to inform learning.
Unpacking TPACK

Teachers cannot shift their beliefs towards technology integration without understanding the impact of integrating technology on their instruction. Harvey and Caro (2017) noted that the purpose of TPACK "is to maintain the interconnection between three key context areas of teacher education – content, pedagogy, and technology" (p. 107). Mishra and Kohler (2006) described the three core components of TPACK as: (a) content knowledge is the subject matter knowledge that is taught, (b) pedagogical knowledge refers to the instructional practices and methods, and process of teaching, and (c) technology knowledge is an understanding of basic and advanced technologies and the skills needed to use the technology (pp. 1026-1027). Twenty-
first century teachers should understand the interactions of the three core components of TPACK (content, pedagogy, and technology) and the four summative outcomes (pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge, and technological pedagogical content knowledge) (Harvey & Caro, 2017). According to Mishra and Kohler (2006), "Knowledge of technology" is an "important aspect of overall teacher knowledge" (p. 1024). They unpack the four outcomes as follows: (a) pedagogical content knowledge is using the appropriate instructional strategies, practices, and differentiation to fit the content and vice versa; (b) technological content knowledge is an understanding of the relationship between technology; (c) content, technological pedagogical knowledge is an awareness of the technologies available and realizing those teaching strategies could change when using particular technology; and (d) technological pedagogical content knowledge is an "emergent form of knowledge that goes beyond all three components" (pp. 1027-1028). Once teachers have a working knowledge of TPACK, they need to understand how it aligns with their personal beliefs and perspectives before observing a shift in their instructional practices.

The illustration in Figure 2 demonstrates the application of the TPACK framework in integrating technology in the classroom during the pivot to virtual learning. In the following description, I analyze the tasks and techniques demonstrated by teachers in each of the summative TPACK outcomes. Technological knowledge (TK) refers to the hardware, internet, and digital resources used to communicate the curriculum. Teachers utilize pedagogical knowledge (PK) when using their instructional strategies to differentiate instruction. Teachers use content knowledge (CK) when displaying their depth of knowledge of the content. The tasks and techniques demonstrate teachers' foundational knowledge when integrating technology into the curriculum.
The overlaps of these three core knowledge components also demonstrate teachers' understanding of the components necessary to integrate technology to support student learning. Teachers' use of digital tools and instructional practices for learning is considered technological pedagogical knowledge (TPK). When using instructional best practices to teach and communicate their curriculum, teachers display an understanding of pedagogical content knowledge (PCK). The pivot to virtual learning displays teachers' technological content knowledge (TCK) by enhancing content delivery through digital tools. Lastly, when using all six components together during the pivot to virtual learning by using digital tools, instructional strategies, and content to enhance the learning process, teachers align with technological, pedagogical content knowledge (TPACK). Figure 2 illustrates the practical application of the TPACK framework in the classroom. Teachers' beliefs may not align with the integration of technology in the classroom, which might have created tension when schools pivoted to virtual learning and the need to integrate digital tools became necessary.

**Application of Teachers’ Beliefs**

School districts are encouraged to understand teachers' perspectives and beliefs before asking them to change their instructional practices. Kim et al. (2013) suggested that "teacher beliefs are regarded as one of the most valuable constructs for teacher education" (p. 77). Teachers' beliefs influence the decision-making process, help solve problems, and influence their teaching practices and can be understood by making inferences from teachers' actions (Chen, 2008; Ertmer, 2005). Teachers' beliefs influence their instructional practices and technology integration strategies and guide them to build their knowledge and adapt their instructional practices. (Ottenbreit-Leftwich et al., 2010). Introducing teachers to the TPACK framework provides them with a guide as they integrate technology into the curriculum.
Teachers' use of technology in the classroom correlates with their beliefs on technology's impact on student learning (Ottenbreit-Leftwich et al., 2010). Researchers have described teachers' beliefs as being "about the value of technology for student learning" (Kim et al., 2013, p. 77). Teachers rely on their existing beliefs and experiences when integrating technology in their classrooms (Chen, 2008). Kim et al. (2013) stated, "In order to understand why technology is integrated differently among teachers, their fundamental beliefs about what is important in student learning and thus teaching should be understood" (p. 77). Understanding teachers' beliefs before expecting them to integrate technology allow a supervisor to create a plan that aligns with, or begins to shift, a teacher's perspective on using technology to inform learning. When referring to teachers' beliefs, Koh et al. (2016) included the "views that teachers hold about aspects such as teaching, learning, pedagogy, students, technology, as well as the interaction of these aspects within the myriad of pedagogical situations they experience in the classrooms" (p. 21). The recommendation for teachers integrating technology in their curriculum is to focus on "how technology is used" and not focus on "what teachers need to know to incorporate technology in their teaching" (Mishra & Kohler, 2006, p. 1018). Teachers are encouraged to understand the importance of integrating technology to inform student learning and provide a roadmap to integrate technology. Lastly, TPACK can provide a roadmap to prepare them for a successful shift in their instructional pedagogy.

Conceptual Framework Summary

If teachers understand the need to change how they deliver instruction and are determined to shift their beliefs, administrators can support the shift by providing instruction on the TPACK framework. Teachers may have expert knowledge of technology usage (TK) but need guidance on integrating technology to inform student learning (TPK). Mishra and Koehler (2006)
explained that "knowing how to use technology is not the same as knowing how to teach with it" (p. 1033). Mishra and Koehler also argued that their "model of technology integration in teaching and learning argues that developing good content requires a thoughtful interweaving of all three sources of knowledge: technology, pedagogy, and content" (p. 1029). Teachers' knowledge, perceptions, and personal beliefs influence their TPACK construction (Harvey & Caro, 2017). Teachers' beliefs include their various beliefs, including integrating technology with their instructional strategies (Chen, 2008).

Teachers express their knowledge in subjective terms based on evidence, allowing the words belief and knowledge to be interchangeable (Chen, 2008). Chen (2008) stated that "when trying to integrate technology into their instruction, teachers refer to their existing beliefs and prior experiences" (p. 67). Teachers draw from prior knowledge when determining when to integrate digital tools into their instruction. Ertmer (2005) determined that "if technology is treated as an instructional innovation, beliefs will play a significant role in whether or how it is adopted and implanted" (p. 31). When expecting teachers to shift their instructional practices from what they have always done, attention is needed to shift their beliefs and perceptions. Tension during the shift may be necessary for teachers to see the need to align their beliefs with the expected instructional practices. During the pivot to virtual learning in March 2020, districts expected teachers to shift their instructional practices without first understanding their beliefs and without giving teachers a roadmap such as TPACK to help shift their instructional practices.

**Summary**

In this literature review, I demonstrated how significantly teachers' beliefs and perspectives impact technology integration. Reviewing the literature underscores the importance of integrating technology to inform student learning. There is a gap in the literature on the impact
of the current pandemic on teachers' beliefs and whether their beliefs shifted because of the change in instruction when schools shut down. More research is needed to determine the pandemic's impact on teachers' beliefs regarding technology integration. Specifically, this study focuses on shifts in teachers' beliefs because of the pandemic and how teachers now view technology integration's impact on student learning. The next chapter describes the methods used to examine shifts in teachers' beliefs toward technology integration during the COVID-19 pandemic.
Chapter III - Methodology

In this single-case study design, I gathered quantitative (Phase I) and qualitative data (Phase II) to evaluate teachers' beliefs about technology integration. I used a survey instrument in Phase I to collect data regarding: (a) teachers' knowledge of technology and (b) their beliefs and perspectives on the impact technology integration has on student learning. Gathering data on teachers’ perspectives of their technology skills and their beliefs regarding technology through the survey were compared to the information shared in Phase II of the study during data triangulation. Phase II of the study analyzed teacher interviews to understand their beliefs and perspectives on integrating technology and administrator interviews to gain their perspectives on technology integration and related teacher support and training. During the analysis phase, I used the data collected from the surveys and interviews to answer the research questions and examine how teachers' beliefs and perceptions towards technology integration shifted during the COVID-19 pandemic. I then compared the teacher data to the administrator data and looked for similarities and differences.

Case Study Research Design

A simple definition of a case study is a "description of an individual case and its analysis" (Starman, 2013, p. 31). Yin (1994) defined a case study as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not evident" (p. 13). Expanding on his definition, he explained that "a case study is not either a data collection tactic or merely a design feature alone but a comprehensive research strategy" (Yin, 1994, p. 13). Case studies are the preferred strategy when ‘how’ or ‘why’ questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context.
This case study investigated how teachers’ beliefs shifted as a result of the COVID-19 pandemic, which aligns with Yin's definition of a case of a contemporary phenomenon within its real-life context. A case study is a study of a bounded phenomenon of an event, given the circumstances of the phenomena that I studied, a case study is the best methodology for this study (Creswell & Guetterman, 2019). This single case study is bound by the phenomena of teachers who worked at a parochial school during the COVID-19 pandemic which allowed me to understand more fully the lived experiences of these teachers.

This study utilized a case study method focused on the shift in teachers’ beliefs toward technology integration that may have occurred because of the need to pivot to virtual learning after March 16, 2020, when schools closed their buildings to in-person learning. Figure 3 displays the flow of the single case study of collecting the data in each phase, analyzing the data, and interpreting the data.
Figure 3

Study Design

Note. This figure illustrates the design of this study.

Yin identified five key components of research design: questions, propositions (what the study will examine), units of analysis, logic linking the data to the propositions, and criteria for interpreting the findings (1994). Yin encouraged researchers to determine if the case will be a single-case design or a multiple-case design. This study examined teachers working at a
parochial school during the COVID-19 pandemic. This case study is a single case study given that it is bounded by the actions of one school during their pivot to virtual learning.

Description of the Setting

This study took place at a traditional brick-and-mortar parochial school which is part of the archdiocese teachers union. The school serves approximately 1100 students from ninth through twelfth grade. In response to the COVID-19 pandemic, and for the health and safety of students, the governor of the state closed schools for two weeks beginning March 16, 2020. During this time, the department of education created a continuity-of-education plan to guide public school districts as they pivoted to full or part-time virtual instruction. Many schools used the two-week closure to create plans for virtual learning and to provide professional development to teachers. The site chosen for this study did not have a continuity-of-education plan before the school closures, but administrators met and created a plan to pivot to virtual learning. Quick action of the administration was needed to create a plan and prepare and train staff to pivot from in-person learning to virtual learning. All students had received critical hardware (MacBook Air laptops) at the beginning of the school year, which allowed the administration to focus on instruction. The school posted updates on its website and social media outlets, allowing the public to follow the transition to virtual learning. A site where teachers integrated technology into virtual learning was essential to being able to study teachers’ beliefs and perceptions of technology integration.

Purposeful Sampling

According to Creswell and Guetterman (2019), “[i]n purposeful sampling, researchers intentionally select individuals and sites to learn or understand the central phenomenon” (p. 206). This study used purposeful sampling to locate the site. I selected this school because it was an
example of innovation and initiative in technology integration. The teachers at this school made for a purposeful sample, as I selected this setting because of their quick shift to remote instruction during the pandemic. During the pandemic, I followed news and social media to track how schools were pivoting to virtual learning. This site was one of the schools that I followed on social media and became aware of their innovative ways of implementing virtual learning to allow students to continue to learn online. Teachers were quickly able to create online instruction that engaged students through digital resources. During the summer, I contacted the school's principal to inquire about gaining access to the site for this study.

**Population**

Study participants were secondary education teachers and administrators currently teaching ninth to twelfth grades at a parochial school in Pennsylvania. I introduced and outlined the study during a faculty meeting on November 17, 2021, at the site and explained the process for participation. All full-time classroom teachers and administrators currently at the school that were employed prior to the 2019-2020 school year had an opportunity to participate in the study. The site was selected because of the examples of innovation and initiative during the pivot to virtual learning that was posted on the school’s website and social media.

**Participants**

The participants in this study included 13 full-time secondary education teachers who were currently teaching ninth to twelfth grades at a parochial high school and two administrators. The first step in the recruitment process was attendance at a faculty meeting where I introduced my study to the teachers and administrators and explained Phase I and Phase II, including the criteria for eligibility in both phases (Appendix B). The next step was to begin recruiting teachers for Phase I and II of the data collection.
In all, 13 parochial high school teachers participated in Phase I of the study. Teachers employed as full-time classroom teachers who were hired before the 2019-2020 school year were eligible to participate in the study. The criteria of teachers employed at the school at the beginning of the 2019-2020 school year were necessary to ensure the results of the case being bounded in the phenomena of teachers and administrators who worked at this parochial high school during the COVID-19. After the faculty meeting, the principal provided the names and email addresses of teachers currently employed at the parochial high school and I solicited participants for the study. Teachers received an email which described the study again and included a participant consent form (Appendix C and D). The email also contained an individual link to the study’s Qualtrics survey.

Full-time classroom teachers and administrators who were currently employed and hired before the 2019-2020 school year were eligible participants for the qualitative semi-structured interview phase of the study. One of the questions on the Qualtrics survey asked teachers to provide the year they began working at the parochial high school to identify teacher participants for the qualitative interviews. All teachers who met the requirements were invited to join the Phase II of the study. At the conclusion of Phase I, I emailed full-time teacher participants who were employed at the parochial high school prior to the 2019-2020 school year to invite them to set up a time for the Zoom interview.

Five full-time administrators who were employed at the parochial high school prior to the 2019-2020 school year were invited to participate in the qualitative semi-structured interview phase. After the faculty meeting, the principal provided the names and email addresses of administrators currently employed at the parochial high school and I solicited administrator
participants for the interviews. All administrators were emailed describing the study and provided the participant consent form (Appendices F and G).

**Informed Consent and Protection of Human Subjects**

West Chester University’s Institutional Review Board required participants’ signed consent before they could begin the study. Participants were recruited through an email sent to all full-time classroom teachers and administrators currently employed at the chosen parochial high school (see Appendix C and F). The email for teachers contained a link to a Qualtrics survey, and the first question allowed participants to access the informed consent form (see Appendix D). Teachers confirmed their study participation and provided their consent by selecting the "I consent to participate in this study" option. Once that option was selected, teachers were able to answer the remaining questions on the survey. Administrators signed the informed consent in the email attachment (see Appendix G) and emailed it back to me prior to their interview.

**Procedures**

I used Yin's (1994) case study design because it can be "altered and revised after the initial stages of a study" (p. 52). This case study's structured plan and procedure gave me a roadmap to follow throughout the entire study. Figure 4 below shows the structured plan I created and followed as I progressed from the beginning to the end of the study. After identifying eligible participants for each study phase, the next step was to begin the data collection process.
Figure 4

Study procedural diagram

Note. The figure represents the procedural diagram of the study from IRB approval through data coding and analysis.

Data Collection

To ensure accurate data collection, Yin (1994) and Merriam (1988) suggest using multiple sources to capture the case fully. The sources of data collection suggested when using a case study are documentation, archival records, interviews, direct observations, participant observations, and physical artifacts (p. 79). The most critical type of data collection for a case study, according to Yin (1994) are interviews. Interviews allow the researcher to hear the participants’ stories and perspectives of the phenomenon. Merriam (1988) suggested using interviews for a case study but stated that quantitative data could also be used to "support the finding from qualitative data" (p. 68). Another way to ensure accurate data collection is to triangulate data by using multiple sources (Yin, 1994). Triangulation allows the researcher to
validate the data with more than two sources. I collected three data points through a survey instrument, teacher interviews, and administrator interviews which allowed me to triangulate the data. Teachers and administrators were given the opportunity to share artifacts during the interview which provided an additional data point to triangulate the data.

On November 17, 2021, I sent the initial email to teachers immediately following the faculty meetings where I introduced my study. Teachers had two weeks to complete the survey (survey window closed on December 1, 2021). I sent an email reminder one week before the survey was closed, and another reminder two days before the survey was closed.

All teacher and administrator interviews were completed virtually using Zoom software. The interviews were recorded using the Zoom recording feature. Zoom provided a transcription which I verified against the recording for accuracy and then sent the transcription to participants for member checking. During the interview, teachers and administrators had an option to provide artifacts that were used during the pivot to virtual learning.
Table 1

Data Collection Procedure

<table>
<thead>
<tr>
<th>Type of Data</th>
<th>Quantitative</th>
<th>Qualitative</th>
<th>Qualitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who</td>
<td>Teachers</td>
<td>Administrators</td>
<td>Teachers</td>
</tr>
<tr>
<td>What</td>
<td>Teacher survey</td>
<td>Administrator semi-structured</td>
<td>Teacher semi-structured interviews</td>
</tr>
<tr>
<td></td>
<td>questionnaire</td>
<td>interviews</td>
<td></td>
</tr>
<tr>
<td>When</td>
<td>The study began with</td>
<td>The interviews took place after</td>
<td>The interviews began on</td>
</tr>
<tr>
<td></td>
<td>a teacher survey on</td>
<td>November 17, 2021, once the</td>
<td>December 1, 2021, after the</td>
</tr>
<tr>
<td></td>
<td>November 17, 2021.</td>
<td>teacher surveys were distributed.</td>
<td>teacher survey</td>
</tr>
<tr>
<td></td>
<td>Teachers had two</td>
<td></td>
<td>window was closed.</td>
</tr>
<tr>
<td></td>
<td>weeks to complete it.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Where</td>
<td>Teachers completed</td>
<td>Interviews were conducted through</td>
<td>Interviews were conducted</td>
</tr>
<tr>
<td></td>
<td>the survey on their</td>
<td>a Zoom session with the camera on.</td>
<td>through a Zoom session with the</td>
</tr>
<tr>
<td></td>
<td>own using Qualtrics</td>
<td></td>
<td>camera on.</td>
</tr>
<tr>
<td></td>
<td>software.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How</td>
<td>Researcher-created</td>
<td>Researcher-created questions</td>
<td>Researcher-created questions</td>
</tr>
<tr>
<td></td>
<td>Qualtrics survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Why</td>
<td>To understand teachers’ technology skills, experience, and beliefs</td>
<td>To understand the support given to teachers to integrate technology</td>
<td>To understand beliefs and perceptions of using integrating technology and school culture</td>
</tr>
</tbody>
</table>

*Note.* The data collection procedure provides detailed information regarding the procedures for all three phases of the study.

After the survey completion window closed, I selected teachers for an interview. This allowed time to review the survey and ensure that teachers participating in the interview were full-time classroom teachers employed at the parochial high school prior to the 2019-2020 school year.

**Instruments for Study**

This study used a survey instrument and semi-structured interviews to collect data. Participants’ answers to the survey provided information about their technology skills,
knowledge of technology integration, and their beliefs/perspectives on the impact of technology integration on student learning. Semi-structured interview data collection allowed me to examine participants' beliefs and perspectives on integrating technology.

**Survey Instrument.** I created a survey using Qualtrics Survey software to ensure the data gathered matches the study's intention. Data collected from the survey included information on (a) teachers' knowledge of technology and (b) their beliefs and perspective regarding the impact technology integration has on student learning. I met with teachers who did not participate in the study but taught during the pivot to virtual learning to provide feedback on the survey and verify that the data provided information on teachers' knowledge of technology integration and teachers' perspectives of the impact technology integration has on student learning. The survey included 20 multiple choice questions about participants' technology knowledge and skills, knowledge of technology integration, and their beliefs/perspective on the impact technology integration has on student learning. Five questions on the survey collected demographic information for teachers, including gender, age, race, teaching certifications, years of teaching, and the number of years employed at the parochial high school (Appendix I).

**Semi-structured Interviews.** I conducted one 30-40 minute semi-structured interview per teacher and administrator. I created the interview questions for teachers and administrators (Appendices E and H). All interviews were completed virtually and recorded using Zoom software to observe teachers' comfort levels in a virtual setting. After the interview, a transcription created in Zoom was verified against the recording for accuracy and then sent to participants for member checking.
**Data Analysis and Coding**

Data analysis involves interpreting data and drawing conclusions (Creswell & Guetterman, 2019). Yin's (1994) views on "data analysis consist of examining, categorizing, tabulating, or otherwise recombining the evidence to address the initial propositions of a study" (p. 102). Relying on theoretical propositions or developing a case description will help researchers determine which data analysis technique will work best for their case study. Yin recommended the following data analysis techniques: pattern-matching logic, explanation-building, time-series analysis, and program logic models. In this study, I sought to understand if teachers’ beliefs toward technology integration shifted during the pandemic by gathering data through interviews and surveys. The data was examined through central tendency analysis and first- and second-cycle coding.

**Phase I Analysis.** Raw survey data was imported to SPSS statistical analysis software. I ran descriptive statistics to find general tendencies regarding demographic information and to determine any outliers in the data. The survey questions asked for teachers' perceptions of what they held to be true for questions related to their technology skills and beliefs toward integrating technology to inform student learning. Teachers provided information on their instructional practices and perception before and during the pivot to virtual learning. During the analysis, I looked for common trends amongst all the participants from which I could draw conclusions.

**Phase II Analysis and Coding.** I used inferential statistics to draw conclusions about teachers’ perspectives on technology integration and their current practices. After each semi-structured interview, I took the transcription and uploaded it to Dedoose for coding and theme identification. The Dedoose application used to analyze qualitative data allows the researcher to
store, manage, code, and retrieve data. During the analysis, I looked for unique themes amongst teachers and completed a cross-comparison of themes identified by the administrator group.

I used first- and second-cycle coding methods to code the data (Saldaña, 2013). During the first-cycle coding, predetermined codes, also known as *a priori* coding (Saldaña, 2013), were the six components of the TPACK framework: Technological Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Technological Content Knowledge (TCK), Pedagogical Content Knowledge (PCK), and Technological Pedagogical Knowledge (TPK). I identified the categories to show the areas of TPACK that teachers had developed and the areas that teachers still needed to develop. Additional codes were developed during data analysis as they emerged. During the second-cycle coding method, I reanalyzed and reorganized codes from the first-cycle coding (Saldaña, 2013). The last step was to look for themes that emerged from the data (Creswell, 2013). I then used the common themes to draw conclusions to answer the research questions.

**Confidentiality**

I provided assurances of participant confidentiality through all phases of the study. Identifiable information was removed throughout the data collection phase; identifiable information and participants were represented with a pseudonym. Additionally, participants' demographic information was not combined during the analysis to avoid small representation from being identified (e.g., the PI analyzed gender and age separately) to maintain participant confidentiality. All information received including participant survey data and all documents related to my study, were saved on my personal password-protected computer.
Potential Risks

Potential risks included concerns about the information gathered from the study being used for evaluation purposes in the participants’ school setting. Integrating technology into the curriculum has become an expectation in many schools. Administrators often use teacher observations for evaluation purposes, and the administrator completing the evaluation is looking for a certain level of technology integrated into the lesson based on the school’s expectations. Teachers may have anxiety and concern that the data collected during this study could become part of their evaluation. One of the reasons I excluded teacher observations as a data-collection instrument was to alleviate this concern from participants. I assured participants that the data collected was for research purposes only and that individual teacher data would not be shared with the administration.

Participants may be concerned about sharing their beliefs regarding technology integration if those beliefs conflict with the expectations of their current job description. Removing identifiable information allowed for participants’ identities to remain confidential. Assurances of participant confidentiality were made to allow the participants to answer questions honestly on the survey and in the interview.

Finally, teachers may be new to integrating technology in their classrooms. Therefore, asking participants about their comfort level with technology and their technology skills may make them feel uncomfortable or possibly inadequate.

Threats to Validity and Reliability

I addressed validity and reliability by utilizing a survey instrument and semi-structured interviews to collect data. According to Creswell & Plano (2017), validity "serves the purpose of checking on the quality of the data, the results, and the author's interpretation of the data results"
Ensuring validity in this study requires reviewing the accuracy of the data and my interpretation of the data. Conceptualization of the study and how the researcher collected, analyzed, and interpreted the data addressed the concerns about validity and reliability (Merriam, 1988). The reliability of the data in this study also will be addressed. Yin (1994) suggested using four tests used often to determine the quality of research: construct validity, internal validity, external validity, and reliability" (p. 33). In the following sections, I will check my data collection and results using these four measures: internal validity, external validity, and reliability.

**Internal Validity**

Merriam (1988) referred to internal validity as that which "deals with the question of how one's findings match reality" (p. 166). The six strategies discussed to ensure internal validity are: triangulation, member checks, long-term observation, peer examination, participatory modes of research, and researcher's biases (Merriam, 1988). The two appropriate strategies for this study were member checking and triangulation to confirm internal validity. Triangulation allows the researcher to validate the data with more than two sources, thus collecting data through a survey instrument, teacher interviews, and administrator interviews allowed me to triangulate the data as a means of validating the data, which is represented in Table 2.
### Table 2

**Data Triangulation**

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Survey Question</th>
<th>Administrator Interview Questions</th>
<th>Teacher Interview Questions</th>
<th>Artifacts Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do high school teachers integrate technology in the classroom?</td>
<td>7e, 13a, 13b, 13c, 13d, 13e, 16, 17, 18, 19</td>
<td>2, 6, 10, 11, 12</td>
<td>2, 10, 11</td>
<td>Professional development plans and training</td>
</tr>
<tr>
<td>How do high school teachers perceive their beliefs about technology integration to inform student learning, and how these beliefs might have shifted during the pandemic?</td>
<td>7a, 7b, 7c, 7d, 7f, 7g, 8, 9, 10, 11, 12, 14a, 14b, 14c, 14d, 14e, 14f, 15, 20</td>
<td>3, 4, 5, 7, 8, 9, 13, 14</td>
<td>3, 4, 5, 6, 7, 8, 12, 13</td>
<td>Student activity examples, Lesson plans</td>
</tr>
</tbody>
</table>

*Note. The data triangulation chart aligns survey questions, teacher and administrator interviews, and artifacts with each research question.*

A case study may require the researcher to make inferences about a situation that cannot be observed. Anticipating and asking questions during the inference process is necessary to mitigate concerns about internal validity (Yin, 1994). As I analyzed the data and began making inferences, I checked to see if there was another explanation I had not considered before moving forward with my inference. An example of the process was when a teacher reflected on shifting back to pre-pandemic instructional practices; before I made inferences regarding their beliefs.
toward technology integration, I reviewed the data to determine if there was another reason for the shift in instructional practices.

**External Validity**

External validity deals with concerns about whether or not the study's findings can apply to other situations (Merriam, 1988; Yin, 1994). The participants at this one site experienced the pivot to virtual learning together by following one plan by a parochial high school. While all schools in the state pivoted to virtual learning simultaneously, their experiences were also unique. Understanding teachers’ beliefs toward technology integration at this one school allowed me to gain perspective on their experiences during the pivot to virtual learning. While not all experiences are exactly the same, all teachers in the state were given a short period of time to adapt their instructional practices to a virtual setting. Listening to the steps the teachers at this site took to pivot to virtual provided insight and examples of the experiences of teachers during the COVID-19 pandemic.

**Reliability**

To ensure a case is reliable, a well-documented procedure allows another researcher to replicate a study (Merriam, 1988; Yin, 1994). I developed three procedural diagrams, the study procedural diagram (Figure 4), the data collection procedure (Table 1), and the data triangulation chart (Table 2), which provide detailed information about the steps taken to collect and analyze the data. I also checked for reliability in the survey instrument tool by having teachers who did not participate in the study, but taught during the pivot to virtual learning, review the instrument tool and provide feedback to ensure the data collected from the tool would allow me to answer the research questions. I confirmed the reliability of this study through triangulation and identifying my bias (Merriam, 1988), which I discuss in the next section.
**Researcher’s Bias**

I have 17 years of experience teaching in both brick-and-mortar and cyber charter schools and am currently an administrator at a cyber charter school. When schools closed in March 2020 because of the COVID-19 pandemic, brick-and-mortar school districts began making plans to pivot to virtual learning. The cyber school was already providing virtual instruction prior to the pivot to virtual instruction via brick-and-mortar schools. Before the COVID-19 pandemic, many brick-and-mortar schools did not have the infrastructure to pivot to virtual learning, so they paused in-person education to create a plan for virtual learning.

I was transparent with the participants regarding my professional experience at the cyber charter school, described the onboarding process of new hires at the school, and explained that transitioning to teaching at an online school is a process. I explained that before the COVID-19 pandemic, there may not have been an expectation placed on brick-and-mortar schools to have strategies in place to deliver virtual instruction. My responsibility was to focus the study on how technology education beliefs and perceptions for teachers in a brick-and-mortar setting had shifted since the pandemic and not to research how well they delivered online instruction.

I was aware of researcher bias and used the following three ways to ensure validity during data collection and analysis. First, I kept memos throughout the data collection and data analysis process, writing down important notes and observations as I processed the information. I also strived for validity through reflexivity. Reflexivity involved me being aware of my experiences and how they shaped my interpretation of this study (Creswell, 2013). I have 14 years of experience at the cyber school integrating technology. I was aware that my experience is different from teachers at brick-and-mortar schools and I needed to stay focused on their stories. Being reflective and journaling are ways that I separated my experience from other teachers’
experiences. A third way I ensured validity in the study results was by checking and rechecking the data (Marshall & Rossman, 2016) and compared the transcription to the recorded interview to ensure accuracy in the transcription.

**Generalizability**

This study is not generalizable beyond these specific teachers at this particular school. It is important to understand this site to understand teachers’ beliefs toward technology integration during the pivot to virtual learning to begin to understand what was going on during this period in time. Each student and teacher at this parochial high school had their own computer before the school pivoted to virtual learning. In this study, teachers who worked at schools where a technology plan was not in place, or where students and teachers were not using technology regularly, may have different perceptions and beliefs than teachers at the parochial high school. Since parochial schools are not under the same mandates from the Department of Education as public schools, this may give the parochial schools a bit more flexibility to respond to issues that arise, such as the need to pivot to virtual learning. Thus, the steps the parochial school took to pivot to virtual learning because of the COVID-19 pandemic may not be feasible for public schools. However, like the public schools, the parochial school does give standardized tests at specific grade levels, which requires the need for proficiency in grade-level standards and prepares students for their next steps after high school.

**Limitations**

The first limitation is the population because the teachers at the school make for a small sample pool. A second limitation is the small sample pool did not provide enough data to analyze the data outside of descriptive analysis. A third limitation is collecting data where participants are asked to recount their actions pre-COVID-19 such as their perceptions towards technology
integration before the COVID-19 pandemic and their instructional practices prior to the pivot to virtual learning. The last limitation related to the methodology chosen was a case study in which all collected data is self-reported. Self-reported data has been found to be reliable when participants are secure that their information is kept confidential.

Summary

In Chapter III, I provided an overview of the single-case study methodology used in this study. I identified how I selected the site and participants for the study using purposeful sampling. Data collection was completed using a survey instrument for teachers and semi-structured interviews of both teachers and administrators. As a result of the small sample pool, only descriptive statistics were used during the data analysis phase to analyze the Phase I data, and the first- and second-cycle coding method was used with a priori coding during the first-cycle coding phase. I also addressed reliability, validity, limitations, generalizability, and researcher bias. In Chapter IV, I will discuss the results of the data collection.
Chapter IV: Results and Analysis

I investigated teachers’ beliefs about technology integration in the classroom and the ways their beliefs have shifted since the start of the COVID-19 pandemic. I aimed to understand the shift in teachers’ beliefs about technology integration from the beginning of the COVID-19 pandemic to make suggestions on the most effective ways to support teachers in integrating technology to support student learning in the future. The primary research question guiding this study was: How has the pandemic shifted teachers’ beliefs about integrating technology as an effective means to inform student learning at one school? The study also included two sub-questions:

(1) How do high school teachers integrate technology in the classroom?

(2) How do high school teachers perceive their beliefs about technology integration to inform student learning, and how these beliefs might have shifted during the pandemic?

Classroom teachers participated in a survey (Appendix J) during Phase 1 of the study. The parochial high school principal provided me with the emails of the 19 full-time staff who had worked at the school since the 2019-2020 school year. I emailed the staff members a 20-question survey (see Appendix I), which collected information on participants’ demographics, technology skills, knowledge of technology integration, and beliefs and perspectives on the impact of technology integration on student learning. Of the 19 full-time teachers who had worked at the site since the 2019-2020 school year and were eligible to participate in the study, 13 teachers completed the survey within the two-week window it was available: a 68% completion rate. Of the six teachers that did not participate, four started the survey but did not complete or submit it, and two did not begin the survey.
After the two-week survey window ended, an email was sent to the 13 teacher participants who completed the survey, which invited them to participate in an interview during Phase 2 of the study. Two administrators, as well as ten classroom teachers participated in 30-40 minute semi-structured individual interviews (Appendices K and L). Interviews were recorded through the Zoom platform, then transcribed, cleaned, and uploaded to the coding software, Dedoose. I used member checking to validate the accuracy of the transcripts by sending the transcripts to participants for review (Creswell & Guetterman, 2019; Yin, 1994). I encountered technical difficulties during two interviews. Only three minutes of one of the interviews was recorded, not allowing me to use the information during the analysis phase. The second technical difficulty occurred because of the internet stability at the parochial high school. While the participant was able to move to a location with a more stable connection, four minutes of the beginning of the interview was not fully transcribed.

Phase I Participant Demographics

The first six questions of the survey collected demographic information, including age, gender, race, number of years teaching, teaching certifications, and number of years worked at the parochial high school. Table 3 includes the demographic information for the 13 teacher participants.
### Table 3

**Demographic Characteristics**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>All Participants</th>
<th>N=13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5</td>
<td>28.5%</td>
</tr>
<tr>
<td>Female</td>
<td>8</td>
<td>61.5%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-39</td>
<td>6</td>
<td>46.2%</td>
</tr>
<tr>
<td>40 or older</td>
<td>7</td>
<td>53.8%</td>
</tr>
<tr>
<td>Year’s teaching</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-10 years</td>
<td>6</td>
<td>46%</td>
</tr>
<tr>
<td>11-20 years</td>
<td>2</td>
<td>16%</td>
</tr>
<tr>
<td>21 and over</td>
<td>5</td>
<td>38%</td>
</tr>
<tr>
<td>Employed at the parochial high school</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-5 years</td>
<td>4</td>
<td>30.7%</td>
</tr>
<tr>
<td>6-19 years</td>
<td>5</td>
<td>38.4%</td>
</tr>
<tr>
<td>Over 20 years</td>
<td>4</td>
<td>30.7%</td>
</tr>
</tbody>
</table>

*Note: This table provides demographic characteristics of the survey participants. Data on race was removed to protect identity.*

In addition to the demographics in Table 3, the participants at this school held the following teaching certifications: Biology 7-12, Middle School Science 7-9, English 7-12, Mathematics 7-12, School Counselor, Social Studies 7-12, Special Education, Spanish PK-12. The demographic information provides an understanding of the teachers who participated in Phase I of the study.

**Phase II Participant Backgrounds**

The participants for the interviews were teachers and administrators who worked at the parochial high school since the 2019-2020 school year. The teacher participants taught in both the humanities and STEM (Science, Technology, Engineering, Mathematics) disciplines.
Pseudonyms were assigned to the participants to protect their identity. Below I have provided more information about each participant to create context for the information provided in the interviews. The participants provided the information through the survey and interviews.

**William**

William is 50-59 years old and has taught STEM courses for over 20 years at both private and parochial schools. He has been at this parochial high school for three years. He had prior experience pivoting to virtual learning during summer school at a private school.

**Marsha**

Marsha is 50-59 years old and currently teaches humanities at the parochial high school. She has 30 year’s experience teaching at parochial schools and has been at this parochial high school for the past 20 years. She has a master’s degree and perceives some of her instructional practices as “old school.”

**Brooke**

Brooke is between 30-39 years old and currently teaches humanities at the parochial high school. She has a master’s degree and has experience teaching all grade levels for the past ten years in the parochial school system and has been at this parochial high school for six of those years. Teachers look to Brooke for support in integrating technology.

**Mary**

Mary has been an administrator at the parochial high school for the past three years. She has taught at parochial schools for the past 21 years in both grade school and high school. She perceives that technology can “bring the [content] to life.”
**Kevin**

Kevin is between 40-49 years old and has a master’s degree. He has taught humanities courses at parochial schools for the past 26 years and has been at this parochial high school for the past 23 years. He refers to himself as being “old school.”

**Carol**

Carol is between 30-39 years old and has earned a master’s degree. She has been teaching at parochial schools for the past 16 years, 13 of those years have been in the humanities department at this parochial high school. She currently uses technology in the classroom when necessary or enhances her instruction.

**Betty**

Betty has been an administrator at the parochial high school for the past eight years. She has been an educator for the past 23 years and has taught at a cyber charter school, parochial school, and at the university level. She perceives technology integration as a way for teachers to instruct all types of learners.

**David**

David is between 30-39 years old and has a master’s degree. He has taught humanities at this parochial high school for the past six years. Prior to the pivot to virtual learning, he had been posting lessons and assignments on the learning management system the parochial high school was using at the time.

**Lisa**

Lisa is between 30-39 years old and teaches STEM courses. She has taught both middle school and high school at parochial schools for ten years and has been at this parochial high
school for the past three years. She perceives technology integration as a way to increase student engagement and ownership of their learning.

**Michael**

Michael is between 30-39 years old and has a bachelor’s degree with a double-major in education. He has been teaching humanities at parochial schools for the past six years, with five of those years at this parochial high school. One of the ways he uses technology is to have students record themselves speaking a world language.

**Linda**

Linda is between 50-59 years old. Prior to becoming a teacher, she was a paraprofessional at a public school. She has been teaching humanities at this parochial high school for four years. She uses technology in her lessons daily but balances it with face-to-face interaction that students have missed out on during the pivot to virtual and hybrid learning.

In summary, most of the participants have spent their teaching careers at parochial schools with at least four years of experience. All departments, including math, science, social studies, English, world language, and electives, are represented by at least one participant. The teachers began the pivot to virtual learning with different levels of technology integration experience. Table 4 provides a highlight of each participant demographic in Phase II.
Table 4

**Phase II Participant Demographics**

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Age Range</th>
<th>College Degree</th>
<th>Department</th>
<th>Years Teaching/Years at Parochial School</th>
</tr>
</thead>
<tbody>
<tr>
<td>William</td>
<td>50-59</td>
<td>Bachelor’s Degree</td>
<td>STEM</td>
<td>20/3</td>
</tr>
<tr>
<td>Marsha</td>
<td>50-59</td>
<td>Master’s Degree</td>
<td>Humanities</td>
<td>30/20</td>
</tr>
<tr>
<td>Brooke</td>
<td>30-39</td>
<td>Master’s Degree</td>
<td>Humanities</td>
<td>10/6</td>
</tr>
<tr>
<td>Mary</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Administrator</td>
<td>10/6</td>
</tr>
<tr>
<td>Kevin</td>
<td>40-49</td>
<td>Master’s Degree</td>
<td>Humanities</td>
<td>26/23</td>
</tr>
<tr>
<td>Carol</td>
<td>30-39</td>
<td>Master’s Degree</td>
<td>Humanities</td>
<td>16/13</td>
</tr>
<tr>
<td>Betty</td>
<td>50-59</td>
<td>Master’s Degree</td>
<td>Humanities</td>
<td>23/8</td>
</tr>
<tr>
<td>David</td>
<td>30-39</td>
<td>Bachelor’s Degree</td>
<td>Humanities</td>
<td>6/6</td>
</tr>
<tr>
<td>Lisa</td>
<td>30-39</td>
<td>Bachelor’s Degree</td>
<td>STEM</td>
<td>10/3</td>
</tr>
<tr>
<td>Linda</td>
<td>50-59</td>
<td>Bachelor’s Degree</td>
<td>Humanities</td>
<td>4/4</td>
</tr>
</tbody>
</table>

*Note: The table provides a summary of Phase II participant demographics.*

Before discussing the case study analysis, it is important to understand the teachers’ experiences during the 2019-2020, 2020-2021, and 2021-2022 school years.

**Experiencing a Pivot to Virtual and Hybrid Learning**

The 2019-2020 school year began with in-person learning until March of 2020, when many schools closed their buildings in an effort to slow the spread of the COVID-19 virus. As a result of the immediate closures, teachers were given little to no time to prepare for the pivot to virtual learning (Winter et al., 2021). School buildings remained closed and virtual learning was
extended until the end of the 2019-2020 school year. The parochial high school moved to a hybrid learning model for the 2020-2021 school year and was able to open the school building for full in-person learning for the 2021-2022 school year. The sequence of events pertaining to times of virtual and in-person learning is displayed in the timeline (Figure 5).

**Figure 5**

*Sequence of Events from August 2019-March 2022*

Note: The timeline provides the sequence of events for the three school years.

As the cases of the COVID-19 have decreased, the parochial high school has been able to continue to provide in-person learning to all students throughout the 2021-2022 school year.

*Preparing for the Pivot to Virtual Learning.*

While the teachers’ reflections on their initial response to the virtual learning pivot varied, all participants reported having little time to prepare. The parochial high school administrators
informed teachers of the pivot during a faculty meeting on Friday afternoon, March 13, 2020. Prior to the faculty meeting, Betty, an administrator at the parochial high school, had been in meetings that week with other principals in this school system to determine if students had Wi-Fi at home and to work out details with the teachers’ union on the expectations for teachers during the pivot to virtual learning. Betty was also on a subcommittee to ensure teachers had the resources needed to pivot to virtual learning, which included purchasing Zoom licenses to provide a way for teachers to continue to bring their classes together asynchronously during virtual learning.

During interviews, teachers at the parochial high school reflected on the pivot, recalling that they received an email around 2:15 p.m. on Friday, March 13, 2020, informing them of an emergency faculty meeting at the end of the day (Interviews, Marsha, Michael, & Brooke). For instance, David recalled that this email also instructed teachers to have students clear out their lockers and bring their books home at the end of the day (Interview). At 2:15 pm, the administration informed teachers they should take home what they needed to begin teaching virtually for two weeks starting Tuesday, March 17, 2020, and gave the teachers the weekend and Monday, March 16, 2020, to prepare to pivot to virtual learning.

The teachers’ preparation to pivot to virtual learning varied. Since the beginning of the year, Brooke had been integrating technology in her classroom using digital resources such as Flipgrid, No Red Ink, and Quizlet, but she had yet to introduce her students to Zoom (Interview). These digital resources allow teachers to assess students’ mastery of the content, differentiate, and check for understanding throughout the lesson. Brooke recalled hearing rumors based on other schools and events of a possible move to virtual learning, and she wanted to prepare her students for what might be coming. On Friday, she told her students, “We know
what's coming; we don't know the details yet, but everyone has to be able to get on Zoom” (Interview). So, Brooke had all her students register and practice using Zoom during her classes that Friday.

A few teachers had been integrating technology prior to the pivot to virtual learning and only needed to make minor adjustments to their instructional practices. In contrast, some teachers had to completely change the way they delivered instruction after the announcement that all instruction would be virtual beginning March 17, 2020. Marsha had a different experience than Brooke as she was unfamiliar with Zoom and recalled hearing the word “Zoom” for the first time on Wednesday, March 11, 2020 (Interview). While some teachers’ reflections focused on their personal reaction to the pivot to virtual learning, Kevin’s reflections on the announcement of the pivot to virtual learning focused on the support from the principal and assistant principal at the parochial high school. “They were very supportive of us. They said, ‘Do what you need to do, we will take it one step at a time’” (Interview).

Only one teacher had prior experience with virtual learning. William had experienced the pivot to virtual learning during summer school at a different school in 2018 when the school asked teachers to pivot to virtual learning for one day because of construction happening at the school. The other school had informed the summer school teachers before the session that the school would be closed on July 3, 2018, for the day. This school gave summer school teachers a month’s notice to give them time to prepare their lessons and assignments for the day, unlike the pivot to virtual learning in March 2020 where teachers were only given three days’ notice to prepare for virtual learning. Prior to the virtual day for summer school, William had a practice run with the students to ensure they could open and use Google documents and other necessary digital resources. He recounted that the experience in March 2020 was different from the pivot to
virtual learning in March 2018 as it was “like they turned us loose to the Wild West and [said], ‘Go do what you have to do,’ and I don't think there were any ground rules” (Interview). William provided artifacts from the lesson he taught students on July 3, 2018, and from a lesson he used on March 19, 2020. The overall lesson format was similar as both were asynchronous. One of the differences between the two lessons was the summer school lesson from July 3, 2018, was given to students through a Google Document, whereas the lesson provided to students on March 19, 2020 was uploaded to Google Classroom. The structure of the lesson was similar to a teacher providing instruction and then giving students practice problems to complete; both lessons provided a video for students to watch and two activities. William created a chart at the bottom of both lesson plans to track what students submitted, if students had mastered the concept or the lesson needed revision, and the student feedback he provided (artifacts).

Just as the initial response of teachers to the pivot to virtual learning at this parochial high school varied, how teachers prepared for the pivot to virtual learning also varied. A few teachers prepared lessons to post in the learning management system the school had provided, while other teachers learned new online recourses to use during virtual learning. Two teachers perceived having previous experience using Zoom that helped with a smooth transition in the pivot to virtual learning (Interviews, Michael & David). Teachers such as Carol and Lisa did not use Zoom during the initial two weeks of the pivot to virtual learning but instead decided to post assignments that students would complete and submit (Interviews, Carol & Lisa).

Brooke took a different approach and while she used Zoom to instruct students, she also wanted to ensure students and families knew what to expect, so she began preparing a weekly communication. Brooke recounts that she “took that Monday, [March 16, 2020] and I got organized and I thought okay that's what I'm going to, I'm going to send out a weekly email to
the families, and we're just going to keep having a class like we normally have will just be on Zoom” (Interview). While some teachers created a plan right away for the initial two weeks of virtual learning, a few teachers spent March 14-16, 2020 researching and preparing for the pivot (Interviews, Linda & Marsha). Marsha found resources that would help with the transition, and she emailed the principal asking the parochial high school to purchase those resources. She took an additional step and spent Monday collaborating with other teachers who were “more tech-savvy” (Interview). After the initial pivot to virtual learning, the parochial high school began collecting data from all stakeholders.

The pivot to virtual learning was new to many schools, including this site, and there was a continuous need to collect, review and evaluate data to make needed changes to the current schedule and strategies used during the pivot to virtual learning. Mary, one of the school’s administrators, explained that “we were also getting feedback from the parents and students so that we can identify issues and figure out strategies to address’ (Interview). One of the changes made from informal feedback given by parents was for the administrators to create a schedule of classes to avoid a conflict of two classes running simultaneously. William recalled, "after like two weeks, we split the day in half like the first four periods were Monday, and the second four periods were Tuesday" (Interview). After the initial pivot to virtual learning, some teachers reevaluated their traditional instructional practices.

**Shifting Instructional Practices to Support Learners**

Some teachers started using Zoom and other online resources on Tuesday, March 17, 2020 (Interviews, Brooke & Marsha). Other teachers who had thought the pivot to virtual learning would only last two weeks began to shift their instructional practices to find strategies that worked for them for a more extended period (Interviews, Carol, Kevin, & David). One of the
teachers, Carol, who had started posting assignments without additional virtual instruction through Zoom, stated:

[When] we realized that it was probably going to be a little bit longer than the two weeks; that's when I started to kind of have more one-on-one or group contact with the students. [I began] offering Zoom sessions and creating videos through Screencastify. (Interview).

Kevin was another teacher who did not use Zoom right away. He reflected that he “started to evolve [in his instructional practices] after two or three weeks. I’m like, all right. Yeah, I need to start focusing more on using the online resources” (Interview). Not all teachers shifted to using Zoom to meet with students virtually. Lisa "beefed" up what she was preparing once she realized the pivot to virtual learning would last more than two weeks and began creating instructional videos using Screencastify and giving students practice problems to complete (Interview).

Teachers’ decision not to use Zoom was a choice in instructional practices, even if they were familiar with Zoom. An example of making this decision was David, who chose to create an asynchronous classroom without Zoom meetings. Instead, he used the Google classroom, which he had already set up and posted lessons and assignments for students (Interview). The school provided professional development for teachers who were learning new online resources in an effort to support teachers with their instructional practices during the pivot to virtual learning.

Providing Professional Development to Adapt Instruction

After the initial two weeks of virtual learning, teachers recalled that they realized virtual learning would likely continue through the end of the 2019-2020 school year, and they began reaching out internally to more tech-savvy teachers for help. Brooke noted that she “was known
for having integrated different digital resources” and that “colleagues were reaching out to [her]” for support in integrating technology (Interview, Brooke).

One of the questions asked during the interview pertained to the professional development offered during the pivot to virtual learning. Betty, an administrator at the parochial high school, recounted that she “stayed in constant contact with the teachers, getting feedback from them as to what was working, what wasn't working” (Interview). Administration supported teachers during this time by creating a list of the digital resources used and then reaching out to teachers who were knowledgeable in using digital resources from the list. Teachers perceived as experts at a particular online resource would either set up a Zoom session or create a video providing step-by-step instructions on using that digital resource (Interviews, Michael, Brooke, David, Linda, & Lisa). When giving an example of professional development offered during the pivot to virtual learning, Carol explained that their faculty meetings which were now held through the Zoom software were a time to “get together in that manner and share best practices of what was going on at the moment.” She went on to say how her “colleagues would put together little videos or via Zoom instruct us on what was working best for them at the moment” (Interview). Two of the teachers’ perspectives of having their colleagues provide professional development during virtual learning were that “our own colleagues were [the] best resources on the ground” (Interview, Michael) and “the greatest resource you have, which is the teachers themselves and their experience” (Interview, David). Having informal professional development either through a video or during a Zoom session gave teachers the option of a hands-on learning approach which many teachers (92.3%) preferred (Survey). Professional development was provided to support teachers through the pivot to virtual learning. Teachers were provided
professional development on digital resources such as ‘No Red Ink’ and ‘GoFormative’. They were able to continue using the digital resources they learned during the pivot to hybrid learning.

**Envisioning a Pivot to Hybrid Learning**

The parochial high school worked throughout the summer to create a plan to bring students back into school buildings for the 2020-2021 school year. One of the plans included hybrid learning which combines in-person learning and virtual learning (Lieberman, 2020). This parochial high school pivoted to hybrid learning for the majority of the 2020-2021 school year. Twenty percent of district leaders who participated in an EdWeek Research Center survey reported their school was using a similar hybrid model as this site's model of using a staggered schedule with students in-person two or three days a week (Lieberman, 2020).

The parochial high school’s hybrid learning model divided students into two groups. Each group was required to come to the school building for in-person learning every other day and then attend school through virtual learning the other days. To prepare for the upcoming school year, Betty, an administrator at the parochial high school, spent the summer working with a subcommittee to map out the 2020-2021 school year (Interview). The [school system] “spent a ton of money, putting really nice cameras in all the classrooms so that the teachers could be teaching from really any spot in the room, so they could be seen on the camera during Zoom [sessions]” (Betty’s Interview). According to Lieberman (2020), “Some teachers find the new demands of hybrid instruction overwhelming, while others are more eager to adapt.” Six of the teachers interviewed at this site reflected that hybrid learning was difficult and challenging to engage half of the class in front of you while at the same time engaging half of the class through Zoom (Interviews, Marsha, Linda, Lisa, Michael, Kevin, & Carol). Looking back on the last year and a half, Lisa thought if she needed to pick between virtual learning or hybrid learning, she
would choose virtual learning because “I actually had just all the kids on one screen at a time, and I could interact with all the students, like, I felt like I had my full class when they were just all in one spot” (Interview). Only one of the teachers reflected on the benefits of the hybrid model and perceived it “allowed for some more individualized learning because we only had half the class every other day” (Interview, Brooke).

Even though teachers perceived the hybrid model as challenging, they found strategies that allowed them to work with the entire class, both in-person and virtually. One strategy was to “partner the Zoom kids up with the kids in the classroom, and they would do a lot of partner work” (Interview, Lisa). Another example of strategies that teachers found effective to support hybrid learning was to prepare “an activity like group activities that [he] could easily break out into breakout rooms on Zoom while simultaneously also having the students who were in front of me also do those activities as a group” (Interview, Michael). After discussing the benefits and challenges of hybrid learning, teachers reflected on their perceptions of the impact that both virtual and hybrid learning had on student learning.

**Reflecting on Virtual and Hybrid Learning**

Teachers provided their perceptions on the impact that virtual learning has on student learning. Overall, 76.9% of teachers perceived the pivot negatively impacted students’ virtual learning, and 15.4% of teachers perceived that students’ learning was positively impacted by virtual learning, while 7.7% of teachers perceived student learning stayed the same during the shift (Survey). Even though many teachers perceived that the pivot negatively impacted student learning negatively to virtual learning, they reflected positively on their instructional practices during virtual and hybrid learning.
During the interviews, teachers reflected on their experience with the pivot to virtual learning and shared this time’s impact on their instructional practices. Kevin expressed that he was “happy with what I did. I could have probably done some things better,” but he went on to state, “It was hard, I admit with pride, besides like my first-year teaching, [this was] my most difficult year teaching last year” (Interview). Another reflection of the two years of virtual and hybrid learning was from Marsha, who perceived virtual learning “was actually in some ways…a profitable professional experience because it really did force me way out of my comfort zone, and then [I] was just learning [new instructional strategies], all the way through that spring” (Interview). Both teachers could look back at the last two school years and see the changes to their instruction through integrating technology.

Case Study Analysis

This study examined teachers and administrators working at a parochial high school during the COVID-19 pandemic. This case study was a single case study given that it studied the actions of one school during their pivot to virtual learning. This single case study was bound by the phenomena of teachers who worked at this parochial high school during the COVID-19 pandemic, and the results allowed me to understand more fully the lived experiences of these teachers. I collected data through a survey instrument and semi-formal interviews of both teachers and administrators in this study.

The survey questions addressed two general categories: technology skills and shifts in teachers’ beliefs about technology integration during the pandemic. Due to the small number of study participants, my data analysis was descriptive in nature with no statistical comparisons. The semi-formal interviews were transcribed through the Zoom software, and I verified the transcript against the recorded interview for the analysis. The transcripts were reviewed, cleaned,
and uploaded to the Dedoose software for coding. I used both first- and second-cycle coding methods to code the data (Saldaña, 2013). The first-cycle coding included a priori coding using the TPACK framework’s six components: Technological Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Technological Content Knowledge (TCK), Pedagogical Content Knowledge (PCK), and Technological Pedagogical Knowledge (TPK). Additional codes emerged during the second-cycle coding. Table 5 identified the 21 codes selected during first-cycle coding and emerged during the second-cycle coding, arranged by the main codes first (parent codes) and then by sub-categories of the main codes (child codes). The final stage of data analysis was to look at each set of codes to develop themes.
### Table 5

**Summary of Codes**

<table>
<thead>
<tr>
<th>Parent code</th>
<th>Excerpts</th>
<th>Child code</th>
<th>Excerpts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedagogical Knowledge (PK)</td>
<td>14</td>
<td>Technology Plan</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technology Training</td>
<td>24</td>
</tr>
<tr>
<td>Content Knowledge (CK)</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technological Knowledge (TK)</td>
<td>17</td>
<td>Curriculum training</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technology in the classroom</td>
<td>18</td>
</tr>
<tr>
<td>Pedagogical Content Knowledge (PCK)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technological Content Knowledge (TCK)</td>
<td>9</td>
<td>Pedagogy training</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shifts in instructional practices</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technology integration</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technology integration definition</td>
<td>10</td>
</tr>
<tr>
<td>Technological Pedagogical Knowledge (TPK)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Barriers to technology integration</td>
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<tr>
<td>Pivot to virtual learning</td>
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<td>Hybrid learning</td>
<td>13</td>
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<td></td>
<td></td>
<td>Training during pivot to virtual</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>learning</td>
<td></td>
</tr>
</tbody>
</table>

*Note: This table shows parent and child codes that emerged from the interview data and the number of excerpts from each.*
**Research Sub-Question 1**

The four major themes that emerged through data analysis addressed the research question, *How do high school teachers integrate technology in their classroom?* were: (a) training to integrate digital resources, (b) recounting the benefits of technology integration, (c) leveraging the power of technology uncertainty if integrating technology informs student learning, and (d) uncertainty if integrating technology informs student learning. The following sections provide an in-depth review of each sub-theme.

Teachers’ technology-related skills and comfort level play an essential role in their ability to integrate technology. On the survey, teachers indicated tasks they regularly complete using a computer. Table 6 provides the data analysis results for the types of tasks teachers complete on the computer.

**Table 6**

*Types of Tasks Completed Using Computers*

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Percentage of Teachers who use a Computer for Each Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gradebook</td>
<td>13</td>
<td>100%</td>
</tr>
<tr>
<td>Resources for Teachers</td>
<td>13</td>
<td>100%</td>
</tr>
<tr>
<td>Resources for Students</td>
<td>12</td>
<td>92.3%</td>
</tr>
<tr>
<td>Word Processing</td>
<td>12</td>
<td>92.3%</td>
</tr>
<tr>
<td>Communication</td>
<td>11</td>
<td>84.6%</td>
</tr>
<tr>
<td>Assessing Data</td>
<td>11</td>
<td>84.6%</td>
</tr>
<tr>
<td>Research</td>
<td>10</td>
<td>76.9%</td>
</tr>
<tr>
<td>Planning and Organization</td>
<td>10</td>
<td>76.9%</td>
</tr>
<tr>
<td>Assessment</td>
<td>9</td>
<td>69.2%</td>
</tr>
<tr>
<td>Calendar</td>
<td>7</td>
<td>53.8%</td>
</tr>
</tbody>
</table>

*Note:* The table provides the number and percentage of teachers who use computers to complete specific tasks at the parochial high school (Survey).
On the survey, teachers indicated that they used a computer to complete many of the tasks needed for instructional purposes, such as: (a) using an online gradebook (100%), (b) looking for digital resources for teacher use (100%), (c) finding digital resources to support student learning (92.3%), and (d) using the computer for word processing (92.3%). Many teachers also used a computer to: (a) communicate with stakeholders (84.6%), (b) assess data for analysis (84.6%), (c) researching for both students and teachers (76.9%), and (d) planning and organizing for instruction (76.9%). A few teachers reported using a computer to create assessments (69.2%) and using a digital calendar (53.8%). Teachers’ responses to using a computer to find resources for both their instruction and student learning may have been higher as a result that the parochial high school provided professional development to support teachers in learning the resources needed for the pivot to virtual learning.

Training for Teachers to Integrate Digital Resources. Professional development and training are ways for teachers to learn how to integrate technology into their curriculum. On the survey, teachers shared the types of training that assisted them with using and integrating technology in their classrooms, citing professional development (52.1%) as the most common type of training, with workshops and conferences (30.4%), graduate courses (13.0%), and pre-service training (4.3%) rounding out the other sources of training (Survey). The parochial high school had not focused professional development on integrating technology prior to the pivot to virtual learning. The administrators at this site asked teachers who had knowledge of various digital resources to provide informal professional development for colleagues to help them transition to the pivot to virtual learning. Another support for teachers to pivot to virtual learning was understanding technology integration.
When teachers pivoted to virtual learning in March 2020, they were required to integrate technology to instruct students virtually. Thus, at the beginning of the pandemic, teachers may have begun integrating technology without truly understanding the importance of integrating technology in the classroom or being able to define technology integration. During the interviews, I asked administrators and teachers to reflect on how they would describe technology integration. Teachers' answers varied, but all descriptions focused on student learning. Teachers defined technology integration as: (a) "the tools of technology that enhances the curriculum or enhances the learning experience for the students" (Interview, Betty), (b) "a different way of getting information across to the student rather than the traditional" (Interview, Linda), (c) "use of the tools and resources available to us to better engage and teach our subject to our students" (Interview, Michael), and (d) "technology as a tool to integrate learning in a new [and] different way with the kids" (Interview, Carol). While still focused on engagement, Brooke also addressed the ability to individualize learning for students through technology and perceived that integrating technology had allowed her to “shift towards that personal engagement” (Interview). Integrating technology did not simply replace what teachers were already doing with technology. It enhanced the curriculum as described by Marsha, who perceived "using technology to enhance the instruction, not replac[ing] necessarily and making sure that I keep up with where the students are and how they are learning" (Interview). Engaging students, differentiation, and enhancing the curriculum were three benefits of integrating technology mentioned in the interviews. Teachers recounted other benefits of technology integration and provided examples.

**Recounting the Benefits of Technology Integration.** Throughout the interviews, teachers and administrators recounted the benefits of integrating technology which included: (a) video resources, (b) differentiation, (c) project-based learning, and (d) collaborative learning; and
gave examples of using technology integration to engage students and inform learning. Mary described the benefits for "visual learners" or "students that just are not quite getting it." Her perception was that "having access to different digital sites and resources that brings it to life for [students], it definitely helps." Mary expanded, "You can explain something so many times, but when you have this video that you can bring into it and show them like this is how it works” (Interview). Just as teachers had professional development to learn how to use new online resources, students also needed time to learn new resources. Brooke reflected on this need for time to learn new instructional practices when she explained, "If it is modeled appropriately and then they are guided through that process, I think it can be really effective." She gave an example of facilitating students in writing a blog. Instead of saying, "Write a blog on this link, you are going to have 10 minutes to do it," she “model[ed] for them how to produce engaging blogs” (Interview). Integrating technology into the curriculum can allow teachers to individualize the curriculum for students as Marsha, who uses the resource ‘No Red Ink’ to differentiate instruction. Marsha described, “If I am using [No Red Ink] to enhance [student] grammar learning and it paces it for them, I am able to differentiate levels [by having students] use that website” (Interview). Teachers explained the importance of integrating technology for student learning and provided examples of how they integrated technology to support learning.

Integrating technology allowed teachers to continue the learning process outside of the classroom. Lisa gave an example of when she integrated technology during group work to complete a lab report. Instead of having students write out a lab report, Lisa has them work in groups to complete a Google Slidedeck, which is essentially a virtual notebook where they can add graphs or analyses. She said that technology “allows [students] to work together in the classroom, outside of the classroom” (Interview). The flipped classroom model where students
review course content online for homework and work on problems, discussions, or a project in the classroom was another example of an approach that showed the benefits of technology integration (Klein, 2021). William explained that when he used the flipped classroom model, he instructed students to "take a look at it for homework, maybe make some comments, and we are going to come in and do some problems" (Interview). Websites such as Khan Academy provided videos that could be used as an additional resource to introduce a topic or provide additional instructions on a topic (Survey). These examples demonstrate how integrating digital tools has the potential to engage students and inform learning by providing individualized instruction and resources that support student learning.

Brooke’s unit on kingship was a rich example of how a previously taught unit through lecture can integrate technology to allow students to be an integral part of the learning process and take ownership of their learning. She began by spending one class period introducing the topic and giving students foundational information. The next step was to “break the students into partners, and together each student partner pair was assigned one king.” The student groups “become the expert in that king” during the following two class periods. During this time, the student groups were “really getting to know one king, and then they bring to life their king for us as a class through a movie or a video or Canva presentation.” During the planning of this unit, Brooke determined how to assess mastery of learning and provided an opportunity where students “have learned something about the topic that will last with [them] and they will be able to hold on to while also having them tangibly make or do something utilizing the resources that we have with technology” (Interview). Students had the opportunity to work collaboratively and took on the teacher’s role by presenting their information to their class. Integrating technology allows students to show mastery of the content in many different ways.
Leveraging the Power of Technology. Teachers demonstrated how to integrate technology through their examples and reflected on the benefits and importance of integrating technology into the curriculum to inform student learning. Technology integration allowed all types of learners to show mastery of content in the ways they are most comfortable. Since not all students were comfortable standing in front of a class, technology allowed the introverted students to "create beautiful videos and beautiful slideshows and really illustrate a topic in a way that [the teacher] would never be able to do. It lets their voice be shown” (Interview, Brooke). Brooke went on to explain, “You are not limited to what the book in front of you is saying and the piece of paper saying” (Interview). Teachers were not the only ones to express the benefits of using technology. Mary, one of the parochial high school administrators, also supported this notion, explaining that technology integration is important because it “brings education to life for the students and makes it more accessible, and [technology] allows us to do more” (Interview). Leveraging the power of technology as a tool for engagement can be particularly beneficial, as Marsha reflected:

It is essential in these this day and age, because again if I want to, I am speaking from experience [as] I teach seniors, so that is a difficult age to keep engaged, and if I am not using the latest tools, I run the risk of losing them [by] not replacing classical teaching. I need to keep it fresh and keep them interested and get them ready for what they are stepping into in terms of their college and in terms of their job market” (Interview).

Students seemed to be more engaged in learning when they could take ownership of their learning. Brooke noted that “there is so much that students can explore with technology that they can take more ownership of their learning” and technology “benefits [the students’] learning experience[s]” (Interview). In addition, technology allowed students to show mastery of content
using their strengths. David shared that when a student asks a question, classmates can locate an answer and present the information to the class instead of the teacher taking responsibility for providing the answer. An example was when a student asked a question in class; instead of the teacher looking up the answer, the students connect their device to the Apple TV to find the answer together (Interview, David). In this case, technology had the potential to elevate students’ abilities to participate more actively in seeking answers to their questions (Interviews). While many teachers provided rich examples of integrating technology to engage students and inform learning, a few of the teachers shared concerns about integrating technology. A few teachers were not sure if technology informs student learning.

Uncertainty if Integrating Technology Informs Student Learning. While many teachers saw the benefits and importance of integrating technology to inform learning, two teachers were unsure that technology integrations play a role in increased student learning. One of the teachers did not “think [technology integration] increases student learning that much” (Interview, Kevin), and another teacher was unsure. She stated:

[I am] kind of on the fence on [whether technology plays a role in increased student learning]\a little half [on one side half on the other] just because I try to use it as much as I can because I know our students are going to go into a workforce that is going to require them to use technology but I am also concerned that sometimes that having it be a free for all tends to limit how much I can control in the classroom." (Interview, Lisa)

Even though Lisa and Kevin were not sure how much integrating technology increases student learning, they have continued to use it in their lessons when there is a purpose (Interview). Even teachers who had concerns with integrating technology reflected on the ways their instructional
practices have changed since the pivot of virtual learning. In the following section, I will address sub-question 2.

**Research Sub-Question 2**

The three major themes that emerged through data analysis which addressed the research sub-question, *How do high school teachers perceive their beliefs about technology integration to increase student learning and how these beliefs might have shifted during the pandemic?* were: (a) reflecting on integrating technology, (b) managing internet issues and other technology concerns, and (c) going back to pre-COVID-19 instructional practices. The next sections provide an in-depth review of each sub-theme that addressed sub-question two.

In August 2021, when this parochial high school teachers returned to in-person teaching, they reevaluated their instructional practices. During the interviews, teachers reflected on how they integrated technology prior to the COVID-19 pivot to virtual learning and how they currently integrate technology. Teachers had spent almost a year and a half providing virtual instruction to students. On a 5-point Likert scale ranging from uncomfortable (1) to comfortable (5), teachers were asked to rate their comfort level with online programs and resources (Table 7).
### Table 7

*Teachers’ Comfort Level with Online Programs and Resources*

<table>
<thead>
<tr>
<th></th>
<th>Extremely Comfortable</th>
<th>Somewhat Comfortable</th>
<th>Neither Comfortable nor Uncomfortable</th>
<th>Somewhat Uncomfortable</th>
<th>Extremely Uncomfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using a learning management system (LMS)</td>
<td>69.2%</td>
<td>30.8%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Using Google Documents</td>
<td>84.6%</td>
<td>15.4%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Using Online Resources</td>
<td>23.1%</td>
<td>38.5%</td>
<td>30.7%</td>
<td>7.7%</td>
<td>0%</td>
</tr>
<tr>
<td>Creating online activities for students</td>
<td>53.9%</td>
<td>23.1%</td>
<td>15.3%</td>
<td>0%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Using video conferencing software</td>
<td>69.2%</td>
<td>30.8%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

*Note: This table provides data on teachers’ (N=13) comfort levels with specific online programs and resources. All teachers reported being either somewhat or extremely comfortable using a learning management system, Google Documents, and video conferencing software, as many of the teachers used all three of these online programs during periods of virtual learning. During the pivot to virtual learning, teachers used the learning management system the school provided to post assignments and provided online instruction using Zoom sessions. The continual use of these online programs may have influenced teachers’ comfort levels. Yet, only 61.6% of teachers*
reported that they were somewhat or extremely comfortable using online resources, while 77% of teachers have created online activities for students (Survey). Not all teachers reflected on using digital resources, which may explain the lower percentage of teachers who were comfortable using online resources. Using digital tools over the past two years, many teachers have become familiar with the technology they may not have been familiar with prior to the pivot to virtual learning, which might have increased their comfort level. As teachers reflected on their instructional practices of the last two years, they evaluated the shifts that may have occurred through the pivot to virtual and hybrid learning.

Seven of the teachers noticed a change in their instructional strategies regarding technology integration. Administrators, such as Betty, also "noticed the people that got good at it quickly, stayed last year and really the ones that were here last year really tried continuously to improve what they had learned, so they are still the in-house experts" (Interview). Two of the teachers who perceived a change in their instructional practices and use of technology in the classroom were not using technology often prior to the pivot to virtual learning. Linda noted she “uses [technology], like every day…now, [she has] not gone back [to her pre-COVID-19 strategies]” (Interview). Marsha reflected, “The silver lining of it all was it forced a lot of us who were veteran teachers to push out of that comfort zone…I am a better teacher now actually because of [virtual learning]” (Interview). Throughout the interviews, teachers reflected on the ways they integrate technology in their classrooms.

**Reflecting on Integrating Technology.** After experiencing the pivot to virtual and hybrid learning, some teachers saw the benefits of integrating technology and reevaluated their instructional practices. Marsha reflected on the technology tools she learned and used during the pivot to virtual learning and went on to say, “I can use [technology] more effectively because [it
is] augmenting my teaching rather than replacing some aspects of it” (Interview). Marsha was not using technology prior to the pivot to virtual learning and recounted that the first time she had heard the word Zoom was the Wednesday prior to the pivot. She invested the time at the beginning of the pivot to virtual learning to learn how to use the digital resources and realized the benefit of integrating technology may have on student learning. She is now committed to integrating technology in meaningful ways to engage students.

Teachers reflected on how they were integrating technology through one of the survey questions. They were given five statements regarding technology and asked to mark all that were true regarding their perceptions of technology integration before and during the COVID-19 pandemic or to indicate that the statement was false (Table 8).

**Table 8**  
*Perceptions Towards Technology Integration*

<table>
<thead>
<tr>
<th>Statement</th>
<th>Before the COVID-19 pandemic*</th>
<th>During the COVID-19 pandemic</th>
<th>This statement is false.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrating technology is a teacher expectation at the school.</td>
<td>84.6%</td>
<td>84.6%</td>
<td>0%</td>
</tr>
<tr>
<td>Integrating technology in lessons increases student learning.</td>
<td>53.8%</td>
<td>61.5%</td>
<td>25.4%</td>
</tr>
<tr>
<td>Technology integration allows students to take ownership of their learning.</td>
<td>53.8%</td>
<td>46.2%</td>
<td>30.8%</td>
</tr>
<tr>
<td>Integrating technology in lessons engages students in learning.</td>
<td>84.6%</td>
<td>61.5%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Students overuse technology and need to do more paper and pencil activities.</td>
<td>61.5%</td>
<td>53.8%</td>
<td>23.1%</td>
</tr>
</tbody>
</table>
**Note:** This table describes teachers’ perceptions toward technology integration across five categories divided by ‘before the COVID-19 pandemic,’ ‘during the COVID-19 pandemic,’ or ‘this statement is false.’

*The data results in the “before the COVID-19 pandemic” are teachers’ recounting their perceptions toward technology integration pre-COVID-19.

In her interview, Mary, an administrator, explained that using technology “was not mandated, but [teachers] were definitely encouraged to use it” (Interview). This was not reflected in the survey data as 84.6% of teachers perceived integrating technology was an expectation of administration. All teachers were using technology daily during periods of virtual learning, which was different prior to the pivot that might explain the increase in teachers’ perceptions that integrating technology in lessons increases student learning. Teachers could not monitor students during virtual learning the same way they did when students were physically in front of them. Monitoring students could explain the decline in perceptions around engagement and ownership of learning during the COVID-19 pandemic. During the interviews, teachers mentioned that they stopped using paper and pencil assessments during virtual learning and have not gone back to using them (Interviews, Marsha & Linda). Examples such as this aligned with the survey that many teachers (53.8%) did not perceive students needing to complete activities using paper and pencils (Survey). During the interviews, teachers reflected on pre-COVID-19 instruction and compared it to the instructional practices they were currently using.

For instance, Kevin used to show video clips and stated that "even back in the VCR days, you showed a clip that was technology, technically 25 years ago," noting that he had "definitely use[d] [technology] more in the last year and a half than [he] had ever [used technology before]." Some teachers acknowledged that they had not moved entirely to integrating technology. David
explained, "I think I have become more open to trying it and doing it, and I still kind of [integrate technology]" (Interview). Other teachers, like Lisa, expressed that the shift to virtual learning had informed current teaching practices. “During COVID, it really had us take a deep dive to find some of these resources. I have kept some of [the resources she used during the pivot to virtual learning]” (Interview, Lisa). The interviews provided teachers the time to stop and reflect on the last two years of teaching and find positive moments.

Marsha posited that the new instructional strategies she learned through the pivot to virtual learning had given her the “luxury” of deciding the best way of teaching a concept. As she plans lessons, she now considers, “Is it best presented through technology?” or “Is it best presented old school?” (Interview). An example of this is when she teaches a unit on *The Great Gatsby*. Instead of the students and teacher reading the entire book aloud, Marsha will split up the reading by having the students watch a part of the movie or will listen to a section of the book through a YouTube recording. When students are reading from the book, they prefer the hard copy rather than the pdf available on the learning management system the school was using (Interview). Kevin, for instance, perceived himself as an “old school,” “pen and paper guy” but went on to say that he “definitely have now learned [technology], all right.” He continued by reflecting that he “had definitely changed, [he is] using [technology] more, and trying to integrate [technology].” Kevin explained that he does not “necessarily agree with [using technology] but [students] all have these computers, so [he is] trying to come up with ways to [integrate technology]” (Interview). Kevin explained that it could be challenging to ensure that students are on-task on their devices, but he was finding meaningful ways to integrate technology. Although Kevin refers to himself as “old school,” he is trying to use digital tools more in the classroom to increase student learning.
Teachers reported that the pivot to virtual learning paused many teachers’ traditional pedagogical practices. Now students can show mastery of content through a presentation instead of taking a paper and pencil assessment. Another example is in a world language course, to show acquisition of the new language, students record themselves speaking the language at home instead of standing in front of the class (Interview, Linda). Once teachers had all their students in the classroom together, they needed to decide if they would return to their pedagogical practices used two years ago or continue to expand on the practices they had used during virtual and hybrid learning. For example, Brooke reflected on past instructional practices of teachers who perceived that they were responsible for providing all the information to students. She stated that teachers "do not have to be the source for everything because we are not always going to be there" and that teachers can "empower [students] to take charge of their learning." Brooke continued to say that integrating technology can “benefit [students] learning experience” (Interview). Another benefit of the pivot to virtual learning was that teachers began to integrate Puente durá’s (2013) SAMR model. Marsha referred to the model when she recalled that she "can use [technology] more effectively, because [technology integration is] augmenting my teaching rather than replacing some aspects of it, and I can pick and choose [the] technology to use” (Interview). Lisa also referenced components of this model when she cited that technology should not be used just for the sake of using it but "needs to be used with a purpose to either enhance formative assessment or a tool that helps them learn another way” (Interview). Many of the teachers’ examples reflected the replacement and augmentation levels of the SAMR models.

Several teachers spoke about their decision to change how they give student assessments because of their time teaching in a virtual learning environment. For example, Michael perceived his teaching practices had changed significantly and that he had not "made copies all year.”
When talking about the changes he made with assessments, he shared that he is “a lot more comfortable with [creating] an assessment that [students] can do on their Macbooks.” One of the ways that Michael changed his assessments was by having students create presentations. While elaborating on this, he noted the changes to students' technology skills and that their “capacity has grown a bit being able to embed a video into a PowerPoint or even put themselves in their presentation” (Interview). Similarly, Linda perceived that her instructional practices with the integration of technology had “definitely” changed since pre-COVID-19. At the beginning of our interview, she was experiencing internet connectivity issues and moved several times before she had a strong enough connection to continue the interview. When asked if this deterred her from using technology in her lesson, she explained that she plans every lesson to incorporate technology and felt strongly about using it. She recalled that “before [COVID-19 pivot to virtual learning] I did the traditional paper-pen tests, [now that teachers are back in school] I continue to use [technology]” (Interview). She gave an example of how her instructional practices have changed:

Normally [before the pivot to virtual learning], it was me standing in front of the classroom saying something, and then I would give [students] the comprehension questions. I found Flipgrid, where students could record themselves so that I could hear them speak. I found a lot of [digital resources] I did not [use] before. I definitely use [technology], like every day. I have not gone back [to my instructional practices pre-COVID]; a lot of my stuff is online now.

Teachers were not the only ones who saw a difference in their instructional practices since they started using technology more during their lessons. Betty, an administrator at the parochial high school, thought “[teachers] want to continue [to integrate technology], and they
liked the results of using [technology].” She stated that teachers want to continue integrating technology because “they have seen results with the [digital tools] that they know that the kids like” (Interview). When reflecting on the changes teachers made after the pivot to virtual learning, Mary, another administrator at the parochial high school, noted that "some of the teachers have realized like this actually helps a lot, so they continue to do it now." She also noticed that "some of those teachers who were not very comfortable with the technology before hav[e] kind of reverted" (Interview). The administrators identified teachers in three categories: (a) teachers who were using technology prior to the pivot to virtual learning and continue to use technology now that the parochial high school has returned to in-person learning, (b) teachers who were not using technology prior to the pivot to virtual learning but show the impact that technology had on student learning and now that students are back to in-person learning continue to integrate digital tools in their learning, and (c) teachers who were not using technology prior to the pivot to virtual learning and have reverted to their traditional pre-COVID-19 instructional strategies. Teachers reflected on the changes they have made in their instructional practices and discussed barriers they need to consider when integrating technology into their curriculum.

Managing Internet Issues and Other Technology Integration Concerns. Teachers described barriers they faced when integrating technology in their classroom. Research has identified two types of barriers to technology integration: first-order and second-order barriers. Internet access was considered a first-order barrier mentioned by five teachers as being an issue at the school (Ertmer, 1999; Hew & Brush, 2007; Kopcha, 2012).

Connecting to the Internet Concerns in the Classroom. When teachers were asked if there were any barriers to integrating technology, they shared their concerns about internet-connectivity issues. During her interview, Linda experienced internet-connectivity issues. The
teacher moved twice in the classroom and then walked down the hall looking for a place to
continue the interview where the internet connection would be more substantial. She was able to
find a place in the faculty lounge to continue the interview. Linda mentioned, ”Wi-Fi is horrible
here. It is very frustrating.” Carol agreed that connection issues “are something that we face a lot
of the time” (Interviews, Linda & Carol). Marsha commented that internet issues happen daily:

If I wrote a book on teaching, what would I call it? It was like having a plan B. So, you
know, there have been times when I had been scrambling because my lesson was
predicated upon having a piece of technology. It did not work, so that is when pens and
paper and books are still good. (Interview)

Lisa predicted that the parochial high school’s internet issues resulted from the school’s
infrastructure being incapable of supporting 1000 devices simultaneously. She went on to
mention that “it is most frustrating when you are trying to use something and excited about using
it, and then when it is not working it leads to frustration, and then the kids cannot get on it [and]
are frustrated” (Interview). In a follow-up question, the teachers said the Internet issues do not
dissuade them from integrating technology but that they usually have a backup plan ready to
prevent a teaching disruption. Brooke mentioned that “internet issues at home could be a barrier
for students during virtual learning” (Interview). While internet concerns were the main barriers
teachers mentioned, they also discussed other concerns such as classroom management.

Managing Computer Devices in the Classroom. Internet connectivity was the main
barrier to technology integration mentioned by five teachers. However, teachers also mentioned
other barriers, such as students not having their devices charged, broken devices preventing
students from using their computers, and missing software on student devices (to monitor
students while on the internet). Classroom management issues were another barrier that two of
the teachers mentioned. Lisa was concerned that “it being a free-for-all tends to limit how much [she] can control in the classroom. [She has] 34 students on 34 Macbooks tends to lead to off-tasks, off-topic” (Interview). In addition, while students returned to the school building full time this year after being home during the pivot to virtual learning (March 2020-September 2020) and then continued to learn from home on a rotational basis during hybrid learning (September 2020-June 2021), both teachers and administrators raised concerns about students’ social development as a result of virtual and hybrid learning.

**Needing Social Interactions in the Classroom.** The last concern that participants mentioned during the interview were students’ need for social interactions in the classroom. While the social aspect of school may not be a direct barrier to technology integration, it has created concerns related to the overuse of technology in the last two years. On March 16, 2020, students completed the remainder of 2019-2020 at home. Some of their coursework was completed during Zoom sessions, while completing other coursework asynchronously and independently. The parochial high school was hybrid for the entire 2020-2021 school year, where students were only face-to-face with half of their classmates at a time. At the beginning of the 2021-2022 school year, as students returned to the building full-time, the administration encouraged teachers to reduce the amount of technology used in the classroom. Betty reflected on this decision to “give a little more face time to each other and just the building relationships in the classroom having the group discussions you know back to hands raising and communicating and sharing” (Interview). Teacher comments seemed in line with a researcher who said social interaction at school is important for developing social and interpersonal skills (Rubin, 2020). According to Wolfman-Arent, students learn to follow the rules and solve school problems in the classroom (2021). Linda mentioned the student behavior changes seen this year in the classroom,
and David mentioned that this year’s freshmen were in sixth grade during their last full year of in-person learning, “so some of them still socially have that kind of mentality” (Interview). The social aspect of the COVID-19 pivot to virtual learning and the impact of technology is an area that is still evolving in research, but this study has brought to light an area of concern.

Going Back to Pre-COVID-19 Instructional Practices. As teachers reflected and compared their instructional practices now to their instructional practices prior to the shift to virtual learning, not all teachers noted a change. While Marsha has made some changes to her instructional practices, one thing that has not changed because of her teaching beliefs is having students take notes on paper instead of using the computer. She feels that students retain more information when using pen and paper to take notes (Interview). Two teachers reflected that their use of technology has not changed since the pandemic. Carol had “gone back more to pre-pandemic technology use” as students have been “so saturated with [technology], that [she has] really tried to go back to a lot of pen and paper a lot of times." Specifically, she had periods that were "lids down, and we are writing or talking or discussing during class." Carol said she now uses technology only "when necessary, needed, or it enhances whatever we are doing" (Interview). Similarly, Lisa described her technology integration as “very limited, I used it mostly for formative assessment purposes, and then I would use it to really just [to] post resources for students” (Interview, Lisa).

Summary of Findings

This chapter introduced and discussed my findings from this single case study bound by the phenomena of teachers and administrators who worked at one parochial high school during the COVID-19 pandemic. Seven themes emerged after first and second cycle coding. The first four major themes were: (a) training to integrate digital resources, (b) recounting the benefits of
technology integration, (c) uncertainty if integrating technology increases, and (d) leveraging the power of technology that answered the first sub-question. The last four major themes were: (a) reflecting on integrating technology, (b) going back to pre-COVID-19 instructional practices, and (c) managing internet issues and other technology concerns which answered the second sub-question. While the results are not generalizable to other locations and are specific to the site of this study, some of the findings from this study can be generalized to the larger population of teachers at this specific school. The next chapter will summarize the study and a discussion of the results. It will also consider the application of conceptual frameworks to findings, limitations of the study, methodology, analysis, generalizability, implications for educational practice, and recommendations for future educational research.
Chapter V: Discussion

In March 2020, teachers across the United States needed to quickly integrate technology as schools pivoted to virtual learning as a result of the COVID-19 pandemic. Even though school administrators had encouraged them to integrate technology into their curriculum for years (Morgan, 2020), many teachers had not yet fully embraced technology integration at this time. Thus, in order to provide the least amount of disruption to students’ learning, teachers integrated technology daily to instruct students, and they no longer had a choice when or if they integrated technology - even if it did not align with their beliefs (van der Spoel et al., 2020). This study sought to examine how the pandemic has shifted teachers' beliefs about technology integration as an effective means to inform learning. This single case study design considered the shifts in teachers' beliefs about technology integration which may have resulted from the pivot to virtual learning during the COVID-19 pandemic.

Summary of Study

A primary research question and two sub-questions guided this study. The primary research question of this study was: *How has the pandemic shifted teachers’ beliefs about integrating technology as an effective means to inform student learning at one school?* The study also included two sub-questions to gain greater insight into the shifts in technology skills, teachers’ beliefs, and instructional practices of the participants at this parochial high school:

1. How do high school teachers integrate technology in the classroom?
2. How do high school teachers perceive their beliefs about technology integration to inform student learning and how these beliefs might have shifted during the pandemic?

A case study was the method used in this study which Yin (1994) defined as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially
when the boundaries between phenomenon and context are not evident” (p. 13). This case study was bounded by the phenomenon of one event when one school pivoted to virtual learning (Creswell & Guetterman, 2019). I collected data through a survey instrument and semi-structured interviews to look at the tensions between teachers' beliefs and integrating technology which aligns with the conceptual framework of using Mishra and Kohler's (2006) TPACK framework to support teachers in integrating technology into their curriculum.

During Phase I of the study, data collected from 13 full-time classroom teachers through a Qualtrics survey was uploaded to SPSS for analysis. Teachers who completed the survey met the criteria of being employed at the school since the 2019-2020 school year and were also invited to participate in Phase II of the study. Ten teachers and two administrators participated in the Phase II 30–40 minute semi-structured interviews. I transcribed, cleaned, and then sent the semi-structured, Zoom-recorded interview transcripts to participants for member checking. In addition, teachers and administrators had the opportunity to share artifacts pertinent to the pivot to virtual learning to support reflections shared during the semi-structured interview. Phase II data was coded in Dedoose using first- and second-cycle coding (Saldaña, 2013). During the first-cycle coding, the predetermined codes, referred to as a priori coding (Saldaña, 2013), were the six components of the TPACK framework: Technological Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Technological Content Knowledge (TCK), Pedagogical Content Knowledge (PCK), and Technological Pedagogical Knowledge (TPK) (Mishra & Kohler, 2006). During the second cycle of coding, codes were added that provided more insight into technology integration, such as professional development, teachers' definitions of technology integration, and examples. I triangulated data by comparing data from the survey, semi-structured interviews of teachers and administrators, and artifacts. After the first and second
cycles of coding, seven themes emerged after first and second cycle coding. The first four major themes were: (a) training to integrate digital resources, (b) recounting the benefits of technology integration, (c) uncertainty if integrating technology increases, and (d) leveraging the power of technology that answered the first sub-question. The last four major themes were: (a) reflecting on integrating technology, (b) going back to pre-COVID-19 instructional practices, and (c) managing internet issues and other technology concerns which answered the second sub-question.

The themes highlight how the teachers at one parochial high school experienced virtual and hybrid learning during the 2019-2020 and 2020-2021 school years as a result of the COVID-19 pandemic. These themes also highlight the main shifts in teachers' beliefs regarding technology integration, evidenced by their instructional practices in regard to the integration of digital tools in the classroom during the 2021-2022 school year.

**Applications of Conceptual Framework to Findings**

The conceptual framework shows the tensions teachers may have between integrating technology in the classroom through implementing the TPACK framework and their beliefs (see Figure 6). Teachers did not have a choice but to integrate technology during periods of virtual and hybrid learning, which may have created a tension between their beliefs and integrating technology. Teachers who had not integrated technology prior to the pivot to virtual learning and reverted to pre-pandemic instructional practices may indicate that their teacher beliefs did not align with integrating technology and may have experienced tension between those beliefs and integrating technology during periods of virtual and hybrid learning. Teachers integrating digital tools in their instruction prior to the pivot to virtual learning and continuing to integrate technology might indicate no tensions between their beliefs and integrating technology. Those
teachers who were not integrating digital tools prior to the pivot to virtual learning but are now integrating technology since the pivot to virtual learning might indicate a shift in their beliefs which might alleviate the tensions they had previously had between their beliefs and integrating technology.

Figure 6
Conceptual Framework Revisited

Note. This figure displays the tension between teacher beliefs and the TPACK framework, designed to support teachers in integrating technology into their curriculum. The illustration is reproduced and adapted by permission of the publisher, © 2012 by tpack.org.

Understanding teachers' beliefs provide insight into teachers' instructional practices and technology integration (Hsu, 2016). Teachers reported that they continued to do some traditional activities, such as taking notes, because of their teacher beliefs which shows tension between their beliefs and integrating technology. The findings show teachers’ choices made in integrating technology, and I made inferences by analyzing the shifts in their instructional practices.
Conceptual Framework Used During Analysis

During the first-cycle coding analysis process, I used the conceptual framework to support \textit{a priori} coding. The six predetermined codes were the components of the TPACK framework. Using \textit{a priori} allowed themes to arise that would align with the TPACK framework because the predetermined codes connected to technology integration. Connections to the TPACK framework emerged during coding with a clear focus on four of the components: (a) Technological Knowledge (TK), (b) Pedagogical Knowledge (PK), (c) Technological Pedagogical Knowledge (TPK), and (d) Technological Pedagogical Content Knowledge (TPACK). The data provided insight into how teachers implemented TPACK through examples of using digital tools and students using technology for research and presentations. Codes that were identified but that were not common themes were: (a) pedagogical knowledge (PK), (b) content knowledge (CK), and (c) pedagogical content knowledge (PCK).

The themes that emerged through the coding provided insight into how teachers-participants align their instruction to the TPACK framework. The focus of this study was on technology integration, and the questions in the survey and interviews provided insight on how teachers are integrating technology and not what they were integrating, which produced little data to analyze the content teachers were using. Teachers spoke about needing a purpose for technology integration and perceived that it did not add value to use digital tools solely to use technology. Teachers looking for a purpose in integrating digital tools demonstrated the connections of lesson planning filtered through their beliefs and the tensions they might have felt if they do not see the value in integrating technology in their instruction.
**Teacher Beliefs and the Conceptual Framework**

Teacher beliefs inform instructional practices and give insight into their decisions regarding technology integration (Hsu, 2016; Kim et al., 2013). Teachers' beliefs may not change unless these beliefs are challenged (Pajares, 1992). Teachers who were not integrating technology prior to the COVID-19 pivot to virtual learning may have grappled with a tension between their traditional instructional practices regarding technology integration and the new need for integrated technology to continue student instruction. Researchers found a connection between teachers' perceptions of their technology competencies and how often they integrated technology in their classroom (Christensen, 2002; Ertmer & Ottenbreit-Leftwich, 2010; Li et al., 2019). This connection directly aligns with the tension between teacher beliefs and the TPACK framework in the conceptual framework.

**Review of Findings**

Technology integration can create an effective educational environment (Aycicek & Karafil, 2021). Integrating technology into the curriculum can engage students and inform learning (Angers & Machtmes, 2005). This case study collected teacher accounts of the COVID-19 pivot to virtual learning and the use of technology in their classrooms during the 2021-2022 school year. The three significant findings in this study were: (a) teachers’ technology integration, (b) internet connectivity barriers, and (c) shifts in teachers’ beliefs toward technology integration to inform student learning.

During the analysis phase of the study, the challenge to measure teachers’ beliefs became increasingly evident (Ottenbreit-Leftwich et al., 2010). Researchers conclude that teachers' beliefs could be observed by seeing the instructional practices used in the classroom (Chen, 2008; Ertmer, 2005; Pajares, 1992). Researchers have shown that teachers' pedagogical beliefs
align with the strategies they use in the classroom (Ertmer & Ottenbreit-Leftwich, 2010; Li et al., 2019). Therefore, teachers’ behaviors can be compared to past behaviors to measure the changes. During the interview, only one teacher specifically stated that it was because of her teachers’ beliefs that she chose to continue to use a traditional method of taking notes with pen and paper instead of having students use a digital tool to take notes which showed her pedagogical beliefs in this one aspect remained the same (Interview, Marsha). However, some teachers reported that they had not begun integrating technology in their classrooms prior to the pivot to virtual learning, suggesting their pedagogical beliefs did not align with integrating technology. By examining how teachers are currently integrating technology in their classrooms and interviewing them on their use of digital resources prior to the pivot to virtual learning, I gained insight into the possible shifts in their beliefs.

**Teachers Technology Integration**

Technology integration refers to the reliance on technology for lesson delivery (Bauer & Kenton, 2005). The teachers and administrators at the parochial high school described technology integration as using digital tools that enhance learning in different ways. While the description of technology integration varied amongst teachers and administrators, the common themes were student: (a) learning, (b) engagement, and (c) ownership. Integrating technology goes beyond using technology during instruction but entails teachers using digital tools in meaningful ways to support student learning. Many of the examples teachers gave on the ways they integrate technology as an enhancement of the curriculum was represented in the SAMR model using the first two components of substitution and augmentation. For instance, one participant gave an example of substitution when they removed a test or quiz and had students use digital tools to complete a group project that showed mastery of the content. Another
teacher’s example demonstrated the transformation level of the SAMRs model when she modified a unit of study by having students research a topic in groups and then, through technology, present their findings to the class.

During the study, most teachers at the parochial high school provided examples of how they integrate digital tools in the curriculum, such as group work, flipped classroom, and using digital resources such as ‘No Red Ink’ (Interviews, Lisa, William, Marsha). Researchers have identified a correlation between teachers' self-efficacy in using technology to how often they integrate technology in the classroom (Li et al., 2019). Teachers who had not used technology in the classroom began using technology during periods of virtual and hybrid learning. Those teachers became more comfortable using technology in their instruction during the pivot to virtual and hybrid learning and continued to integrate technology in the 2021-2022 school year when students came back into their classrooms for in-person learning. Marsha was not integrating technology in her classroom prior to the pivot to virtual learning and now perceives digital resources allow her to differentiate and engage students (Interview). Linda now uses technology daily and has not returned to her pre-COVID-19 instructional practices (Interview).

During Phase I and Phase II of the study, teachers reflected on how they used digital tools during the 2021-2022 school year, which provided insight into their knowledge of the students, technology integration, and the curriculum. Integrating technology requires technology skills beyond using digital tools; it requires specific knowledge of students, curriculum, and available technology and resources (Christenson, 2020; Hsu, 2010). The teachers at the parochial high school had experience integrating technology through the pivot to virtual learning, which might have boosted their tech-related self-efficacy, which could increase the use of technology in the classroom. The teachers used their knowledge of digital resources, the curriculum, and students
to create engaging lessons that integrate technology and support student learning. Instead of having students stand in front of the class to show their language acquisition, two teachers use digital resources such as Flipgrid for students to record themselves, allowing more time for conversational practice during class (Interviews, Linda & Michael).

During the interviews, teachers’ responses showed how they use technology to assess student learning, including allowing students to use digital tools to research a topic and present it to the class or create a movie showing mastery of content. Helping teachers to understand the benefits of integrating technology increases their desire to include technologies in their curriculum (Ertmer et al., 2012). Integrating technology gives students extended educational opportunities they did not have before, such as listening to a speaker through a video, watching a lesson recording to reinforce a skill taught during class, or using online resources to differentiate the curriculum. Teachers gave examples of how they were currently integrating technology during the 2021-2022 school year. Using technology for assessments was a common way teachers integrated technology which allowed students to show mastery of the content in creative and unique ways, such as a video presentation. The examples teachers shared align with research showing that integrating technology helps motivate students to learn and provides resources that may not usually be available in the classroom (Carstens et al., 2021). Technology integration in the classroom can be a powerful tool for teachers as they determine the best strategies to use to instruct all students and ignite their passion for learning. As participants reflected on how they integrate technology in their classroom, a recurring theme of internet-connectivity concerns arose.
Internet Connectivity Barriers

Barriers to technology integration might affect how often teachers integrate technology in schools. There are two categories of technology integration barriers: first-order barriers, outside teachers' control, and second-order barriers, which are in teachers' control (Ertmer, 1999; Hew & Brush, 2007; Kopcha, 2012). The parochial high school that was the focus of this study provided a laptop computer to every student, giving them the necessary hardware to use technology at school and home, which removed the hardware from being a first-order barrier for students. One first-order barrier that many teachers at the parochial high school spoke about was that the Internet at the school was not always reliable, which made it necessary to have a plan B when planning lessons that relied on students accessing the Internet. Teachers in this study did not let the Internet concerns dissuade them from integrating technology but worked around the barrier to continue using new technology strategies in their teaching. One participant mentioned that students may have experienced some internet issues during the interview while assessing their education from home.

Internet accessibility outside the classroom may have been a concern during the pivot to virtual and hybrid learning. While this was not a focus of the study, some students and teachers may have had an issue during the pivot to virtual learning. A study on Internet usage during the COVID-19 in western Pennsylvania showed an increase of complaints in regard to the quality of their broadband service, especially for customers who used satellite or cable Internet providers. The upstream Internet data usage increased during the COVID-19 pandemic because of Zoom and other video conferencing applications, which may have resulted in a loss of Internet performance (Dahiya et al., 2021). Another area of concern was students who do not have Internet service at home, which one of the teachers mentioned during the interview (Interview,
Brooke). Those individuals without Internet service would typically go to a public place where Wi-Fi was available such as a library. Even though libraries were closed during this time, Wi-Fi was often still available, allowing individuals close to the library to access the Internet. Data from western Pennsylvania showed that thousands of individuals used the Internet for sessions lasting two to two and a half hours (Dahiya et al., 2021).

**Shifts in Beliefs About Technology Integration to Inform Learning**

This particular parochial high school has experienced a “pendulum swing” in terms of the quantity of technology integration opportunities. Prior to the pandemic, teachers and administrators who participated in this study reported a broad range of technology integration experiences, with some teachers regularly using technology in their classrooms and others using it sparingly. As the school returned to face-to-face instruction, even though many of the teachers at the parochial high school were using technology daily during this study, some teachers raised concerns about the amount of technology students needed to use over the last year and a half. Teachers in this study reported that they had been intentional in their lesson planning once back in the brick-and-mortar classroom, allowing time for in-person discussions and group work to allow students to interact with one another socially. During the periods of virtual and hybrid learning, students may have missed out on opportunities to interact with peers socially. These social interactions in the classroom allowed students to develop communication, interpersonal skills, and peer relationships (Rubin, 2020); thus, teachers recounted that they were purposeful in lesson planning to include both content and social interaction elements. The teachers' knowledge of students, the curriculum, and technology resources has allowed teachers to create a classroom that meets students' social needs while still integrating technology when there is a purpose.
While some teachers stepped back from the amount of technology they integrated into their classroom at this time, they now had past experiences to refer to when planning future lessons. After these teachers had taught through virtual and hybrid learning modes for 18 months, they reflected on their use of technology during the pivot to virtual learning, hybrid learning, and in-person learning. Researchers have shown that teachers rely on past experiences in the classroom when planning lessons that integrate technology and increase their confidence in using digital resources through the pivot to virtual learning (Al-Taweel et al., 2020; Van Der Ross & Tsibolane, 2017; Winter et al., 2021). Even teachers who had not been integrating technology before COVID-19 now have 18 months of experience with integrating to rely on as they continue to plan meaningful instruction using digital resources and technology.

Many teachers and both administrators spoke positively about the benefits of technology integration to inform student learning and provided examples of how integrating technology allows teachers to use diverse approaches to learning that traditional methods may not achieve (Li, 2007). Teachers recounted some of the benefits of integrating technology: it extended their teaching time by providing opportunities for students to continue learning outside the classroom, students took more ownership of their learning, and it provided ways for all types of learners to show mastery of the content (Interviews, Lisa, Brooke, Betty). Integrating technology into the curriculum allows students to be active participants in their learning, take more ownership of their learning, and provide a way to connect students’ passion and learning (Angers & Machtmes, 2005; Carstens et al., 2021). The teacher-participants examples of integrating digital tools suggest that when students use technology to show mastery of a skill, digital tools afford them the opportunity to create a project or presentation that uses their passion and strengths (Interviews).
All teachers who participated in this study perceived that technology positively impacts learning, which could reflect the shifts in their beliefs toward technology integration (Survey). Teachers may need to adjust their pedagogical strategies when integrating technology to impact and inform students' learning (Angers & Machtones, 2005; Ayçiçek & Karafil, 2020; Keengwe et al., 2008). During the interviews, teachers recounted changes in their instructional strategies since the pivot to virtual learning and how the changes have impacted student learning. While teachers in this study did not directly relate the changes in their instructional practices to a shift in their beliefs, researchers recognize that teachers often integrate technology into their curriculum if it aligns with their beliefs that technology meets the learning needs of students (Ottenbreit-Leftwich, 2010). A change in teachers' instructional practices by integrating technology suggests a shift in teachers' beliefs.

During the study, the majority of teachers at the parochial high school provided examples of how they used digital tools, which showed their comfort level in using technology; such as William, that integrates the flipped classroom model by using technology to create instructional videos of the course content that students watch for homework. This model allows the entire class time to work on problems with teacher support (Interview, William). Researchers have identified a correlation between teachers' self-efficacy in using technology to how often they integrate technology in the classroom (Li et al., 2019). Teachers who had not used technology in the classroom began using technology during periods of virtual and hybrid learning. Those teachers became more comfortable using technology in their instruction during the pivot to virtual and hybrid learning and continued to integrate technology in the 2021-2022 school year when students came back into their classrooms for in-person learning (Interviews, Linda, Marsha, & Michael).
During Phase I and Phase II of the study, teachers reflected on how they used digital tools during the 2021-2022 school year, which provided insight into their knowledge of the students, technology integration, and the curriculum. On the survey, teachers were asked to provide the ways they integrate digital technology for the following student activities: (a) writing papers (69.2%), (b) research (76.9%), (c) discussions (38.5%), (d) group work (84.6%), (e) online resources (76.9%), and (f) reading required text (61.5%) (Survey). Integrating technology requires technology skills beyond using digital tools; it requires specific knowledge of students, curriculum, and available technology and resources (Christenson, 2020; Hsu, 2010). The teachers at the parochial high school had experience integrating technology through the pivot to virtual learning, which might have boosted their tech-related self-efficacy, which could increase the use of technology in the classroom. The teachers used their knowledge of digital resources, the curriculum, and students to create engaging lessons that integrate technology and support student learning.

Sometimes changing an instructional practice involves more than just learning a new method or tool but recognizing the human element of teachers and their willingness to leave their comfort zone to try something new such as integrating technology (Angers & Machtmes, 2005; Van Der Ross & Tsibolane, 2017). The pivot to virtual learning pushed some teachers out of their comfort zone and gave them an opportunity to find ways to use technology and digital resources such as No Red Ink, which differentiate instruction to reach learners at many different levels. Teachers in this study developed a repertoire of new digital strategies and can now find purposeful ways to use technology in the classroom to engage students and enhance learning for students.
Limitations of the Study

This study had limitations in the methodology, analysis, and generalizability. The limitations within the study's methodology are directly related to the conceptual framework and observations. The study's analysis limitations resulted from the small sample pool and the ability to measure teachers' beliefs. Lastly, I discuss the limitations in the generalizability of this study.

Limitations in Methodology

One limitation of the study may be that my conceptual framework drew on the TPACK framework which has been debated in the field as to whether or not it should be considered a theory (Graham, 2011). By not employing a traditional learning theory I may have overlooked the potential of being able to position this study within a less controversial framework. The findings from this study suggest that there could be a tension between teachers' beliefs and their technology integration. A theory that could be applied to a similar study would be the Theory of Cognitive Dissonance (Festinger, 1957) which postulated that there is tension when a behavior does not align with a teacher's belief. Two cognitions, which would be an action and a belief, are either consonant or dissonant. The cognitions are referred to as consonant if they align with each other and are referred to as dissonant if they do not align with each other (Harmon-Jones & Mills, 2019). If the belief and action are dissonant, it may be a motivator to reduce psychological discomfort by avoiding the information that created the discomfort or dissonance in the first place (Harmon-Jones & Mills, 2019). Adding or increasing the importance of consonant cognition, or removing the dissonant cognition, reduces the dissonance (Harmon-Jones & Mills, 2019). When asking teachers to shift their pedagogical strategies, they will determine if the change aligns with their beliefs or goes against them. Administrators explaining the purpose of integrating technology to support student learning might help a teacher shift their beliefs toward
technology integration. During the pivot to virtual learning, it became necessary to integrate technology for continuity of learning.

Another limitation of the methodology was not including observations in the data collection and analysis. COVID-19 restrictions limited how I collected data. In-person classroom observations would have allowed me to see the different ways teachers were integrating technology. However, the uncertainty of another pivot to virtual or hybrid learning, and social-distancing policies related to the COVID-19 pandemic were some of the reasons for excluding observations from this study. Observing teachers would have provided insight into how they integrate technology in their classroom and validated their reflections during interviews to ensure they were not responding with what they thought I might want to hear. As a result of not being able to observe teachers, I triangulated teachers’ interview data with both artifacts and administrator interviews to gain a different perspective on technology integration at the parochial high school.

**Limitations in Analysis**

As a result of the small participant pool, the survey data was more descriptive in nature. The parochial high school that was studied has 40 teachers. However, some of the teachers were not full-time and held other roles in the school in addition to teaching part-time. Other teachers had not been teaching at the school for the last three years; they were either recently employed or on a leave of absence last year and did not fully experience the pivot to virtual learning and hybrid model. Only 19 teachers met the criteria for participation in the study. Of the 19 eligible to participate, only 13 chose to participate in the study; thus, the small number of participants did not allow me to work with the quantitative data beyond descriptive analysis. As a result, I shifted the emphasis of the study more toward the qualitative data and included all willing participants.
in Phase II of the study. In addition, one interview had technical issues which prevented me from using that interview content in the final analysis.

**Limitations in Generalizability**

One consequence of conducting this study at a parochial school is that they are not under the same mandates from the United States Department of Education as a public school, such as meeting requirements under the Every Student Succeeds Act. Public schools need to meet minimum requirements on standardized testing, career and college readiness, and graduation rates. Because public schools have additional guidelines that teachers need to follow, such as creating student learning objectives (SLO) in addition to teaching the curriculum, this study is not generalizable beyond the teachers at the parochial high school. Understanding the beliefs toward technology integration of teachers at this particular parochial high school during the pivot to virtual and hybrid learning provided perspective into teachers' experiences during the 2019-2020 and the 2020-2021 school years. Pokhrel and Chhetri wrote a report on the impact COVID-19 had on teaching and learning (2021). The report included overviews of pedagogy for virtual learning, challenges in teaching and learning, and opportunities for teaching and learning (Pokhrel & Chhetri, 2021). Completing additional qualitative studies of teachers in various settings to gain their perspective on their experiences with periods of virtual and hybrid learning would allow for the results to be generalizable.

**Implications for Future Educational Research**

The findings from this study have implications for teachers integrating technology in their classrooms. Participant data and associated themes presented in this study may provide guidance that will assist in implementing studies in the future on how teachers are integrating technology after the COVID-19 pandemic. Additional research could also be considered for
replicating this study with a broader participant pool, determining how years of service impact teachers integrating technology, and investing student perspectives on technology integration.

**Technology Integration After the COVID-19 Pandemic**

This study used one school to focus on the shift in teacher beliefs toward technology integration in regard to the COVID-19 pandemic and the resulting pivot to virtual learning. Future research might investigate how often teachers use digital tools in the classroom after the COVID-19 pandemic to determine if teachers' use of technology increases over time. A popular website report estimates that pre-COVID technology was used in the classroom for an average of 30 minutes a day. The usage increased four to five times a day during the pivot to virtual and hybrid learning. Now that many students are back in brick-and-mortar schools full-time, the number of hours technology is used will continue to multiply because teachers have more comfort and proficiency with using digital tools (DisplayNote, 2021). A study to determine the increased use of digital tools might give more insight into the continual shift in teachers’ beliefs and their impact on instructional practices toward technology integration. As a result of COVID-19 pandemic restrictions, the current study did not include classroom observations. However, including classroom observations in future research would give additional insight into how teachers integrate technology to inform learning.

**Replicate This Study with More Participants**

This case study site was a parochial high school with only 19 teacher-participants that met the study's criteria. Replicating the study at a larger high school would allow more participants' perspectives on technology integration to be analyzed and provide greater insight into the shifts in teachers' beliefs about technology integration. The criteria for this study required teachers to be employed by the parochial high school since the 2019-2020 school year.
to ensure they had experiences with in-person learning, virtual learning, and hybrid learning at this site. Replicating this study outside of the COVID-19 pandemic would eliminate the need for criteria of a specific employment year at the school, which would allow broader criteria for participants.

**Comparison Research Based on Years of Service**

This study focused on the shifts in teachers' beliefs towards technology integration during the COVID-19 pandemic at one school. This single case study focused on shifts in teachers' beliefs at one school. It required teachers to have worked at the school since the 2019-2020 school year to ensure the participants had experience at the school prior to the pivot to virtual learning. Creating a study of teachers' beliefs towards technology integration that compared teachers new to the field with veteran teachers would give insight into teachers' readiness to shift instructional practices based on past experiences.

**Student Participants**

This study focused on teachers' beliefs toward technology integration and their perspective on the impact of digital learning on students but did not include students' perspectives. Future research focused on students' perspectives of using technology for academic purposes might give additional insight into the impact of technology integration on learning.

**Implications for Future Educational Practice**

Since returning to in-person learning, some participants noted that they intentionally planned lessons that do not use technology in order to focus on face-to-face interaction. In a recent survey of teachers and administrators, 72% stated that students were wary of using technology during classes and are choosing face-to-face help from teachers instead of logging on for help through a virtual modality (Klein, 2022). Teachers taking a step back from integrating
technology were discovered during the data analysis. A study on the impact of digital technology integration on student well-being concluded that students see a positive impact when using digital tools in their education. Students consider learning with digital resources beneficial and fun, and they could connect more to the content than reading from a textbook (Mourlam et al., 2020). Teachers may want to survey their students to gain their perspective on using technology as they determine the amount of time and usage of digital tools in their classroom. Another recommendation would be for researchers to complete a comparison analysis of students’ academic achievement when using digital tools to assess mastery of the content compared to times when using traditional pen and paper strategies to assess mastery might provide the necessary data on the possible benefits of technology integration as teachers make decisions around the use of technology.

During the study, teacher participants mentioned having attended workshops focused on integrating technology in the classroom. However, most teachers' professional development was limited to the training opportunities provided by their colleagues during the pivot to virtual learning. Offering teachers ongoing professional development on technology integration would allow teachers to continue to increase their comfort level with integrating digital tools to enhance the learning experience for students (Ertmer, 2005; Prestridge, 2012).

In this study, teachers reflected on the professional development their colleagues offered during the pivot to virtual learning and perceived that colleagues were "the greatest resource; you have, which is the teachers themselves and their experiences" (Interview, David). During the interviews, teachers reflected on times they informally met with colleagues already integrating digital tools and resources in their instruction. The informal meetings provided guidance to teachers as they were beginning to learn about digital resources, they might use to instruct
students during the pivot to virtual learning. The times that the teachers met with colleagues for
guidance in using digital tools is an example of an informal professional learning community
(PLC) which is a way to improve teaching practices through collaborative peer-led professional
development activities (Mu et al., 2018). A benefit of creating an educational technology PLC is
to provide teachers with the training to integrate content learning with innovative digital tools
(Paulus et al., 2020). Other benefits of creating PLCs in schools may include helping teachers
learn instructional practices that provide new knowledge and beliefs about teaching and
understanding teachers’ role in helping students achieve (Mu et al., 2018). Teachers who are
currently using digital tools to engage students and enhance learning might lead a PLC, which
would allow other teachers to observe the implementation of strategies presented during the
PLCs.

Conclusion

The study adds to the existing literature on the experiences of teachers and administrators
during the pivot to virtual learning as a result of the COVID-19 pandemic. Specifically, it
examined how teachers’ beliefs towards technology integration shifted during the COVID-19
pandemic. The initial two-week pivot to virtual learning made it necessary for teachers to shift
their instructional practices immediately. During the interviews, all participants provided
reflections on their instructional practices during the initial two weeks of the COVID-19
pandemic, and what changes they made to these practices after those first two weeks to support
student learning. Many teacher-participants recounted the differences in their instructional
practices since returning to in-person learning for the 2021-2022 school year compared to their
pre-COVID-19 pandemic instructional strategies.
Based on the results of this initial study, I recommend continued and sustained research on how teachers integrate technology after the COVID-19 pandemic to help understand how the pivot to virtual learning continues to impact teachers' beliefs and instructional practices. While it might be challenging to measure teacher beliefs, researchers explained that teachers' beliefs could influence their instructional practices (Chen, 2008; Ertmer, 2005; Ottenbreit-Leftwich et al., 2010; Pajares, 1992). Examining these shifts in instructional practices to include technology gives insight into the shifts in teachers' beliefs.
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Appendix A: IRB Approvals

Aug 24, 2021 12:14:19 PM EDT

To: Monica Frank
Col of Education & Social Work, Literacy

Re: Expedited Review - Initial - IRB-FY2021-231 Has the Pandemic Shifted Teachers' Perceptions Toward Integrating Technology to Increase Student Learning? A Case Study

Dear Monica Frank:

Thank you for your submitted application to the WCUPA Institutional Review Board. Since it was deemed expedited, it was required that two reviewers evaluated the submission. We have had the opportunity to review your application and have rendered the decision below for Has the Pandemic Shifted Teachers' Perceptions Toward Integrating Technology to Increase Student Learning? A Case Study.

Decision: Approved

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

Sincerely,
WCUPA Institutional Review Board

IORG#: IOR00004242
IRB#: IRB00005030
FWA#: FWA00014155
Appendix B: Script for Recruitment Email

Hello,

My name is Monica Frank, and I am a doctoral candidate at West Chester University. I have been given permission by your principal, [Redacted] to conduct my study at [Redacted]. My research will explore teachers' perceptions toward technology integration during the COVID-19 pandemic. I’m interested to hear your experiences in teaching with technology over the last 18 months. I am asking you to participate in a teacher survey and interview. You also will have the option to share lesson plans and videos, surveys, and resources used to pivot to virtual learning to clarify or provide an example for your response to the interview questions. During the analysis phase, I will use the data collected from the surveys and interviews of teachers and administrators to answer the research questions and understand how teachers’ beliefs and perceptions towards technology integration have shifted during the COVID-19 pandemic.

I sought permission to complete my study at your school as a result of how quickly you were able to pivot to virtual learning and the various ways you as teachers engaged your students in learning which was highlighted on social media. The research study has been reviewed and approved by the WCU IRB Protocol #00005030. I am excited to begin my study and look forward to hearing your perspective of the pivot to virtual learning. The time commitment to complete both the survey and the interview should be around an hour. The survey will take approximately 20 minutes, while the interview if chosen, will take approximately 40 minutes. All full-time classroom teachers are invited to participate in the survey. Participants for the interview will be chosen from those that
completed the survey and have worked at [redacted] since the beginning of the 2019-2020 school year. Thank you for your consideration in being a part of this study.
Appendix C: Solicitation Email to Teachers

Good afternoon Teachers,

I am a doctoral candidate at West Chester University. I have been given permission by your principal, [Eileen Vice] to conduct my study at [Cardinal O'Hara]. My research will investigate teachers' perceptions towards technology integration and how their attitudes and beliefs have shifted since the start of the COVID-19 pandemic. In this single-case study design, I will gather data in two phases to measure teachers’ understanding of technology. This research will use a quantitative survey instrument to collect data regarding (a) teachers’ knowledge of technology integration and (b) their beliefs and perspective on the impact technology integration has on student learning. The data gathered through the survey will inform the researcher of teachers’ technology skills and perspectives on integrating technology into the curriculum. There will also be a qualitative case study phase of the study, which will involve interviewing teachers to understand their beliefs and perspective on integrating technology and interviewing administrators to understand their perspectives on technology integration and the support and training they provided on technology integration to teachers. During the case study interview phase, participants will describe how their instruction changed as a response to the pandemic and how they have integrated technology through the pandemic. The research study has been reviewed and approved by the WCU IRB Protocol #00005030.

The time commitment for both the survey and the interview should be around an hour. The survey will take approximately 20 minutes, while the interview if chosen, will take approximately 40 minutes. During the interview, teachers will have the option to share lesson
plans and videos, surveys, and resources used to pivot to virtual learning to clarify or provide an example for your response to the interview questions.

All full-time classroom teachers are invited to participate in the survey. Participants for the interview will be chosen from those that completed the survey and have worked at [Redacted] since the beginning of the 2019-2020 school year.

If you agree to volunteer, you will click on the individual survey link sent to you as your consent to participate in the survey.

Thank you for your time,

Monica Frank
Appendix D: Informed Consent Form for Teachers

Project Title: How has the Pandemic Shifted Teachers’ Beliefs About Integrating Technology as an Effective Means to Increase Student Learning? A Case Study

Investigator(s): Monica Frank

Participation in this research project is voluntary and is being done by Monica Frank as part of her Doctoral Dissertation. This research will investigate teachers’ perceptions towards technology integration and how their attitudes and beliefs have shifted since the start of the COVID-19 pandemic. The research study has been reviewed and approved by the WCU IRB Protocol #00005030. Your participation will take about 20 minutes to complete a survey and about 40 minutes to complete the interview, if selected. If you would like to take part, West Chester University requires that you agree and sign this consent form.

You may ask Monica Frank any questions to help you understand this study. If you don’t want to be a part of this study, it won’t affect any services from West Chester University. If you choose to be a part of this study, you have the right to change your mind and stop being a part of the study at any time.

1. What is the purpose of this study?
   ○ This research will investigate teachers’ perceptions towards technology integration and how their attitudes and beliefs have shifted since the start of the COVID-19 pandemic.

2. If you decide to be a part of this study, you will be asked to do the following:
   ○ Complete a Survey
o Complete Interview, if selected
o During the interview, teachers will have the option to share lesson plans and videos, surveys, and resources used to pivot to virtual learning to clarify or provide an example for your response to the interview questions.

  o This study will take up to 1 hour of your time: 20 minutes to complete the survey and 30-40 minutes to complete the interview.

3. Are there any experimental medical treatments?
   o No

4. Is there any risk to me?
   o Possible risks or sources of discomfort include: anxiety and/or concern that the data collected during this study could be used for evaluation purposes, concern about sharing their beliefs regarding technology integration if this is an expectation of their job.

5. Is there any benefit to me?
   o There is no direct benefit to participants. However, as a result of the pandemic, the use of technology in the classroom may increase long term. By participating in this study, participants have the indirect benefit of informing research that may support teachers in using technology to foster learning.

6. How will you protect my privacy?

   The session will be recorded.
The interview will be recorded using Zoom software. The recording of interviews is for research purposes only. Transcription of the recording will be created and made available to the participant.

Your records will be private. Only Monica Frank, Heather Schugar, and the IRB will have access to your name and responses.

Your name will **not** be used in any reports.

Records will be stored:

- Password Protected File/Computer

Insurances of participant confidentiality will be given during each phase of the data collection process. Participants will be aware that all identifiable information in any data collection phases will be removed and replaced with a number. All original documents will be stored in a locked file cabinet at [redacted]. All documents will be scanned to the researcher's password-protected computer. All software used to assist with recordings, transcriptions, or analysis will have a secure login. All information given to the researcher will be kept private and not be shared. Surveys will be emailed from the participants to the researcher and stored on the researcher’s computer that is password protected. A password created by the researcher is needed to access the zoom recording and transcription. The completed transcription will be stored on the researcher's password-protected computer.

Records will be destroyed after manuscript development, but no less than three years from the end of the study.

7. Do I get paid to take part in this study?
8. Whom do I contact in case of research-related injury?

   o For any questions with this study, contact:
     - Primary Investigator: Monica Frank at [redacted] or MF272440@wcupa.edu
     - Faculty Sponsor: Heather Schugar at [redacted] or hschugar@wcup.edu

9. What will you do with my Identifiable Information/Biospecimens?

   o Not applicable.

For any questions about your rights in this research study, contact the ORSP at 610-436-3557.

I have read this form and I understand the statements in this consent form. I know that if I am uncomfortable with this study, I can stop at any time. I know that it is not possible to know all possible risks in a study, and I think that reasonable safety measures have been taken to decrease any risk.

If you agree to volunteer, you will click on the individual survey link sent to you as your consent to participate in the survey.
Appendix E: Potential Teacher Interview Questions

1. Professional information What subject do you teach? Where have you taught? How long have you taught?

2. Have you taken a college-level course or had any training on integrating technology into your curriculum?

3. What is technology integration? What does it look like?

4. How important do you think is it to integrate technology into the curriculum? Why?

5. Do you think technology integration can increase student learning? Why or why not? Can you give an example?

6. What are the barriers you have faced in integrating technology? Are there any other barriers that you can think of, but haven’t experienced yourself? Can you tell me about a specific time you faced a barrier to implementing technology?

7. How did you integrate technology before COVID-19 when your school pivoted to virtual learning?

8. How often did you use technology in the classroom prior to the pandemic?

9. Did you have any training to prepare you to teach virtually after March 13, 2020?

10. Was the training offered through your school or was this your own professional development?

11. How often did you receive professional development during the pandemic (March 2020-Present)? What were the topics?

12. How have your instructional practices changed regarding technology integration due to the pandemic?
13. Have you seen a change in student engagement and learning as a result of the changes you have made?
Appendix F: Solicitation to Administration

Good afternoon Administrators,

I am a doctoral candidate at West Chester University. My research will investigate teachers’ perceptions towards technology integration and how their attitudes and beliefs have shifted since the start of the COVID-19 pandemic. In this single-case study design, I will gather quantitative and qualitative data to measure teachers’ understanding of technology. This research will use a quantitative survey instrument to collect data regarding (a) teachers’ knowledge of technology integration and (b) their beliefs and perspective on the impact technology integration has on student learning. The data gathered through the survey will inform the researcher of teachers’ technology skills and perspectives on integrating technology into the curriculum. There will also be a qualitative case study phase of the study, which will involve interviewing teachers to understand their beliefs and perspective on integrating technology and interviewing administrators to understand their perspectives on technology integration and the support and training they provided on technology integration to teachers. During the case study interview phase, participants will describe how their instruction changed as a response to the pandemic and how they have integrated technology through the pandemic. The research study has been reviewed and approved by the WCU IRB Protocol #00005030.

The time commitment for the interview should be around 30-40 minutes. During the interview, administrators will have the option to share lesson plans and videos, surveys, and resources used to pivot to virtual learning to clarify or provide an example for your response to the interview questions. If you would like to take part, West Chester University requires that you agree and sign the consent form attached.

Thank you for your time,
Appendix G: Informed Consent for Administration

Project Title: How has the Pandemic Shifted Teachers’ Beliefs About Integrating Technology as an Effective Means to Increase Student Learning? A Case Study

Investigator(s): Monica Frank

Project Overview:

Participation in this research project is voluntary and is being done by Monica Frank as part of her Doctoral Dissertation to teachers' perceptions towards technology integration and how their attitudes and beliefs have shifted since the start of the COVID-19 pandemic. The research study has been reviewed and approved by the WCU IRB Protocol #00005030. Your participation will take about 30-40 minutes to Interview. If you would like to take part, West Chester University requires that you agree and sign this consent form.

You may ask Monica Frank any questions to help you understand this study. If you don’t want to be a part of this study, it won’t affect any services from West Chester University. If you choose to be a part of this study, you have the right to change your mind and stop being a part of the study at any time.

1. **What is the purpose of this study?**
   
   o This research will investigate teachers’ perceptions towards technology integration and how their attitudes and beliefs have shifted since the start of the COVID-19 pandemic.

2. **If you decide to be a part of this study, you will be asked to do the following:**
Interview

During the interview, administrators will have the option to share lesson plans and videos, surveys, and resources used to pivot to virtual learning to clarify or provide an example for your response to the interview questions. This study will take about 30-40 minutes of your time.

3. Are there any experimental medical treatments?

   o No

4. Is there any risk to me?

   o None

5. Is there any benefit to me?

   o There are no direct benefits to the participants. As a result of the pandemic, the use of technology in the classroom may increase long term. By participating in this study, participants have the indirect benefit of informing research that may support teachers in using technology to foster learning.

6. How will you protect my privacy?

   o The session will be recorded.
   
   o The interview will be recorded using Zoom software. The recording of interviews is for research purposes only. Transcription of the recording will be created and made available to the participant.
   
   o Your records will be private. Only Monica Frank, Heather Schugar, and the IRB will have access to your name and responses.
   
   o Your name will not be used in any reports.
o Records will be stored:
  - Password Protected File/Computer

o Insurances of participant confidentiality will be given during each phase of the data collection process. Participants will be aware that all identifiable information in any data collection phases will be removed and replaced with a number. All original documents will be stored in a locked file cabinet at [location]. All documents will be scanned to the researcher's password-protected computer. All software used to assist with recordings, transcriptions, or analysis will have a secure login. All information given to the researcher will be kept private and not be shared. Surveys will be emailed from the participants to the researcher and stored on the researcher’s computer that is password protected. A password created by the researcher is needed to access the zoom recording and transcription. The completed transcription will be stored on the researcher's password-protected computer.

o Records will be destroyed After manuscript development, but no less than three years

7. **Do I get paid to take part in this study?**
   - No

8. **Who do I contact in case of research related injury?**
   - For any questions with this study, contact:
     - **Primary Investigator:** Monica Frank at [email] or mf272440@wcupa.edu
9. **What will you do with my Identifiable Information/Biospecimens?**
   
o  Not applicable.

For any questions about your rights in this research study, contact the ORSP at 610-436-3557.

I, _________________________________ (your name), have read this form and I understand the statements in this form. I know that if I am uncomfortable with this study, I can stop at any time. I know that it is not possible to know all possible risks in a study, and I think that reasonable safety measures have been taken to decrease any risk.

___________________________________

Subject/Participant Signature      Date:________________

___________________________________

Witness Signature                  Date:________________
Appendix H: Potential Administrator Interview Questions

1. Professional information: How long have you been an educator? How long have you been an administrator? What types of school environments have you worked in?

2. Have you taken a college-level course or had any training on integrating technology into a school’s curriculum?

3. What is technology integration? What does it look like?

4. How important do you think it is to integrate technology into the curriculum? Why?

5. Do you think technology integration can increase student learning? Why or why not? Can you give an example?

6. Do you feel there is a difference between using technology and integrating technology? Why or why not?

7. Did your school have a technology plan in place prior to the pandemic?

8. How did your teachers integrate technology before COVID-19 when your school pivoted to virtual learning?

9. How often was the technology used in the classroom by your teachers?

10. Was there an expectation for teachers to integrate technology?

11. Did your school provide any training to prepare your teachers to pivot to virtual learning after March 13, 2020?

12. What resources were used to provide the professional development?

13. How often did you offer professional development? What were the topics?

14. Have you noticed a shift in instructional practices regarding technology integration due to the pandemic?
15. Are teachers who did not integrate technology for learning prior to the pandemic, now integrating technology?
Appendix I: Teacher Survey

Consent Form for Teachers

Project Title: Has the Pandemic Shifted Teachers’ Perceptions Toward Integrating Technology to Increase Student Learning? A Case Study

Investigator(s): Monica Frank

Participation in this research project is voluntary and is being done by Monica Frank as part of her Doctoral Dissertation. This research will investigate teachers' perceptions towards technology integration and how their attitudes and beliefs have shifted since the start of the COVID-19 pandemic. The research study has been reviewed and approved by the WCU IRB Protocol #00005030. Your participation will take about 20 minutes to complete a survey and about 40 minutes to complete the interview, if selected. If you would like to take part, West Chester University requires that you agree and sign this consent form.

You may ask Monica Frank any questions to help you understand this study. If you don’t want to be a part of this study, it won’t affect any services from West Chester University. If you choose to be a part of this study, you have the right to change your mind and stop being a part of the study at any time.

1. What is the purpose of this study?

This research will investigate teachers' perceptions towards technology integration and how their attitudes and beliefs have shifted since the start of the COVID-19 pandemic.

2. If you decide to be a part of this study, you will be asked to do the following:
• Complete a Survey
• Complete Interview, if selected
• During the interview, teachers will have the option to share lesson plans and videos, surveys, and resources used to pivot to virtual learning to clarify or provide an example for your response to the interview questions.
• This study will take up to 1 hour of your time: 20 minutes to complete the survey and 30-40 minutes to complete the interview.

3. Are there any experimental medical treatments? No

4. Is there any risk to me?
• Possible risks or sources of discomfort include: anxiety and/or concern that the data collected during this study could be used for evaluation purposes, concern about sharing their beliefs regarding technology integration if this is an expectation of their job.

5. Is there any benefit to me?
• There is no direct benefit to participants. However, as a result of the pandemic, the use of technology in the classroom may increase long term. By participating in this study, participants have the indirect benefit of informing research that may support teachers in using technology to foster learning.

6. How will you protect my privacy?
The session will be recorded.
• The interview will be recorded using Zoom software. The recording of interviews is for research purposes only. Transcription of the recording will be created and made available to the participant.
• Your records will be private. Only Monica Frank, Heather Schugar, and the IRB
will have access to your name and responses.

- Your name will not be used in any reports.
- Records will be stored:
  - Password Protected File/Computer
  - Insurances of participant confidentiality will be given during each phase of the data collection process. Participants will be aware that all identifiable information in any data collection phases will be removed and replaced with a number. All original documents will be stored in a locked file cabinet at [redacted].

All documents will be scanned to the researcher’s password-protected computer. All software used to assist with recordings, transcriptions, or analysis will have a secure login. All information given to the researcher will be kept private and not be shared. Surveys will be emailed from the participants to the researcher and stored on the researcher’s computer that is password protected. A password created by the researcher is needed to access the zoom recording and transcription. The completed transcription will be stored on the researcher's password-protected computer.

- Records will be destroyed after manuscript development, but no less than three years from the end of the study.

7. Do I get paid to take part in this study? No

8. Whom do I contact in case of research-related injury?

For any questions with this study, contact:

- Primary Investigator: Monica Frank at [redacted] or MF272440@wcupa.edu
- Faculty Sponsor: Heather Schugar at [redacted] or hschugar@wcupa.edu
9. What will you do with my Identifiable Information/Biospecimens? Not applicable.

For any questions about your rights in this research study, contact the ORSP at 610-436-3557. I have read this form and I understand the statements in this consent form. I know that if I am uncomfortable with this study, I can stop at any time. I know that it is not possible to know all possible risks in a study, and I think that reasonable safety measures have been taken to decrease any risk.

If you agree to volunteer, you will click on the individual survey link sent to you as your consent to participate in the survey.

- I consent to participate in this study (1)

- I do not consent to participate in this study (2)
Q1 What is your age range?

- 20-29
- 30-39
- 40-49
- 50-59
- 60 or above

Q2 What gender do you identify as?

_______________________________________________________________________________
Q3 What race do you identify as?

- Caucasian
- African American
- Latino or Hispanic
- Asian
- Two or more ethnicities
- Middle eastern/Arabic
- Unknown
- Prefer not to say
- Other
Q4 How many years have you been teaching?

- 0-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 21-25 years
- over 25 years

Q5 Please list your teaching certifications

________________________________________________________________
________________________________________________________________
________________________________________________________________

Q6 How many years have you worked at [blank]?
Q7 Please share your beliefs and perceptions on technology integration.
<table>
<thead>
<tr>
<th>Strongly agree (11)</th>
<th>Somewhat agree (12)</th>
<th>Neither agree nor disagree (13)</th>
<th>Somewhat disagree (14)</th>
<th>Strongly disagree (15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology integration impacts student learning. (a)</td>
<td><img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /></td>
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<tr>
<td>I use technology occasionally during a lesson. (b)</td>
<td><img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /></td>
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<tr>
<td>Students are more engaged when learning with technology. (c)</td>
<td><img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /></td>
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</tr>
<tr>
<td>Technology gets in the way of learning. (d)</td>
<td><img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /> <img src="bullet.png" alt="bullet" /></td>
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</tr>
</tbody>
</table>
I would like to use technology but am not sure where to start. (e)

I would use technology more if the hardware/software was available. (f)

I see my student’s taking ownership of their learning through technology. (g)
Q8 Do you integrate technology into your lessons?

- Yes
- Maybe
- No

Display This Question:
If Q8 = Yes

Q9 How often do you integrate technology into your lessons?

- Daily
- 1-3 times a week
- Weekly
- Monthly

Display This Question:
If Q8 = Yes

Q10 Please give an example of how you integrate technology into your lessons.

________________________________________________________________
Q11 Do you believe technology integration impacts student learning?

- Definitely yes
- Probably yes
- Might or might not
- Probably not
- Definitely not

Q12 Would you like to integrate technology into the curriculum on a more regular basis?

- Yes
- Maybe
- No

Q13 Please rate your comfort level with the following technology.
<table>
<thead>
<tr>
<th>Extremely comfortable</th>
<th>Somewhat comfortable</th>
<th>Neither</th>
<th>Somewhat uncomfortable</th>
<th>Extremely uncomfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
</tr>
</tbody>
</table>

Using a learning management system (LMS) such as Moodle and Schoology.

(a)

Google Docs

(b)
| Online resources to communicate information such as Nearpod. (c) |  
| Creating online activities for students (d) |  
| Using a video conferencing software such as Zoom (e) |  

Q14 Please indicate the statements that applied regarding your perception of technology integration during the following times. Mark all that apply.
<table>
<thead>
<tr>
<th>Before the Covid-19 pandemic (2)</th>
<th>During the Covid-19 pandemic (3)</th>
<th>This statement is false. (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrating technology is a teacher expectation at the school. (a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrating technology in lessons increases student learning (b)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology integration allows students to take ownership of their learning. (c)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrating technology in lessons engages students in learning (d)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Students overuse technology and need to do more paper and pencil activities. (e)

I use technology to give assessments. (f)

Q15 In what ways is student learning impacted during periods of virtual learning?

- Positively impacted
- Negatively impacted
- Learning stays the same
Q16 What trainings have you participated in to support technology integration? Mark all that apply.

- Course during pre-teacher training
- Professional development
- Conference or Workshop
- Graduate course

Q17 How often do you use digital technologies for professional and personal purposes?

- Daily
- 4-6 times a week
- 2-3 times a week
- Once a week
- Monthly
- Never
Q18 How do you prefer to learn new computer software applications?

- I prefer attending a workshop or training
- I prefer to read a manual or watch a video
- I prefer hands-on learning
Q19 Digital technology can be used for a variety of activities. Please mark all that apply. I use digital technologies for ....

- Planning and Organization
- Calendar
- Word processing
- Assessment
- Gradebook
- Research
- Communication
- Assessing data
- Resource for students
- Resource for teachers
Q20 Please mark the student activities you use to integrate digital technology. Please mark all that apply.

- Writing a paper
- Research
- Discussions
- Group Work
- Online Resource such as GoFormative
- Reading required text such as a novel or textbook

End of Block: Default Question Block