DID IT CHANGE HOW WE TEACH? A QUALITATIVE EXPLORATION INTO TEACHER PERCEPTIONS OF HOW TECHNOLOGY CHANGED IN THE CLASSROOM AS A RESULT OF THE PANDEMIC

by

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Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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Abstract

The purpose of this case study was to understand the perceived change in educator attitudes from the pandemic concerning technology at Cornerstone School. The problem addressed in this study was the lack of motivation of educators to try new ways to use technology in their classrooms. The theory guiding this study was J. Bruner's constructivist theory which focuses on obtaining knowledge through discovery. The connection between Bruner's theory and the perceived change in teachers' attitudes was that teachers learned technology through their use and discovery. A qualitative case study design was used to carry out this investigation. Ten educators were recruited using a typical purposeful sampling strategy; all were from a small private school. These included educators from the kindergarten through 11th-grade levels. The data were collected through a questionnaire followed by semi-structured individual interviews, an analysis of reflective journal prompts, and an analysis of artifacts. Findings revealed themes pertaining to the study's purpose, including pre-pandemic attitudes toward technology, successful practices using technology during the pandemic, and post-pandemic attitudes toward technology. Confidence developed by the participants through the discovery of technology used confirmed Bruner's theory that learning through discovery gave the participants a more positive attitude towards technology and influenced how the participants taught.

Keywords: pandemic, technology, constructivism, attitudes

Copyright Page

Dedication

I dedicate this dissertation to God, my fiancé, and my children from whom all joy is obtained. I also dedicate this dissertation to the family I was born into including my brother, who raised two amazing Christian children on his own, my sister, who is the most beautiful person I know (yes, even through chemotherapy,) and her loving family, and to my parents for raising all of us in church and teaching us to accept others.

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List of Abbreviations

Digital Equity Education Roundtables (DEER)

Fourth Industrial Revolution (4IR)

Information and Communication Technology (ICT)

Intelligent Tutoring Systems (ITS)

International Society for Technology in Education (ISTE)

Social Cognitive Theory (SCT)

Technology Acceptance Model (TAM)

Technological, pedagogical, and content-related knowledge (TPACK)

Test of e-learning related attitudes scale (TeLRA)

Unified Theory of Acceptance and Use of Technology (UTAUT)

Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)

World Health Organization (WHO)

CHAPTER ONE: INTRODUCTION

Overview

The use of technology in the classroom has been a topic for educators for many years. Many governments worldwide have increased technology expenses in the classroom (Dincher & Wagner, 2021). School districts in the United States have quadrupled their technology spending from 2015-2017 (Cornman, et al., 2020). It is important for teachers to use technology in their classrooms to justify these expenditures, but more importantly, because research shows that technology is an excellent tool to engage students, enhance learning, and prepare students for the workplace (Hoffman & Ramirez, 2018). This study explored the attitudes of teachers who were marginally using technology before the Covid-19 pandemic in implementing technology in their classrooms during and post the Covid-19 pandemic: specifically, any changes in their attitudes about technology use in the classroom. Some teachers embraced technology and spent their free time exploring new and exciting ways to reach their students, while other teachers complained about having to endure new technology training every time a new curriculum is introduced. Teachers' attitudes regarding technology related to how they implement technology in their classrooms. The pandemic forced educators to learn new types of technology very quickly. This research study investigated teachers' attitudes concerning technology after the abundance and variety of use during the pandemic and the use of online learning. Online learning and e-learning were defined as learning systems using the internet and computers to receive instruction (Levy, 2006).

This case study examined the perceptions of teachers based on the newly acquired usage of technology through the constructivist theory. Finally, it identified the likelihood of technology usage by teachers who have acquired a new sense of confidence in using technology. It also

examined how learning institutions can effectively prepare educators for technology in their classrooms. This chapter introduced relevant background information, historical, social, and theoretical context of the topic. It also explained the problem statement, purpose statement, and significance of the study with a theoretical and empirical perspective. This chapter closes with the explanation of the proposed research questions.

Background

Technology has been increasingly present in classrooms across the United States (Vongkulluksn et al., 2018). What has been called the Fourth Industrial Revolution (4IR), paved the way for teachers to use technology effectively in the classroom (Naidoo & Singh, 2020). This increase in technology use changed how teachers teach; for some educators, it created anxiety causing them to avoid technology in the classroom due to their lack of competence (Akram et al., 2022). Research showed teachers were enduring high levels of stress trying to keep up with the ever-changing technological demands placed on them (Fernandez-Batanero et al., 2021). These closures led to virtual training to help teachers through professional development so teachers could have some social interaction with their students using virtual meeting applications. The theoretical concept that supports the examination of educators' use and the effectiveness of learning technology is the constructivist theory because learners should be actively engaged through the act of doing (Schunk, 2012). Bruner (1985) asserted that learning happens through experience. This concept was relevant because teachers had to learn technology to teach virtually during the pandemic. Whether teachers were online briefly in 2020 or continued to work virtually throughout the pandemic, the technology they were exposed to impacted how they teach.

Historical Context

Historically, technology promised to change education forever, but the process did not happen as quickly as was originally expected. In 1982, Time Magazine named the personal computer the Machine of the Year even though most homes didn't have one at that time (McCraken, 2022). According to the National Center for Education Statistics (2022), it wasn't until 2009 that 97% of all classrooms in the United States had at least one computer. Although classrooms had computers, many teachers did not know how to use them. Many teachers used the same lesson plans every year, and technology in the classroom would have forced them to change what they had been doing for decades. Salomon (2002) called this the Technological Paradox and explained that education preserves itself and only uses technology in existing practices. This problem evolved from overwhelming teachers with new technology in the classroom. During the pandemic, some teachers had their schools closed and were asked to teach virtually the following week. More than 1.57 billion children were affected by school closures in 2020 (United Nations Educational, Scientific, and Cultural Organization, 2020). This idea motivated the current study in determining if this paradox still exists after the technology use teachers were exposed to during the pandemic. The access to technology in education for pre-service teachers has risen with the inclusion of technology courses for education degrees (Atabek & Burak, 2020). Research showed that the increase in coursework gave preservice teachers more confidence to use technology in the classroom (Atabek & Burak, 2020) and many universities have adjusted their curricula to meet these needs. Dinchner & Wagner (2021) recommended that policymakers not only invest in training teachers but also integrate information in professional development on the potential benefits of educational technology in the classroom.

Social Context

It was recommended that technology should be used to enhance social interaction when

face-to-face interaction wasn't possible, technology use also hindered social interaction as people turned to technology to withdraw from others using social media when face-to-face interaction wasn't possible (Njiku, Maniraho, & Mutarutinya, 2019). The use of Zoom and Google Meet made virtual teaching possible during the pandemic and offered some social contact to students that would have otherwise been completely isolated. Students without internet or devices had to resort to doing worksheets. This allowed for social interaction when the pandemic started, and schools closed. Teachers provided students with additional social outlets by creating group collaborations, such as social networking, to support social interactions (Ventura, 2017). Students were negatively impacted if teachers did not integrate the technology on a social level for students. The relationships that children normally formed with their peers were far from "normal" when compared to face-to-face instruction (Uzun et. al, 2021). Another social aspect of technology for education included training and collaboration among educators. Research showed that teachers be trained and collaborate in the same types of technology that students are expected to know (Guzzemos & Seufert, 2021). Teachers attended training on new technology along with their peers and depended on each other when they needed assistance. Teachers, students, and teacher education programs benefit from this research so they can examine the benefits of an implemented constructivist view to train teachers to implement technology.

Theoretical Context

Theories on technology acceptance began with Bandura's (1986) explanation of the Social Cognitive Theory (SCT) with the idea that learning is social and based on prior experiences. Davis (1989) used the Technology Acceptance Model (TAM) to measure attitude, which was expanded on by Venkatesh & Davis (2000). Taylor & Todd (1995) combined the TAM model with the Theory of Planned Behavior. More recently UTAUT (Venkatesh et al.,

2003) and UTAUT2 (Venkatesh et al., 2012) were developed. These concepts are related because they focused on attitude and examined how confidence is related to experience. Research on student attitudes, creativity, and adjustment to virtual learning were addressed by current research. For example, Patton et al. (2020) found that secondary students felt they could be creative and had positive attitudes toward their online learning experience. Casacchia et al. (2021) analyzed the effects distance learning had on teachers and described the discomfort of not having any feedback during lessons while trying to communicate with students. These articles illustrated the current research on the topic of attitudes affected by Covid, but few explored teachers' attitudes towards technology or a change in usage in the classroom. Research confirmed that using technology gives teachers the confidence to use and effectively learn how to implement technology in their classrooms (Atabek & Burak, 2020). Constructivists advocated for authentic learning based on real-life experiences (Schunk, 2012). Constructivism included situated learning discovery learning and encompassed the use of technology for engagement (Ibanez et al., 2019). The technology engaged for real-life experiences was simulated for authentic learning. Bandura (1986) stated that cognitive learning and self-efficacy are predictive of one's beliefs in what one can accomplish. There was a gap in the literature examining teachers' attitudes before and after the pandemic. Minimal research has been done measuring teachers' attitudes toward technology after the pandemic. Prior research focused on the impact of the pandemic and the use of technology regarding children (Toquero & Talidong, 2020). This research was an extension of prior research because it focused on the perceived attitudes of teachers.

Problem Statement

The problem was that many teachers did not embrace technology use in their classrooms (Fraillion et al., 2014). The pandemic forced teachers to use technology who otherwise were not. Xu et al. (2012) found that teachers with less than three years of experience teaching were more likely to have a negative attitude concerning technology and resist incorporating technology in their lessons. Chakraborty et al. (2020) found that even college professors typically just used presentation tools with students and did not use collaborative or interactive technology. Research showed that less than half of the teachers report using ICT (Information and Communication Technology) in their classrooms daily (Fraillon et al., 2014). There were many reasons teachers chose not to use technology. They may have lacked training, they might have experienced stress in learning something new, or their pedagogy might have kept them using technology effectively in their classrooms. Technology has been constantly changing, which can be very challenging to keep up with for teachers. Dincher & Wagner (2021) found that many elementary teachers continued to prefer paper, phone calls, and emails while teaching virtually. Confidence also played a factor in using technology in the classroom and new programs were continuously being introduced to teachers which stretched their confidence in technology regularly. Research showed the four main characteristics of a teacher that lead to teacher effectiveness with ICT were education, professional development, self-efficacy, and ICT use available (Tang, 2021). Undoubtedly, the recent pandemic offered many advancements to the use of technology in the classroom by making more types of ICT available. According to the World Health Organization (WHO, 2021) there were almost five million deaths worldwide from Covid-19. The pandemic forced most of the world's educators to stay home and learn to teach virtually (Siddiqui & Kathpal, 2021). Unless educators found a new appreciation for technology and planned to

continue to implement it in their classrooms, they would not have been able to engage students virtually.

Research showed that educators, teacher educators, and policymakers saw the importance of integrating technology in the classroom and preparing teachers (Wilson et al., 2020). Research also shows that field experience is a contributing indicator that pre-service teachers will integrate technology into their instruction (Wilson et al., 2020). Confidence and willingness to integrate technology were related to the experiences a teacher has in their lives regarding technology. Educators were forced to get comfortable with technology during the pandemic. By examining teachers' attitudes toward technology, practitioners can better understand how to train teachers to apply technology to classrooms and examine if that training is a permanent use in the teachers' classroom to address students' needs.

Purpose Statement

The purpose of this case study was to understand how the attitudes of educators concerning the usage of technology changed after the experience of online teaching during the pandemic at Cornerstone School. The educators' attitudes were defined as their willingness to use technology in their classrooms. The pandemic was referenced as the time period of the spring of 2019 to the fall of 2022 when schools closed, and teachers held classes in a virtual format for their students. Teachers reflected on their technology usage before the pandemic and after the experience of the pandemic.

Significance of the Study

Theoretical Perspective

The theoretical significance of this study was related to the necessity of learning. Bruner (1986) reflected on the need to examine the working model of what a learner is and the best

environment for the learner. Bruner (1986) concluded that any learning can happen if the conditions of the specific situation allow for it. The relevance to this study is the emphasis Bruner (1986) makes on the fact that learning must mean something to the learner. This is an example of what happened to teachers during the pandemic. Teachers that were resistant to new technology and avoided trying new software were thrown into having to learn new things because it meant something to them. Once learning technology became important to the teachers, they found ways to use technology and implement it in their classrooms.

Empirical Perspective

The empirical significance of the current study related to similar studies by examining the impact of COVID-19 on the use of technology. Although other studies focused on students, methods of teaching online, attitudes of teachers during COVID, and higher education attitudes, this study focused on the educator as the learner and their perceived change in attitude regarding all technology use in a K-11 setting (Adhya & Panda, 2022; Butnaru et al., 2021; Chakraborty et al., 2020; Dorji, 2021; Oliveira et al., 2021,; Toquero & Talidang, 2020; Uzun et al, 2020). The methodological approach contributed to the literature by examining teachers' attitudes through surveys, interviews, and documentation. The questions focused on the educator 's perceived attitudes and their implementations of technology before and after the pandemic. The participants of this case study included private school teachers that taught before and after the pandemic. This study included a small private school to increase the scope of current research. The results determined if learning through necessity has an impact on the learner.

Practical Significance

The practical significance of the study was relevant to area teachers, the school district, and learning institutions that educate teachers. Teachers recognized that any technology training

they received must be implemented correctly and quickly to create engaging lessons. Administrations could make training more relevant to teachers so they do not feel like their time is wasted on the technology they cannot use for their specific classrooms. Districts and administrators often lacked the vision to guide teachers on using technology even though they know the importance (Tyler-Wood et al., 2018). Learning institutions could reflect on how they educate students to become teachers. Universities cannot possibly train students on every possible application or software, but they could educate students on reflecting the relevance and efficiency of learning new technology regardless of their pedagogy. Research showed that field experience is also a contributing indicator that pre-service teachers choose to integrate technology into their instruction (Wilson et al., 2020) along with increased university classes.

Research Questions

The research questions in the current study focused on teachers' attitudes and usage of technology after the onset of the pandemic. The questions were conducted through initial surveys and interviews. Specific questions addressed technology before and after pandemic usage and self-concept.

Central Research Question

How do educators perceive the influence of the Covid-19 pandemic on their attitudes and use of technology in the classroom?

Sub-Question One

What impact did the pandemic have upon the attitudes of technology use among educators in the classroom?

Sub-Question Two

What are the experiences of educators using technology in the post pandemic era?

Sub-Question Three

How have teachers' attitudes changed concerning learning new technology?

Definitions

1. *Constructivism* – Students learn by constructing meaning through inquiry and prior knowledge (Bruner, 1997).
2. *Pedagogy* – The act and discourse of teaching (Alexander, 2004).
3. *Self-Concept* – Perceptions about oneself based on an experience (Byrne, 1996).

Summary

The pandemic affected education all around the world with school closures and distance learning (Dincher & Wagner, 2021). Stakeholders scrambled to provide students with an education while families stayed home. Teachers were thrown into teaching situations that were not in their comfort zone. They had to learn how to teach using technology to reach their students. Teachers forced students out of their comfort zone to learn in a new way (Wiggins & McTighe, 2021) out of the classroom. This study established if taking teachers out of their comfort zones ignited new learning for them. The problem with technology in education before the pandemic was that many teachers did not use technology effectively. Many teachers only used technology to make presentations and navigate relevant software. The purpose of this case study was to understand how the attitudes of educators concerning the usage of technology changed after the experience of online teaching during the pandemic at Cornerstone School. The pandemic is in reference to the time period of the spring of 2019 to the fall 2022 when many schools closed and held classes in a virtual format for their students.

CHAPTER TWO: LITERATURE REVIEW

Overview

This study focused on the attitudes of teachers concerning technology and what they learned by implementing technology into their lessons. A systematic review of the literature was conducted to explore teachers' attitudes concerning technology. An exploration of the effect the pandemic influenced on the use of technology was also explored. This chapter presented a review of the current literature related to the topic of study. In the first section, the theories relevant to technology use in the classroom, the aspect of training, and the significance of the teachers' pedagogy, followed by a synthesis of literature about teacher usage of technology. Lastly, literature relating to students' needs regarding technology, and the implications COVID produced in education. In the chapter summary, a gap in the literature was identified, presenting a viable need for the current study.

Theoretical Framework

This literature review examined teachers' attitudes towards technology and related it to research before and after the world pandemic focusing on Bruner's theories regarding technology. In 1990, Bruner stated that technology in the classroom could be used correctly to facilitate a hands-on learning approach and is an active learning process that builds on knowledge (Bruner, 1990). Bruner suggested that the activity the student is engaged in should go from enactive to symbolic through a logical progression and inquiry (Bruner, 1966). The hands-on approach done by teachers during the pandemic enhanced their knowledge of technology. Technology in the classroom has changed a great deal since 1990. The constructivist approach to technology addresses the possibility of using a hands-on approach to learning through technology. Bruner (1986) explained that true learning comes from experience, although there is

not one type of learning. The learner, for the purpose of this study, referred to the educators not the students. Constructivists advocated for authentic learning based on real-life experiences (Schunk, 2012). Bruner (1997) explained that construction is also adaptation to the world and changing if required. Constructivism also included situated learning and discovery-learning which encompasses the use of technology for engagement (Ibanez et al., 2019). Bruner explained the constructionist model with an emphasis on world experiences for mastery (Bruner, 1986). This real-world application was relevant to teachers who had to navigate technology during the pandemic.

Many educators believed that students need to be involved with hands-on experiences for cognitive development (Rushton, 2011). A hands-on experience was not possible in the literal sense during the pandemic. Educators that could not let go of the necessity of hands-on experience may not have been as open to using technology to teach virtually. This idea made it difficult for those educators to embrace technology if they didn't know how to use it effectively. Technology could be used to enhance learning when "hands-on" learning wasn't possible. Virtual programs got introduced regularly for education and required the students to move or manipulate the materials virtually which was proven very beneficial to learning (Hillmayr et al., 2020).

The possibilities for using technology in the classroom are continually changing and improving. Technology could be used to promote collaborative learning (Yates et al., 2021) by requiring students to engage with one another to provide feedback or create projects. Social interaction using online tools is also used by educators (Beardsley et al., 2020) by building lesson plans and planning together. As technology evolved new effective methods for teaching also evolved (Alfy et al., 2017). Bandura (1986) stated that cognitive learning and self-efficacy

were predictive of one's beliefs in what one can accomplish. Tondeur et al., (2020) explained that self-efficacy is related to how teachers perceive their competency in using technology to support their pedagogical activities. Research has shown the significance of students' self-efficacy using various technologies in online learning (Wei & Chou, 2020). This competency could be increased with practice. Social cognitive theory refered to the idea that people's beliefs of what they are capable of affected their lives and the way they perform (Bandura, 2006). For example, people who saw themselves as inadequate on computers chose not to use computers (Oliver & Shapiro, 1993). Educators that were proficient with different types of technology were more likely to use different types of technology with confidence in the classroom (Sauber et al., 2020). Educational technology has made advances in gameplay for students and increased students' abilities in cognitive learning. The cognitive skills learned through technology positively affect self-efficacy (Zhenhua & Jang, 2017)

Related Literature

The difference between educators who understood how to integrate technology in the classroom and educators who did not know how to integrate technology in the classroom was made obvious in the 2020-2021 school year (Ferdig et al., 2020) because of the pandemic. While most research at that time was centered around the student's ability to retain information in a remote setting and the loss of learning they would be subjected to (Hermann, 2020) this research focused on how teachers' attitudes toward technology changed as a result of the pandemic because they were forced to integrate technology use in the classroom.

The related literature is presented through seven themes that emerged while reviewing research on the subject matter. The seven themes describe the related components to examining how teachers' perceptions about technology effects their use of technology in the classroom, the

significance of technology in the classroom, and how the pandemic may have shifted their perceptions of technology. The teachers that were not comfortable with technology faced more challenges than their coworkers at the onset of the pandemic (Siddiquei & Kathpal, 2021). The first themes focus on the importance of technology in education and the tools available to educators and their attitudes regarding technology. Research showed that although technology showed learning potential, some teachers rarely adopted to using technology (Fraillon et al., 2020). Putnam and Borko (2000) correlated the literacy of teacher technology with the knowledge of technology teachers can instill in their students. Educators who prioritized integrating technology better prepared their students for the technology-driven world (Awofala et al., 2019). Teacher anxiety, confidence, and training play an important role in the amount of technology used in the classroom and its usefulness of it. The remaining themes focused on students' needs and attitudes regarding technology and the effect the pandemic had on education.

The Importance of Technology in Schools

Research shows that lecture-based learning is inadequate for today's educational practices because they are not collaborative (Kwon & Woo, 2018). Competency in most types of work today requires students to be fluent in technology (Drozdikova-Zaripova & Sabirova, 2020). This experience with technology begins in the classroom at a young age for students today. Juhanak et al. (2019) found that the later a child uses a computer, the lower their level of ICT competence. This lack of competence followed the student throughout their education and later into their career. Administrators had an obligation to students to help them develop skills that will help them in the workplace (Choppin & Borys, 2017).

Technology started to change the focus of the content to the student as the creator (Drozdikova-Zaripova & Sabirova, 2020). Hillmayr et al. (2020) found that the use of digital tools that include manipulation tools for science and math had a significantly positive effect on learning and attitudes concerning technology for students. Schools that provided computer science classes for students can help, but technology in the classroom was relevant for all classes. There has been an increase in interest in computer science education students as well as a projected increase in the job market (Menekse et al., 2020). The Bureau of Labor Statistics projects computer-related jobs to increase by 24% by 2026 (Watson, 2018). More jobs require computer skills and basic technology knowledge (Awofala et al., 2019). Beyond computer science classes, historically, research showed that technology has the potential to increase the effort students' put forth while learning (Ainley et al., 2008; Blumenfeld et al., 2006; Lai, 2008; Mayer, 2019; Zhu & Urhahne, 2018). Hillmayr et al. (2020), found that programs that simulate real-world problem-solving stimulate students' thinking. The type of digital tool is also important to the use of technology in schools regarding student thinking. Some of the different types of digital tools included practice, tutoring systems, and simulations (Hillmayr et al. 2020).

Fraillon et al. (2019) found that 91% of teachers thought that technology helps students have an interest in learning and 87% of teachers across 12 countries thought that ICT helps students work at their appropriate level (Fraillon et al., 2019). Teachers found that the least important activities regarding student learning are websites and blogs (Karchmer-Klein & Konishi, 2021). Researching information, surveying, participating in online games, and creating presentations were among the most important for student engagement and achievement according to teachers (Karchmer-Klein & Konishi, 2021). Technology greatly enhanced student learning by engagement in classrooms (Higgins et al., 2019). The importance of technology use

for students in schools is emphasized by the fact that many schools now have one-to-one ratio policies in place, which means every student in a school gets a device, instead of sharing classroom computers or tablets (Bushweller, 2020).

Many programs and initiatives have supported the importance of the use of technology in the classroom. The United States Department of Education had the initiative to enhance broadband all over the United States to close the digital divide among learners (Department of Education, 2022) this program was referred to as DEER (Digital Equity Education Roundtables). The Office of Education Technology also pledged Educator Preparation Programs that included e-learning and collaborative development to support teachers in using technology effectively (Department of Education, 2022). The policy by the Department of Education that articulated the vision for technology in schools listed clear goals that include funding (Department of Education, 2022) called the National Educational Technology Plan.

Administrators and training personnel developed technology-integrated lesson plans and prioritized training and support for their teachers a priority (Harris & Jones, 2020). This is also an example of how stakeholders view the importance of technology in the classroom. Technology standards have been available to teachers, administrators, and students through the International Society for Technology in Education (ISTE). The ISTE provided a comprehensive list of learning objectives and activities to support teachers in the classroom (ISTE, 2022). Textbooks publications have advanced to also provide technology enhancement lessons for teachers and digital textbooks (Futterer et al., 2022). These teaching tools and advancements have been provided to teachers because teaching technology was and continues to be considered an important aspect of teaching.

Types of Digital Tools

There are many types of digital tools that teachers have used to bring technology into the classroom. Nattland & Kerres (2009) divided the types of tools into five categories including drill, tutoring, intelligent tutoring, simulations, and hypermedia systems (Hillmayr et al., 2020). The use of intelligent tutoring systems and simulations showed more benefits (Hillmayr et al., 2020) than the other types of tools. Although, Hillmayr et al (2020) showed all digital tools had a positive effect on student learning and placed emphasis on the importance of teacher training. Learning with digital tools was proven beneficial if learners used visual and auditory functions, there was no cognitive overload, and the learners were actively engaged in comprehension (Mayer, 2014). Digital tools were more beneficial when they were used with other instructional methods and not used to replace instruction (Hillmayr et al., 2020).

Interactive tools were categorized as dialoguing, controlling, and manipulating for the learner (Hillmayr et al., 2020). Dialoguing was reported to be an important aspect to using digital tools because the learner could manipulate the material they were presented with and sometimes controlled the objects on the screen (Hillmayr et al., 2020). Students showed improvement in the effectiveness of dependent work when an interactive environment was presented to them (Zaripova-Drozdikova et al., 2020). Interactive tools and digital learning have increased with the increase of flipped classrooms (Zaripova-Drozdikova, et al., 2020). Flipped classrooms increased the number of digital tools and interactive tasks allowing students to get information at their convenience and research showed that digital tools were practical when addressing absences (Zaripova-Drozdikova, et al., 2020).

Drill and Practice. Drill and practice systems enhanced content knowledge by letting the student practice at their own pace with immediate feedback (Hillmayr et al., 2020) and repeat exercises as they needed to in order to master a skill. A negative feature to drill and practice

systems was that they only gave corrective feedback (Bayraktar, 2002). Research showed that explorative feedback had a more positive impact on learning (Belland et al., 2017). Another negative aspect of drill and practice systems was that they did not offer guided activity (Hillmayr et al., 2020). Drill and practice systems only strengthened learned content, they do not give the learning new knowledge (Hillmayr et al, 2020).

Drill and practice systems were the types of tools frequently used by students. Bice & Tang (2022) found that most teachers used a drill and practice tools at least once a week. Teachers with teacher-centered classrooms tend to use drill and practice activities as a supplemental part of their instruction (Bice & Tang, 2022) which was consistent with research that states that teacher-centered classrooms negatively saw the impact of technology use (Hermans et al, 2008) and only used it as a supplement. Educators that were new to using technology viewed drill and practice as an extra component to their lessons, but not as a necessary function, and found no real use for it (Bice & Tang, 2022).

Tutoring Systems. Tutoring systems offered new content knowledge in small units and included exercises to practice and offered pacing for the learner (Hillmayr et al., 2020). One benefit to intelligent tutoring systems was that they had adaptive features that presented new content based on prior knowledge and offered differentiated feedback and hints (Nattland & Kerres, 2009). Another benefit was that tutoring systems created a more problem-based learning environment for the learner because many times they could choose what was fascinating to them (Singh et al., 2022). These adaptive features created a positive impact on student learning (Ma et al., 2014). Intelligent tutoring systems (ITS) offered students learning material that was aligned with student needs, their preferred media to learn, and offered learning at their own pace (Singh et al., 2022). ITS was not meant to replace teachers, but to recognize the learning challenges of

the learner and enable the teacher to focus on their tutoring to support the learner (Singh et al., 2022).

Most tutoring systems required that teachers must also observe the student's behavior and provide feedback (Singh et al., 2022). New technology such as the SeisTutor analyzed the learner's behavior and even adapted to the learner's desired pedagogy (Singh et al., 2022). Sigh et al. (2022) found that 77% of the students were strongly satisfied with this type of learning. Only teachers that displayed a strong attitude toward technology in the classroom would be chosen to work with an ITS of this nature (Singh et al., 2022) based on their attitude towards technology. Research showed that intelligent tutoring systems produced statistically significant effect sizes for learning outcomes over other digital tools (Hillmayr et al., 2020).

Simulation Tools. Simulation tools like interactive mathematical tools were more beneficial than hypermedia systems (Hillmayr et al., 2020) and showed the greatest learning gains. The ability to manipulate different perimeters to visualize different outcomes provided exploratory learning for students (Hillmayr et al., 2020). Many students have misconceptions about science and math that can be disproved by simulations. Simulation examples included manipulating real-world situations, virtual reality, virtual laboratories, and algebra systems (Lichti & Roth, 2018). Simulations could also replicate model-based learning (Buckley et al., 2004) and cognitive constraints from misconceptions (Jimoylannis & Komis, 2001).

Hillmayr et al. (2020) found that students had a more positive attitude toward the subjects that used simulations. Recent research has also shown an increase in teacher attitude when simulations were part of the learning environment (Koparan, 2022). Students with a negative attitude towards a subject changed to a more positive attitude about that subject with the use of simulations (Koparan, 2022). Research in this field indicates that simulations also provided

teachers with more variety and time to teach a topic because there was no set-up time or materials to purchase (Koparan, 2022). A negative aspect of using simulations included in research, showed that simulation-based teaching success was related to the attitude of the teacher using simulation-based teaching because they were not comfortable using it with their classes (Koparan, 2022).

Hypermedia Systems. Hypermedia systems or hypertext programs were comparable to an encyclopedia providing information through hyperlinks (Hillmayr et al., 2020). Hillmayr et al (2020) found hypermedia to be the least effective form of digital tool. It reinforces the idea that learning without guidance was less beneficial (Hillmayr et al., 2020). Students could click on a variety of links without guidance to research topics. In recent research, Cebi & Guyer (2022) found that students with a low memory capacity had less satisfaction and higher perceived disorientation using hypermedia.

Hypermedia continues to be common practice using Google Classroom and was used by many teachers during the pandemic. Students that used hypermedia without the support of a teacher or another person guiding them rests solely on the student's learning abilities and focus (Cebi & Guyer, 2022). Hyperlinks provide reading material to students, but many times students struggled reading and comprehending at the level provided by the hyperlink. Some teachers cited online teaching as not authentic because they could not trace student participation using hyperlinks (Dorji, 2021). Although research showed that teachers continue to use a hypermedia source such as Google Classroom, it would be with the support of the teacher in a face-to-face environment to support learning (Hussein et al., 2021).

Google Classroom. One of the biggest tools that became common practice during the pandemic was the use of Google Classroom (Hussein et al., 2020). Although much of the

research on Google Classroom comes from other countries, there is an insight into the findings on Google Classroom as it pertains to the United States. Hallal et al. (2020) found that teachers were able to establish communication and create lessons easily using Google Classroom at the onset of the pandemic. It was also found that most of the teachers believed using Google Classroom was effortless (Hussein et al., 2020). Although educators found flaws in Google Classroom services (Hussein et al., 2020). Research also showed an overall increase in teacher opinion of online learning after the pandemic (Hallel et al., 2020).

Hussein et al. (2020) listed that the largest external hindrance was internet connection using Google Classroom, but as stated, most of the research is not in the United States. Internet connection, although a hindrance, was not a negative aspect of the use of Google Classroom. Another hindrance to Google Classroom was the use of assessments because teachers could not be sure students were not cheating (Hussein et al., 2020). Cheating was a concern for learning in person and online. Google Classroom is still a useful tool after the pandemic even though it was found that teachers thought the support system provided by Google Classroom was flawed in some respects during the pandemic (Hussein et al., 2020).

Video Conferencing. The other tool that became prevalent during the pandemic was Zoom or Google Meets. These platforms were used by many professionals, such as physicians, not just teachers during the pandemic. Video conferencing provides synchronous communication between teachers and students using cameras and chat tools (Riyadh et al., 2022). Working from home became a worldwide concept during the pandemic (Riyadh et al., 2022). Although video conferencing appeared to be the answer to being able to teach from home, students' attendance was much lower than in face-to-face classes (Riyadh et al., 2022).

Riyad et al. (2022) researched students in Sri Lanka and found Zoom attendance was a problem for many online learners during the pandemic. There was an overall unwillingness to engage in the classroom lesson (Borup et al., 2020). Although this was true for many students, age played a factor in engagement when comparing engagement of students (Borup et al., 2020). Universities found that video conferencing became so prevalent in education during the pandemic that it has become the new normal for online learning (Zacharis, & Nikoloupoulou, 2022). Research showed that college students fully intended to continue learning virtually either fully or in a hybrid model (Zacharis, & Nikoloupoulou, 2022).

Teacher Training

As online learning grew in schools and universities, there was a concern for increasing success in online learning surrounding students and teachers (Heo et al., 2020). Teachers had many reasons for not embracing technology in their classrooms prior to the pandemic. They may have lacked training, they might have experienced stress in learning something new, or their pedagogy might have kept them from using technology effectively in their classrooms (Salomon, 2002). Some teachers insisted on using paper and pencil perhaps because they say students need to learn how to write, or they were just more comfortable doing what they had always done (Dincher & Wagner, 2021). When using technology many teachers simply replaced textbooks and blackboards with eBooks and PowerPoint presentations and suggested they were integrating technology (Lui et al., 2019). Teachers needed appropriate training to efficiently integrate technology (Ottenbreit-Leftwich, 2018). Teachers with technology training will continue to be valuable to all staff members (Howell, 2021).

Increasing teacher knowledge of technology should begin while students are pre-teachers to start building the needed confidence to integrate technology because personal capabilities play

a strong role in technology integration (Altun, 2019). Altun (2019) found that grade levels and GPA are not related to the teacher's self-reported technology ability. The issue of adding technology to education and updating professional development has been an issue for a long time (Altun, 2019). Research showed that one of the many challenges for teachers during the pandemic was that teachers felt they were not prepared and lacked training (Siddiqueil & Kathpal, 2021). Usefulness also played a factor in using technology in the classroom and discomfort of the educator had an impact on using technology (Gomez & Ivanov, 2017). Pandya et al. (2021) found that essential training existed in higher education institutions and faculty felt supported during the pandemic, while many K 12 teachers did not (Kim & Asbury, 2020). Academic institutions should have acknowledged computer anxiety and created ways to reduce that anxiety in pre-service teachers (Awofala et al., 2019).

Regardless of teachers' readiness for online learning they had to participate in online learning and use technology during the pandemic (Heo et al., 2020). Teachers historically have been required to take professional development classes to prepare them for what lies ahead in the classroom, most teachers have experienced some training regarding technology. Teachers have experienced professional development opportunities to learn how to integrate technology into their classrooms to create authentic learning experiences for children (International, 2017). Districts continue to purchase new technology but don't always provide training for the technology and the investment in training should be equal (Dincher & Wagner, 2021).

Professional development days that are offered through schools do not always address the learning need of each teacher. Updated professional development days focusing on integrating technology are crucial to support teachers (Altun, 2019). This could be a challenge when computer applications and software are updating and changing often. The teacher training

delivered at schools has traditionally been usually a holistic approach to the entire staff and does not include individual classroom applications. Although many pieces of training included practices that teachers can use in the classroom, research showed that teachers were more likely to use an application or practice when they used it themselves (Guggemos & Seufert, 2021) especially if it involves technology.

Ideally, teacher education programs have prepared teachers for using technology in the classroom effectively. Government and professional organizations have identified the need for technology training for teachers (Nguyen & Bower, 2018). These needs are implemented through standards and objectives offered at colleges and universities. Giving teachers the tools to create a curriculum that involves technology in their lesson plans should be a priority for education programs. Research shows that pre-service teachers analyzed technology on external characteristics instead of the value it may possess to the learner (Lee & Kim, 2014).

Research showed that new teachers were more likely to use technology if they have been exposed to effective ways to use it (Eksail & Afair, 2020). Training on creating collaborative interactions also continues to be essential for students to create ties to each other and their institution whether in person or virtually (Oliveira et al., 2021) so it should be a priority for colleges and universities. Colleges and universities made changes to address the needs of teachers and provide them with the confidence they need so teachers have a more positive attitude toward technology in the classroom. These college programs can shape teachers' attitudes if there is an understanding of the factors that lead to these attitudes (Luik & Taimalu, 2021).

Technology Courses

Some research suggests a problem identifying the appropriate technology training for teachers in teacher education programs. There was a concern that without the use of technology teachers would not be able to reshape the teaching-learning process that is necessary to keep up with student needs (Bhat, 2016). Most teacher education programs require technology classes but that may not be enough to prepare teachers for all the ways they will use technology. Less than 5% of pre-service teachers reported that they spent time digitally on their professional development tasks (Altun, 2019). Teachers need training in lesson planning, lesson delivery, and data collecting. Research shows the increase in technology courses in education was beneficial to integrating technology (Wilson et al., 2020). However, teacher education programs could not possibly keep up with the changing programs that were required by individual districts. Districts purchase new books and programs that follow a new curriculum often and those changes challenge teachers. Teachers struggled to meet the demands of a constantly changing system and did not learn to use technology efficiently.

Preparing teachers by providing them with experience using technology influenced teachers' use of technology (Tondeur et al., 2017). Kuhfeld et al. (2020) cited the common barriers for technology use in the classroom as resources and teachers' technology skills. If teachers feel comfortable with one program, they may be more confident to use a similar program for their students. Colleges and universities play an important role in developing teachers and influencing their intention on using technology in the field (Watson & Rockinson, 2021). Pre-service teachers often only get one technology class to explore how technology integrates into lesson plans for students.

Technology Integration

Technology in the classroom can be integrated into all aspects of a lesson or not at all and the teacher is the one that controls it (Njiku et al., 2019). Integration can be limited by factors that are beyond the teacher's control. For example, time, resources, and support are external factors, while knowledge and attitude are internal factors that can be controlled (Luik & Taimalu, 2021). Ottenbreit-Leftwich et al. (2018) suggest focusing on internal factors because the teacher will find a way to integrate technology if those factors are overcome. Sangeeta & Tandon (2020) found that teachers must find a use for technology to adapt to use it. The pandemic offered exposure to those teachers to find a use for the technology they may not have appreciated before the pandemic.

During the pandemic, the quality of lesson delivery likely suffered as a result of instructors lacking online teaching support (Heo et al., 2020). Research shows that even using the whiteboard, which would be considered the primary use of technology in the classroom, increases with whiteboard training **(**Aksu & Ozturk, 2018). Although each time whiteboards are replaced with new models, new training is required. The COVID-19 pandemic provided an opportunity for teachers to integrate technology and enhance their skills in teaching with technology at all levels (Akram et al., 2022).

Research shows that educators, teacher educators, and policymakers note the importance of integrating technology in the classroom and preparing teachers (Wilson et al., 2020). Teachers acknowledged the increased amount of motivation and engagement by students when technology is used in the classroom (Aksu & Ozturk, 2018) but not all teachers are adept at using it in the classroom. Teachers used the whiteboard to show videos, deliver notes, and conduct interactive lessons. Traditional technology or teacher-centered technology is not as engaging as student-

centered technology (Liu et al., 2019). Liu et al. (2019) accurately described the difference between teacher-centered and student-centered technology.

Teacher-centered technology uses technology for knowledge transmission, while student-centered technology focuses on knowledge building (Liu et al., 2019). Many teachers were afraid to release control to their students when trying to use technology to build knowledge in the classroom. When the pandemic hit classrooms, teachers had to learn how to use a variety of programs and had to use a virtual platform to share their lessons with students virtually. Some teachers were more prepared than others based on the training they had and what they were willing to learn on their own. Research showed that some were willing to respond to feedback and monitor and adjust as they went, while other teachers did not and felt less successful (Hu et al., 2020).

Technology is no longer just a way to deliver lessons. Technology integration can help meet students' needs on a social level as well as an instructional one by using online collaboration (Nguyen & Bower, 2018). Students can collaborate virtually and in person if the lesson is delivered correctly and the students are receptive to collaboration. Students can share research using a Google document to collaborate on a project if taught how to use it correctly. Collaborating with technology, or any subject needs to be taught to students to do it effectively (Jones, 2020).

Teacher Attitude Regarding Technology

Although Nguyen & Bower (2018) cite potential reasons that teachers do not use technology such as pedagogy, teaching styles, learning styles, and their capabilities. Other research shows that stress and attitude are the main components of using technology in the classroom (Fernadez-Batanero et al., 2021). Jjiku et al. (2019) defined attitude as a construct that

included enjoyment, confidence (self-efficacy), anxiety, and overall position on technology as an attitude for research. More recently, Adhya & Panda (2022) used the TeLRA (test of e-learning-related attitudes scale (Kisanga & Ireson, 2016) for a quantitative analysis of attitudes regarding technology-enabled learning between online educators and F2F educators in a college setting. Adhya & Panda (2022) found that online educators had a higher positive attitude than F2F teachers regarding technology-enhanced learning. Guoyan et al. (2021) found that effective integration of ICT depends on teachers' self-efficacy. Which reinforces the concept guiding this research, that more exposure to technology leads to confidence with technology and a better attitude.

Studies (Agyei & Voogt, 2010; Hernandez-Ramos et al., 2004) measuring teachers' attitudes regarding technology and integrating technology offered attitude as a major determinant of technology use. Attitude refers to feelings about something and behavior refers to the interaction related to that attitude (Njiku et al., 2019). For this study, attitude referred to one's likes and dislikes about technology. A positive attitude solicits a positive response while a negative attitude solicits a negative response (Dorji, 2021). Teacher attitude was important because teachers continue to be the most crucial decision-makers about what they teach (Agyei & Voogt, 2010). Attitude regarding technology was directly related to teacher turnover during the pandemic (Fernadez-Bataner et al., 2021). Njiku et al. (2019) analyzed the components of attitudes, some of which are enjoyment, confidence, anxiety, integration, benefits, and productivity. Enjoyment or enthusiasm measures a happy feeling using technology (Agyei & Voogy, 2010). Confidence, or self-efficacy, measures an ability to use technology to reach objectives (Schlebusch, 2018).

Another predictor of computer use was self-efficacy (Awofala et al., 2017). Bandura (1982) explained that self-efficacy develops from four areas: performance attainment, observing others' experiences, verbal persuasion, and situational appraisal (Kitchen et al., 2021). Kitchen et al. (2021) found self-efficacy can be enhanced through reflection, self-assessment, support, planning, and guidance. Schlebusch (2018) explains anxiety as technophobia which keeps someone from associating with technology. Dorji (2021) found that more than 50% of the teachers in Bhutanese preferred e-learning once they were comfortable with it and found the usefulness of e-learning. Reluctance to integrate e-learning in the classroom is attributed to a lack of training and technology available (Dorji, 2021). Integration refers to the intent to use technology in education (Agyei & Voogt, 2010). The term benefits refer to the perceived benefit of the technology by the teacher (Agyei & Voogt, 2010) as well as the term productivity.

People tend to have anxiety when they are uncertain about outcomes and challenged in what they are doing. Recently, because of the pandemic, teachers have been faced with many technological changes and these changes have caused anxiety (Fernadez-Bataner et al., 2021). Tourkzadeh & Angulo (1992) found computer anxiety has three dimensions which include psychological (self-efficacy), operational (experience), and sociological (age, gender, etc.). Awofala et al. (2019) found that attitudes toward computer use had a relationship with computer self-efficacy and anxiety which was in line with older research on the same topic by Awofala et al. (2017). Heeok et al. (2020) found that increased self-efficacy in technology by students did not increase learning engagement by students but did increase self-efficacy in utilizing technology in an online environment. Teachers may have had the same experience from the experience of online teaching during the pandemic.

Teachers already experienced burnout and fatigue and experiencing stress with technology interferes with their mental health. This stress has increased over the last 15 years (Fernadez-Bataner et al., 2021) as the use of technology has increased. Time limitations put on teachers is a major barrier in building technology enhanced lessons (PwC, 2018). Research attributed the lack of training to teacher stress (Fernadez-Bataner et al., 2021). This stress increased as teachers had to learn new technology to teach virtually during the pandemic. The stress created by what Hodges et al. (2020) called "emergency remote teaching" was unprecedented (Heo et al., 2020). This anxiety caused many teachers to change professions or retire as a result of having to learn a new way to teach causing retention problems (Matthews et al., 2021).

The bi-directional relationship between teachers' beliefs about technology was related to their pedagogical beliefs and the amount of experience they have with technology use in the classroom (Tondeur et al., 2017). Research showed that positive experiences with technology can influence a teachers' use of technology (Tondeur et al., 2017). The main reasons for the lack of technology integration in the classroom as researched by Karchmer-Klein & Konishi (2021) are stated as lack of class time, lack of professional development, and lack of technology available. Claiming a lack of professional development is a main reason for not using technology emphasized the need for more training in teacher licensure programs as well as in the schools (Karchmer-Klein & Konishi, 2021).

Pre-service Teachers

Pre-service teachers with positive attitudes about technology were more likely to use it and be confident and less stressed using technology (Atabek & Burak, 2020). Research shows that an increased number of courses for pre-service teachers allowed them to use technology

more effectively (Atabek & Burak, 2020). It was also explained that pre-service teachers that increased their use of technology, also increased their positive attitudes toward technology (Atabek & Burak, 2020). Many pre-service teachers have grown-up using technology and possibly feel more comfortable learning something new. Although Altun (2019) found that daily technology use was a weak predictor of technology use because the use could be centered around social media, which is only considered screen time and does not pertain to use in the classroom.

Research also shows that field experience is a contributing indicator that pre-service teachers will integrate technology into their instruction (Wilson et al., 2020). Research also shows that pre-service teachers did not treat technology integration based on a pedological context, only as external characteristics (Wilson et al., 2020). Nelson and Hawk (2020) found that if an active constructivist approach was applied through technology, preservice teachers found a greater value in technology. This openness to learning new technology gave preservice teachers an advantage over veteran teachers. Many new teachers were eager to share ideas with veteran teachers in the classroom and many held training sessions for veteran teachers.

New Technology for Veteran Teachers

New technology required training and modeling (Voet & De Wever, 2017). It isn't enough to attend a training session; new training should be implemented so the teachers feel comfortable using the training in the classroom. Fernadez & Shaw (2020) found that educators that were intrinsically motivated to develop innovative ways to build their curriculum found more success, while those that were dependent on professional development classes struggled during the pandemic. The potential that technology has in the classroom is always changing and with that change comes learning new material. This wasn't the case for educators in the past. They might have had to learn a new curriculum, but educators were not forced technology. When

the pandemic happened, educators had to learn an entirely new way to use technology out of necessity because it was the only way to teach. Publishers offered technology enhancements and every time a new textbook or program was purchased from a school district, new material had to be mastered for the educator.

Every textbook adoption, magazine subscription, or district-funded application came with a new piece of technology that must be learned by educators. Karchmer-Klein and Konishi (2021) found that teachers described technology tools as moving targets, referring to how quickly new technology is introduced and the difficulty to stay current. Textbook companies try to keep up with ever-changing state standards which accompany changing technology (McElhaney, 2016). Many of the training sessions that teachers attended were just focused on learning new technology. This was very time-consuming and may have caused stress for teachers. There were many barriers that held teachers back from using technology including technology attitudes and prior usage, digital skills, and online navigating skills (Altun, 2019). Ertekin et al. found that teachers lacked the proper training to implement a constructionist pedagogy, let alone with the implantation of technology in 2009. This research addresses if that lack of training has changed since the pandemic.

Pedagogy Regarding Technology

Pedagogy is defined as a person's method of teaching (Farjon et al., 2019). Research shows that beliefs about pedagogy and technology are connected, although very little thought is given to pedagogy by new teachers (Nguyen & Bower, 2018). This connection can lead to whether a teacher uses technology in the classroom. Content knowledge is also connected to the use of technology (Farjon et al., 2019). A teacher's pedagogy influences their attitude toward technology and their enjoyment of teaching is based on their pedagogy (Njiku et al., 2019).

Teachers who fundamentally disagree with using technology will not likely try to incorporate it into their lessons. Fraillon, Ainley, Schulz, Friedman, & Duckworth (2019) found that 37% of teachers across 12 countries thought that digital tools kept students from learning. It is unlikely that these teachers will incorporate technology tools into their classrooms, especially if their attitudes did not change after the pandemic.

Research shows teachers benefited from using Technological Pedagogical Content Knowledge (TPACK) (Karchmer-Klein & Konishi, 2020). Mishra & Koehler introduced the TPACK model to investigate pedagogy and technology (Mishra & Koehler, 2007). Mishra & Koehler explained the TPACK model by describing the relationship between technology, pedagogy, content, and how teachers used technology enhanced design for lesson plans. The three related components include technological pedagogical knowledge (TPK), technological content knowledge (TCK), and technological pedagogical and content knowledge (TPACK). Knowledge can be established as perceived knowledge and is related to whether the teacher believed they had more of an influence on their students (Altun, 2019). These models helped to identify attitude characteristics for quantitative and qualitative research.

Teachers identified the appropriate activities and assessments to meet their learning goals using technology (Karchmer-Klein & Konishi, 2020). Research shows that teachers could benefit from reflection activities when considering the TPACK model (Nguyen & Bower, 2018). Pedagogical ideas change how or if a teacher used technology in the classroom. For example, teacher-centered classrooms might have used technology for practice, while student-centered classrooms might have used technology for project-based learning and collaboration (Tondeur et al., 2020). Pandya et al. (2021) found that many higher educational staff changed their delivery of instruction from teacher-led to learner centered during the pandemic as a result of online

teaching. Research shows that there is no difference in course content whether online or face-to-face for higher education (Pandya et al., 2021).

Intentions

Attending training sessions and receiving technological tools purchased by school districts wasn't enough to guarantee teachers would use technology. Teacher's intentions were also not enough to use technology, although research showed that there is a relationship between the intention to use technology and the use of technology in the classroom (Teo, 2018). The COVID pandemic put teachers in a position where they no longer have the right to choose if they use technology in the classroom (Luik, 2021). The inability for some to embrace technology brought more attention to the reasons why teachers are not using technology (Luik, 2021). Teachers could use technology to enhance their pedagogical strategies if they knew how (Tyler-Wood et al., 2018).

Unfortunately, administrators often lacked the pedagogical vision to guide teachers on using technology (Tyler-Wood et al., 2018). Coaches, administrators, and teachers may have had intentions to use technology in the classroom, but unless it was integrated into the planning stages of a lesson plan, technology would not get used. Attitude was a significant characteristic in the adoption of any technology (Sangeeta & Tandon, 2020) and intention to use by the teacher. Research shows that teachers perceived searching online and creating multimedia presentations as the most important activities regarding technology but reported that they do not use them frequently in their lesson plans (Karchmer-Klein & Konishi, 2021). The TAM, a measurement tool, explained teachers' intentions to use technology and found that pre-service teachers had an overall better attitude towards technology (Scherer & Teo, 2019). This tool could

effectively be used to measure teachers' intentions on integrating technology in their classrooms after having to use technology during the Covid pandemic.

New Teachers

Teacher beliefs played an important part in integrating technology and understanding how students learn **(**Nguyen & Bower, 2018). New teachers had not understood their own pedagogy yet and research showed they didn't really know what it entailed (Nguyen & Bower, 2018). Seasoned teachers understood that it was a broad term that encompassed all aspects of learning, and not just delivering a lesson (Nguyen & Bower, 2018). For example, if you saw collaboration as an important part of learning, you would include a collaborative element in your lesson (Nguyen & Bower, 2018). This is also true of technology and how it is used. Although, the intention to use technology does not seem to be indicated by experience or age (Scherer & Teo, 2019). Mentor teachers and teacher educators were important by being good role models for new teachers by integrating technology (Luik & Taimalu, 2021). Dindar et al. (2020) found that inexperienced teachers displayed the same levels of technology acceptance as experienced teachers during the pandemic and most accepted the condition that was imposed on them regardless of experience.

Students' Needs Regarding Technology

Students continue to need technology skills to advance in almost any career. There is a high demand for computer science degrees in college (Strengthening, 2019) as shown by increasing enrollment by 125 percent according to Purdue University. The need to be proficient in technology should be addressed in the classroom. Students with low self-efficacy avoided challenges because they were afraid to fail (Menekse et al., 2020). Technology-integrated lessons addressed many aspects of a student's needs and helped support teachers (Thacker, 2017). These

needs were as basic as Wi-Fi and students getting access to tablets. Students also needed to be prepared for the future and technology played an important part in that as well as problem-solving and communication skills using technology (Thacker, 2017). Technology could be used in multiple ways to enhance differentiation and engage struggling learners. Research shows technology was used as a successful intervention tool for students, especially concerning mathematical concepts to address individual students' needs (Higgins et al., 2022).

Teachers were mindful of using technology for the benefit of students and not overstimulate them. It has been argued that children need regular breaks and visual distance from screens to minimize the harm of the screens (ECA, 2018). If teachers didn't see technology as useful in enhancing differentiation and engaging learners, they would not use it. Some teachers saw the use of technology as harmful. Teachers viewed the usefulness of using technology to address student needs in different ways. Scherer & Teo (2019) referred to this view as perceived usefulness (PU). PU was a measurement tool to determine if teachers used technology to prepare lessons and integrate technology as a teaching tool, or just to deliver lessons (Scherer & Teo, 2019). Research shows that there is a significant increase in achievement among students that were exposed to games and simulations during their learning (Koparan, 2022).

Student Attitudes

Districts encouraged technology to motivate students and prepare them for the future (Hoffman & Ramirez, 2018). Research showed that students saw technology in the classroom as a vital way to learn and thought that teachers should use technology, especially in group work (Hoffman & Ramirez, 2018). Students are used to using their devices to find information and communicate with others (Hoffman & Ramirez, 2018). Research shows that K-12 students were more passionate about learning when they were using technology (Hoffman & Ramirez, 2018).

Technology as a supplement was perceived differently than the technology used as a primary form of teaching. Chakraborty et al. (2020) found that during the pandemic 65.9% of university students felt that they learned more in physical classrooms than solely online. They also found that university students felt that their teachers improved their online teaching skills significantly since the pandemic (Chakraborty et al., 2020).

The two main contributing factors to students' attitudes regarding technology were facilitating conditions and learning value (Zacharis & Nikolopoulou, 2022). Facilitating conditions referred to the accessibility to a laptop or computer and learning value referred to whether the student felt the task is worth their time and effort (Zacharis & Nikolopoulou, 2022). This research offered implications for policymakers and educators with regards to increased enhanced facilitating conditions (Zacharis & Nikolopoulou, 2022). Teachers that used technology so students can practice tasks or summarize their understanding encouraged students to collaborate with their peers (Nguyen & Bower, 2018). Students' needs were met by learning the material and getting some social interaction with their peers. Social skills and collaboration skills through technology will be even more important for students in the future (Halonen et al., 2017).

Research showed that students perceive a need for more assistance in relation to computer science academic performance (Menekse, Zheng, & Anwar, 2020). Needs by students concerning technology correlated to self-efficacy and their prior knowledge of specific technologies (Menekse et al., 2020) Self-efficacy also affected motivation for learning new technologies (Zimmerman, 2008). The reasons for low confidence concerning technology were likely centered around experience (Menekse et al., 2020). Experience can be enhanced in the classroom if the lesson plans are delivered to the student to build confidence. Building

confidence in online courses may increase the attitude of students concerning technology. Research showed that 65.9% of college students preferred physical classrooms over online learning (Chakraborty et al., 2020). Riyath et al. (2022) found that the main reasons students have lower attendance while online learning was that they have low computer self-efficacy, low perceived usefulness, and did not see it easy the technology as easy to use.

Student Data

The debate about standardized testing and its value has been a conversation among teachers and researchers for a long time (Bruno & Goldhaber, 2022). There is no denying that the data acquired from testing is used at some level to guide instruction in the classroom. Futterer et al. (2022) found that students put forth more effort when technology is being integrated into the classroom. The effort put forth by students should be apparent when comparing data for testing. There were problems with testing prior to the pandemic that only added to the debate about the value of testing now. Historically, some of the problems included the results taking too long to get and too little relevant useful information (Marsh et al., 2006).

Research showed that educators, teacher educators, and policy makers saw the importance of integrating technology in the classroom and preparing teachers (Wilson et al., 2020). Using technology for student needs did not just encompass the delivery of a lesson, but also the use of technology to collect data about students. Teachers and administrators used data to make decisions about holding students back, offering them extra tutoring, or putting them in advanced classes (Figlio & Ozek, 2020). Although debates continue about the improvement in students' outcomes and if there are true benefits to giving standardized tests (Bruno & Goldhabor, 2022).

Bruno & Goldhabor (2022) described three categories that involve data. They included using it a diagnostic tool to evaluate a student, to research for interventions or gaps, and to make schools accountable to improve practices (Bruno & Goldhabor, 2022). Teachers used data in the classroom to determine how to differentiate and meet student needs (Bruno & Goldhabor, 2022). There has always been an expectation that schools collect, organize, and implement practices based on student data (Faber et al., 2018). This analysis of data included the use of technology. Data could be taken from a quick online quiz, or a state issued course assessment. Educators were expected to be able to use this technology to analyze student ability. Bruno & Goldhabor (2022) explained that introducing new tests or protocols every few years makes analyzing long-term difficult.

Pandemic Background and Effects

In 2019 the coronavirus outbreak happened in China and within a few months it was declared a pandemic by the World Health Organization (Chakraborty et al., 2020). Schools went from a face-to-face format to an online format to prevent the spread of COVID-19 (Butnaru et al., 2021). The idea to suspend class but continue learning online began with the Chinese Government (Zhang et al., 2020). According to UNESCO, 192 countries closed schools and impacted 99.9% of the students in the world (UNESCO, 2020). Teachers and students had to learn new platforms such as Zoom, Google Classroom, Microsoft Teams, and others (Sangeeta & Tandon, 2020). It was not enough to create lessons, but the lessons for students had to be engaging online learners (Sangeeta & Tandon, 2020). One thing that nations learned from the pandemic was to be prepared for digital learning to be delivered effectively (Siddiquei & Kathpal, 2021). Mathews et al. (2022) found that teachers overall rose to the challenge of online

teaching and did not leave the profession immediately due to stress and anxiety as many suggested might happen.

There were advantages and disadvantages to online learning. The advantages were that many students had more flexibility and exposure to courses they may have not been able to attend, especially college students (Butnaru, 2021). Some of the basic disadvantages include internet connections and other computer issues (Butnaru, 2021). Siddiuque & Kathpal (2021) found that student readiness and the ability for teachers to give effective feedback were also among some of the challenges. Teacher ability concerning technology was also a contributing disadvantage to online learning (Siddiuque & Kathpal, 2021). Another disadvantage was the ability for socialization with others (UNICEF, 2020).

Kim & Asbury (2020) found that socialization was cited as an important fact for teachers because they seek emotional support from coworkers to cope with anxiety. Teacher anxiety and burnout is not a new concept but pairing that with lower confidence in their ability to do a good job for their students took teachers to a new level of stress (Buric & Kim, 2020). This stress was added to by students' access to technology and their willingness to engage in an online platform (Borup et al., 2020). Teachers also experienced anxiety out of concern for vulnerable students that were home alone and without support from parents (Kim & Asbury, 2020). Many students, along with teachers, faced anxiety and stress during the pandemic (Coe et al., 2020) and struggled to adapt to online learning. There was also an expectation that all students had equal access to, and could navigate technology (Chakraborty et al., 2020).

Dorji (2021) found that although the process of online teaching was difficult, online teaching made a significant positive contribution to teachers' attitudes towards online teaching and computers. Dorji (2021) found that teachers still preferred classroom teaching in the

classroom over e-learning because teachers found it more authentic. This research did not address teachers that teach a developed online curriculum through an online school. Teachers did develop more positive attitudes and became more willing to adopt technology in Dorji's research (2021) after the pandemic. Dorji's (2021) research was in Bhutan which is in Southwest Asia and there was not mention of comparing attitudes prior to the pandemic just the usage of technology.

Summary

Teachers have been learning how to incorporate technology into their lessons for many years. They have been to countless training and collaborated on projects using technology. Researchers have identified the theoretical advantages to engaging students using technology to provide "hands-on" constructive approaches and the advantages to social cognitivism when working with others. School districts made decisions regarding curriculum based on the technology offered by that specific curriculum program. This technology was used for lesson design or obtaining student data. Learning new technology caused stress to teachers every year and some chose not to integrate technology in their lessons.

Researchers have been examining the attitudes teachers have toward technology and the factors that lead to those attitudes. Researchers have examined aspects of teacher training, the stress that teachers get from technology, the likelihood of using technology based on teacher pedagogy, and how technology relates to students' needs in the classroom. However, little is known about the effect the Covid pandemic has had on teachers' attitudes toward technology. A gap in the literature exists relating to current data on teachers' attitudes toward technology after submerging themselves with technology during the Covid pandemic.

Teachers' attitudes toward using technology have been studied over the years, as well as the challenges teachers faced, and the effectiveness of online education. This research is unique in that it focuses on the current climate of education in a small Christian school and examined with a reflection if teachers' attitudes and usage changed as a result. The pandemic made using technology mandatory for many teachers and they had to learn to plan engaging lessons by using technology. These teachers had to embrace teaching virtually and their pedagogy regarding using technology in their classroom may have changed. By examining teachers' current attitudes on technology, practitioners can better understand how to train teachers to apply technology to classrooms and examine if that training is a permanent use in the teachers' classroom to address students' needs.

CHAPTER THREE: METHODS

Overview

The purpose of this case study was to understand how the attitudes of educators concerning the usage of technology changed after the experience of online teaching during the pandemic at Cornerstone School. Chapter Three begins with a description of this study's research design and the rationale for choosing the design. Next, I restate the central research question and sub-questions. The next two sections describe the setting of the research site and the teachers that participated in the research. Institutional Review Board (IRB) approval is also included. The research also includes the researcher's philosophical assumptions and bias. The next section includes the data collection technique with procedures and data analysis. The next sections include a discussion of the methods and to achieve trustworthiness and ethical considerations. Lastly, Chapter Three ends with a summary.

Research Design

A qualitative study was appropriate for this study because I interpreted the phenomena of teachers' attitudes on technology surrounding the pandemic. As described by Denzin and Lincoln (2011) qualitative research takes a naturalist approach and examines the meanings analyzed by people. This is done by examining how teachers' attitudes changed towards technology. This research was a single instrumental case study because it focused on a need for general understanding (Stake, 1995). Qualitative researchers also integrate assumptions and theoretical framework to guide the research (Creswell, 2013). This study used the assumptions on technology based on research and by using a theoretic framework to examine the human problem. The ontological assumption that reality is what is perceived by the participants is addressed with Bruner's (1986) idea that learning comes from experience.

The research design that was used is the single instrument case study design. Yin (2014) explains that case study research includes a real-life setting to explore an issue. This idea pertains to the current study on teachers' attitudes in the real-life setting of a school around a real-life event, the pandemic. The origins of case study begin with Freud and have popularity in psychology, the medical field, the legal field, and in social issues (Creswell & Poth, 2018). Case study research was defined by Yin (2014) and has a stepped approach defined by Stake (2006). Stake (1995) and Yin (2014) are used to explain the defining features of case studies in Creswell & Poth (2018). These features were described as identifying the case, parameters, themes, and intent are examined, and in-depth understanding is evident, different approaches to analysis are used, and assertions are provided by the research (Creswell & Poth, 2018). All these characteristics were evident in the current study. The case study in this situation was a single instrumental case study because as explained by Stake (1995) it fits the research because it is focusing on a single issue and selecting one bounded case. The research question in this study pertains to the general need for understanding teachers' attitudes regarding technology based around the single issue of the pandemic.

Research Questions

Central Research Question

How do educators perceive the influence of the Covid-19 pandemic on their attitudes and use of technology in the classroom?

Sub-Question One

What impact did the pandemic have upon the attitudes of technology use among educators in the classroom?

Sub-Question Two

What are the experiences of educators using technology in the post pandemic era?

Sub-Question Three

How have teachers' attitudes changed concerning learning new technology?

Setting and Participants

The setting of this research was at Cornerstone Christian School in Bluffton, South Carolina. This is a pseudonym for the site. It is a K-11 school in a rural area. The school is divided into three wings to separate the high school, middle school, and elementary school. The participants of this study are k-11 teachers at this school. The teachers that meet the criteria and volunteer started teaching before the onset of the pandemic. There is a head of school, a lower school principal, a middle school principal, and high school principal that oversee the operations of the school. There is also a Faith Leadership team that oversees the spiritual well-being of the staff and students. The board of trustees manages the school and the chapel that is associated with the school.

Site

Cornerstone Christian School currently has 420 students with three principals overseeing all operations and a Director of Spiritual Life (Cross, 2022). This school was chosen because it is a Christian School that offered online and face-to-face classes during the pandemic. The teachers' use and knowledge of technology relevantly relates to student achievement during the pandemic. Unlike many schools, this school had a large percentage of students that participated actively in online learning with a higher-than-average amount of parental support compared to many public schools with tuition costs ranging from $11,400-$13,000 per year (Cross Tuition, 2022). There are currently 46 K-11 teachers employed at Cornerstone School. The teacher population consists of 85% Caucasian, 7% African American, and 8% Hispanic (K. Wheat,

personal communication, November 15, 2022). The student population consists of 420 K-11 students (K. Wheat, personal communication, November 15, 2022). The population consists of 81% Caucasian, 15% African American, and 4% Other. There are 189 males and 231 females attending Cornerstone Christian School.

Participants

Participants in this study were teachers that taught prior to the pandemic, taught virtually during the pandemic, and currently teach at Cornerstone Christian School. I used purposeful sampling to recruit ten participants that fit a specific criterion. According to Hammersley and Atkinson (1995) criterion sampling should be used to gain a perspective on a group that shares a chronological experience. The chronological experience focused on the teachers' attitudes before and after the pandemic. The ten educators recruited were elementary, middle, and high school teachers. This population was significant to use because they offered a broad perspective of technology during this time and provided reflection and examples related to the study. A single case study approach was applied to the design, collection of data, and analysis (Yin, 2018).

Researcher Positionality

My motivation for conducting this study was to examine the research under the pragmatism lens, as described by Creswell & Poth (2018). The three elements represented by pragmatism are a situational focus, a method to solve a problem, and a commitment to the process (Wraga, 2019). This research was conducted to determine the outcome of how teachers' attitudes change regarding technology so questions and concerns about technology in the classroom can be answered using a real-world problem. I guided my research with three philosophical assumptions: ontological, epistemological, and axiological.

Interpretive Framework

This study was conducted through a pragmatism lens. The research found a solution to a real-world problem and used it within a historical context and focused on the outcome of the research (Creswell & Poth, 2018). The problem was teachers' attitudes regarding technology in the classroom. I used a diverse approach to collecting and analyzing data as described by Creswell & Poth (2013) and used appropriate methods for answering the research questions. The pragmatism interpretative framework also guided my philosophical assumptions.

Philosophical Assumptions

The philosophical assumptions were consistent throughout this research and centered around my beliefs and values. Huff (2009) explained the assumptions that guide our goals, our training, and decisions as a researcher. The three assumptions addressed were *ontological, epistemological,* and *axiological*. These assumptions summarize my beliefs.

Ontological Assumption

Reality is the key component of the ontological assumption (Creswell & Poth, 2018). Reality may be interpreted by many people differently. This research focused on the reality that is perceived by the participants. The participants answered their questions based on what they determine to be reality. Understanding those perceptions helped to understand that the researcher explored different perspectives of subjects to develop themes and findings as indicated by Creswell & Poth (2015).

The realities of the participants are shaped by their interactions with others (Creswell & Poth, 2015) and that is the reason it is important to gather information regarding attitudes from multiple sources. According to Lincoln et al. (2011) the social constructivism view of ontological beliefs is used on our lived experiences, while the pragmatism view sees reality as what is useful (Creswell & Poth, 2018). Both views were equally significant to this research

because they focused on the attitudes of the participants and if they saw the usefulness in technology.

Epistemological Assumption

Creswell and Poth (2018) described how important it is to get close to the participants in the study and encourage the researcher to collect subjective evidence from the participants. This was done by understanding the context in which they lived and have their experiences (Creswell & Poth, 2018). The researcher must minimize the distance between the participants and themselves in qualitative research (Guba & Lincoln, 1988). Spending time with the participants helped the researcher become more of an insider as opposed to an outsider and gives the researcher a better understanding of the participants (Creswell & Poth, 2018).

As an educator, I have worked and collaborated with a few of the participants in the past. Some of the participants have known the researcher for years. Claims on knowledge will be justified through quotes as evidence distance will be reduced between participants and researcher. Many of the teachers have a history of working together throughout multiple grade levels. Distance is minimized with participants and researchers as Creswell & Poth (2015) suggests by working closely in proximity among the participants for almost a year.

Axiological Assumption

Creswell & Poth (2018) conveyed how important it is that a researcher makes their values and biases known in qualitative research. I am a white, middle-aged, female that has been teaching for almost fourteen years. I have taught in various classrooms, including 3rd grade through 12th grade. I taught in a title I school for two years and now teach in a private Christian school. I acknowledge that this research will be value-laden, and bias will be presented based on my prior experiences with other teachers and schools.

My values during this research were and always have been Christian based, meaning I serve God and everything I do is by his Grace. I have always had an appreciation for diversity and respect for the participants and their attitudes being studied. I was and am currently a teacher with a bias towards teachers with an unwillingness to continue to educate themselves even though it is better for students. I have always viewed technology as a useful tool in the classroom. I continue to view the experiences that were felt by teachers, although difficult at the time, were useful in getting more teachers open to the idea of using technology in their classrooms. There was also an existing bias based on sympathy for overworked and underpaid teachers that were doing their best to make a difference in young lives.

Researcher's Role

My role in this study was as a coworker to the participants. I did not have any authority over any of the participants. I was a sixth-grade teacher at the same school with no additional role. I assume most teachers have had access to technology and have either chosen to learn new programs or they have chosen not to. I also assume they have made the decision to implement technology on their own or made the decision not to implement it. The researcher was aware of these assumptions and biases when analyzing data using the case study research design. These biases were addressed by triangulation using different sources of evidence (Yin, 2018) and setting aside my own history and experiences by focusing on the terminology of the participants (Creswell & Poth, 2017). Themes were determined, and holistic analysis was used with the existing bias of teachers using technology addressed.

Procedures

Site permission was obtained by requesting permission from Cornerstone Christian School. The Interim Head of School was addressed as well as the other administrators on

campus. Participants were solicited through an initial Google Form to determine which participants met the research criteria. Participants were given their informed consent to be participants in the research. Data was managed with prepared, searchable spreadsheets to keep the data organized. Files were kept secure through a password protected database. Data was collected initially by memoing emerging ideas to identify themes of attitude to synthesis summaries and identify themes (Miles et al., 2014). Initial coding was used to determine positive and negative comments and attitudes regarding technology. Utilizing the Data Analysis Spiral as guidance, descriptive coding was put into categories then compared to data provided by the journal entries to determine emerging themes (Creswell & Poth, 2018). Triangulation was achieved by corroborating evidence from interviews, journals, and documentation evidence to validate the data as described by Miles and Huberman (1994).

Permissions

A site permission request letter was submitted on September 6, 2021, and permission was granted October 13, 2021, by the site's administrator. Institutional Review Board (IRB) approval was submitted after the proposal and was successfully defended using the Cayuse link on the IRB main webpage. The purpose of the study was clearly outlined in the permission request.

Recruitment Plan

The sample pool for this research is 58. There were 58 teachers at Cornerstone Christian School. The recommended sample size should be 10-15 participants (Creswell & Poth, 2018). The total number of teachers that are participants in the study was 11. There were 12 participants interviewed, but 1 participant had to leave the country before all data could be given. Marshall and Rossman (2015) state that sampling can change in a study and researchers should

be flexible. The type of sample in this study was criterion sampling. A criterion considered are the number of years teaching, at least some experience with technology, working through the pandemic, and being a teacher at Cornerstone Christian School. This type of sampling assurances the quality of the sample (Miles & Huberman, 1994). The sample size gave consent for their participation located in Appendix A.

Data Collection Plan

There were four forms of data collection in this study. They include an initial demographic survey, semi-structured individual interviews, reflective journal prompts, and artifact analysis. A working hypothesis was refined as data was collected and analysis is advanced (Lincoln & Guba, 1985). The data collection approach included the data analysis approach for each method. The sequence of data collection was chosen to assist with the working hypothesis and spiraled to evaluate data as information unfolds so ideas can be revised (Miles & Huberman, 1994). Research was organized into named digital files so they could be easily located (Creswell & Poth, 2018). A searchable spreadsheet was used to organize memos regarding interview responses, reflective journals, and artifact information so the data could be easily retrieved (Patton, 1980).

Initial Questionnaire

A demographic survey (See Appendix B) was used to gather preliminary data and to help select the participants for the study. The initial demographic questionnaire included closed questions with drop-down options for answers. The participants chosen were interviewed, created journals, and completed an artifact to analysis. The survey was given to all certified teachers at Cornerstone Christian School (N = 58) to ensure there is a large enough sample size that meets the criteria of the study and collects as much data as possible from the participants

(Creswell & Poth, 2018). An online survey was created using Google Forms to verify the individuals fit the criteria of the study and were employed as teachers at Cornerstone Christian School.

Initial Questionnaire

1. Demographics (Age)?
2. Demographics (Gender)?
3. Demographics (Ethnicity)?
4. How many years have you been teaching?
5. Highest education completed?
6. Did you teach in a traditional classroom before the pandemic?
7. Did you teach virtually during the pandemic for a combined period that would equal at least a month?
8. Did you use technology in your classroom before the pandemic (2019)?
9. Do you use technology in your classroom today?

Questions one through four were used to gather basic demographic data. Questions five through nine were used to determine if the teacher could be a participant in the study based on the criteria listed.

Semi-Structured Individual Interviews (Data Collection Approach #1)

The first collection strategy used in this study was individual interviews. Interviews were given individually and in person with a recording device and notes were taken. The researcher administered interviews with semi-structured questions. The interviews were done after the initial questionnaire was given to guide interview questions. Follow-up questions resulted from how the participant answered a question because knowledge that was gained during the

interaction of the interview (Brinkmann & Kvale, 2015). The sequence of questions was not fixed in this study to allow for changes in the responses where they are appropriate (Brinkmann & Kvale, 2015). Participants engaged in a grand tour question to make them comfortable (Marshall & Rossman, 2015) and got them talking about the most engaging virtual lesson they did during the pandemic.

Individual Interview Questions

1. Please describe your educational background and your current position. CRQ

   This question applied to the research to determine the education and experience of the participant.

2. Describe the technology challenges you faced during the pandemic while you were teaching virtually. SQ1

   The challenges described the extent to which the participant was prepared to use technology before the pandemic and referenced the problem that some teachers did not embrace technology before the pandemic.

3. Describe successful practices you used virtually. SQ1

   The willingness to learn technology by the participant was determined by this question.

4. What professional development experiences trained you for the virtual experience? SQ1

   Training before the pandemic determined if the participant was willing to embrace technology without the cause of the pandemic.

5. In what ways are you still using technology beyond just a smartboard? SQ1

   This question helped to determine if experience due to necessity led to learning and implementing technology.

6. Describe your challenges when working with students in your classes using technology before the pandemic. SQ2

   The lesson plan reflection before the pandemic determined the problem in the study. This question related to having a positive attitude regarding technology and its usefulness.

7. Describe successful practices you used during the virtual experience. SQ2

   This question examined the attitude of the successful practice they used.

8. What technology practices are you likely to continue to do now that you are in the classroom? SQ2

   This is related to the perceived usefulness of the technology and the willingness to continue using it which is related to the theoretical framework that we learn by doing.

9. Describe your attitude concerning learning new technology before the pandemic compared to now. SQ3

   This question referred to the purpose of this research and directly related to the attitude of the participant regarding technology.

10. Describe your attitude concerning learning new technology after the onset of the pandemic. SQ3

    This reflection for the teacher was used to determine the anxiety they may have felt.

11. Describe your attitude concerning learning new technology now? SQ3

    The participants described their current attitude regarding technology which directly relates to the purpose of the research.

These questions tracked the attitudes of teachers before, during, and after the onset of the pandemic. My committee reviewed my questions before I submitted them to the IRB.

Semi-Structured Individual Interview Data Analysis Plan *(Data Analysis Plan #1)*

The data analysis for interview questions was analyzed through direct interpretation. The researcher looked for single instances and drew conclusions from them (Stake, 1995). The notes and recordings were analyzed to look for themes throughout the analysis. Descriptive summaries of the interviews were evaluated (Marshall & Rossman, 2015). Interviews provided initial coding to organize the information into three main categories, attitude using technology prior to the pandemic, successful technology practices during and after the pandemic, and attitude toward learning new technology now. Attitudes regarding technology were coded as positive or negative. This served as the initial coding to determine themes (Creswell & Poth, 208). Themes were also identified using participant experience and training. The notes from the interview were transcribed. Themes were grouped into attitude, amount of technology used, and types of tools used. Types of tools used were coded as drill, tutoring, simulation, hyperlink, and video conferencing. This data was organized into a spreadsheet for analysis and triangulated with journals and artifacts for accuracy and trustworthiness (Lincoln & Guba, 1985).

Reflective Journal Prompts (Data Collection Approach #2)

The second form of data collection was the collection of data from reflective journal prompts. Research shows that journaling helps to organize thoughts (Sharmann & Butler, 2015). Participants were given 4 journal prompts and had two weeks to complete them. Journaling allows one to reconsider a prior experience and evaluate it in retrospect (Dewey, 1933). The journal prompts were reflective in nature. Journal prompts were examined to determine themes (Saldana, 2015). The expectation was that the participants would complete journal entries reflecting on using technology before the pandemic, including what types of technology were used regularly before the pandemic, during the pandemic, and current use in the classroom.

Collecting journal entries offers another source as well as artifacts to elicit entries (Clandinin & Connelly, 2000).

Reflective Journal Prompts

1. Explain a time when you felt frustrated trying to learn new technology. What exactly were you trying to learn? Did you feel like you had to learn it?
2. Describe a time when you learned a new type of technology and felt successful. Was it successful for your students? Are you still using it?
3. Describe your attitude regarding technology before the pandemic. Give an example of a type of technology that other teachers used, that you didn't want to learn.
4. Describe your attitude regarding technology now. Can you give an example of a type of technology you use now that you didn't use before?

Journal Prompts Data Analysis Plan *(Data Analysis Plan #2)*

The reflective journal prompts were analyzed, and care was given to the context of the journal entry as suggested by Clandinin & Connelly (2020). Narrative stories explain the depth of the participant and attitude and can shed light on their experiences (Creswell & Poth, 2018). This data revealed attitudes that were organized into positive and negative themes. Data was categorized based on the types of technology used and the participant's view on using that specific technology coding in the same way as the interviews. The types of technology were categorized into the same digital tool categories for the interviews. A spreadsheet was utilized to organize data because large amounts of notes can be overwhelming (Patton, 1980). The spreadsheet organized data into categories based on themes identified, attitudes, and the types of technology tools used.

Artifact Analysis (Data Collection Approach #3)

The participants completed a Google document that lists all the technology they used regularly before the pandemic, what they learned to use during online learning, and what technology they use regularly. This list was created by the researcher based on the technology available to the school at that time. Participants were given the opportunity to fill in their own technology program or tool if it is not listed. This document served as a primary source for data collection. This information was used to compare the use of technology and the types used. Participants were asked to reflect using example lesson plans they created prior to, during and after the onset of the pandemic.

Artifact Analysis Data Analysis Plan *(Data Analysis Plan #3)*

Documents analyzed included a spreadsheet provided by the participants that provided coded information based on digital tools used. This third type of data collection allowed for triangulation of the data and offers credibility of the research (Yin, 2014). The spreadsheet was developed according to the types of technology used and how often it was used. The items were classified by type of digital tool used prior to the pandemic, during the pandemic, and currently. The various types included video assistance, platforms for delivery, and interactive applications. This information was used for comparison with the interviews and journal entries. This data was coded to match the interviews and journal entries for accessible retrieval and analysis (Creswell & Poth, 2018). All the data was coherently put into a signal body of evidence that was analyzed to identify themes in the research. The research was entered into google spreadsheets so information can be found easily. Coding was utilized from the beginning of the research to writing the conclusions as suggested by Miles et al. (2014). Data was held in a secure location digitally through a password protected application.

Data Synthesis

This is an instrumental case study analysis that will take place following the collection of data after each data type. The data will be synthesized in a single set of themes based on descriptions that are similar (Patton, 2015). The themes are separated by teacher attitudes concerning technology prior to the pandemic, during the pandemic, and current attitudes about technology. Themes are also separated into the types of tools used during these times by the participants. The initial survey served to gain participants that followed the criteria of the study. The only analysis was determining if the participant worked prior to the pandemic, during the pandemic, and currently a teacher. The data analysis started with semi-structured individual interviews. These interviews were coded based on positive and negative attitudes and the digital tools used. Positive attitudes had a positive sign and negative attitudes had a negative sign. Coding also represented positive and negative attitudes of the participants that will be synthesized. Memoing was used as a cross reference data with tools listed int the interview as described by the participants in their own words (Saldana, 2015).

The next type of data collection was reflective journaling. Participant responses were coded positive or negative regarding attitudes about technology. This second cycle of analyzation served to reorganize the themes (Saldana, 2015). Themes emerged with language used by the participants and were analyzed for patterns (Creswell & Poth, 2018). Journals responses were locked digitally with a protected password by the researcher and will be kept for 3 years based on the recommendation by Liberty University.

The last type of data collection will serve to triangulate the coded data from the interviews, the data from the reflective journals, and documentation provided to gain validity (Yin, 2018). I cross analyzed the common themes and outlying themes that emerged from the data which is known as categorical aggregation (Stake, 1995). This data answered the central

question addressed in this study of how educators perceive the influence of the Covid-19 pandemic on their attitudes and use of technology in the classroom. It also addressed how the pandemic impacted the attitudes of educators, their experiences, and if their attitude regarding technology has changed. This enabled me to develop implications for technology in education.

Trustworthiness

Korstjens & Moser (2018) summarize trustworthiness as whether the data can be trusted. It is up to the researcher to do what they can to appear credible and trustworthy. Lincoln and Guba (1985) define trustworthiness as having credibility, transferability, dependability, confirmability, and reflexivity. Reflexivity focuses on self-reflection. The researcher did this when referring to bias and preconceptions. Research was protected through online password protected programs so the participants will have their privacy protected and trust the researcher (Marshall & Rossman, 2012).

Credibility

I used a variety of strategies to establish trustworthiness. Some examples of these strategies are prolonged engagement and triangulation (Lincoln & Guba, 1985). The current research prolonged engagement with the participants beyond the interview and triangulated the data by corroborating evidence through multiple sources to the extent to which the qualitative researcher achieved trustworthiness in their study.

Transferability

Transferability relates to how the research is transferred to others or other locations (Lincoln & Guba, 1985). This can be shown by the researcher by giving clear descriptions of the participants and the setting (Korstjens & Moser, 2018). I gave clear descriptions of the

participants and their demographics. The transference to another location within the same parameters of the current study setting could be transferred to another similar setting.

Dependability

Dependability refers to stability over time (Lincoln & Guba, 1985), which can be demonstrated by a clear analysis of the data. Liberty University provides a thorough review of the dissertation process through the dissertation committee and the qualitative research director. These entities make sure the analysis process is within the case study design.

Confirmability

Lincoln & Guba (1985) states that confirmability is related to neutrality. The researcher cannot analyze data based on preferences; but should remain neutral (Korstjens & Moser, 2018). The current research established confirmability through audits, triangulation, and reflexivity. Keeping complete and organized notes lends itself to transparency (Korstjens & Moser, 2018).

Ethical Considerations

Creswell & Poth (2018) offer many ethical considerations, not only for data collection, but for treatment of participants, citations, and IRB considerations. The location of the study was not obtained through unethical practices nor is the researcher in a position of authority in any way. I recorded all interviews and keep organized and well-documented notes. All participants returned consent letters and all information obtained from the participants was kept confidential. The voluntary study informed the participants of their right to withdraw at any time. The use of pseudonyms was used for the site as well as the participants. Physical data was secured and locked in a file cabinet and electronic data was secured through an online secured source through two password protections. All data will be destroyed after three years. There were minimal to no risks to the participants.

Summary

The research is based on the case study design for qualitative research to understand the perceived influence that Covid-19 had on teachers' attitudes and the use of technology. The study was conducted at a small Christian school that includes educators that taught throughout the pandemic. This chapter describes my research design, procedures, and how data would be collected and analyzed. My bias and assumptions were provided with descriptions of the participants and setting. The data collection includes semi-structured interviews, reflective journal entries, and artifact analysis. The analysis of the data includes coding for themes and analyzing the results into spreadsheets for retrieval and analysis.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this qualitative, single-case study was to understand the perceived changed attitudes from the pandemic concerning technology for teachers at Cornerstone School. This chapter reviews descriptions of the participants, the types of data collected, the artifact analyzed, and themes that resulted from that data. Finally, the themes are also related to the research questions.

Participants

The participants in this study taught before the pandemic, during, and after the pandemic. They experienced the pandemic in different schools, giving them different perspectives. Eleven total teachers were purposefully selected from an initial survey given to teachers at Cornerstone School. They have a variety of backgrounds, education, and experiences. The participants were chosen to encompass all most levels and subjects. Some of the participants were new to Cornerstone while others have taught there for over ten years.

Teachers recruited to participate completed an initial survey, an interview, and completed reflective writing prompts that were collected through Google Forms. The participants completed consent forms at the time of their interview and were emailed digital copies of the consent form. Teachers are identified by pseudonyms to protect their identity. Information about each teacher is given. Each teacher self-identified their ethnicity before the interviews on the initial survey. All quotes from the participants are verbatim.

Bill

Bill has been teaching for over 20 years and has a master's in special education. He teaches middle school ELA and Social Studies. He taught at a Montessori school during the

pandemic, so his perspective is unique to this study. His school had little to no technology during the pandemic. Students were expected to Zoom but he only had textbooks to guide lessons. He was the only participant to question the use of going virtual during the pandemic because he said no one around him was sick and wondered why he was being made to go virtual.

Blyth

Blyth is new to Cornerstone with degrees in English and Education and teaches high school English. She was teaching university students when the pandemic hit and did not have the same challenges the other participants in the study faced. The university she worked for expected her to record lessons so students could watch at their convenience. Her responses were more focused around the students' needs and meeting their needs for access to materials and information. She expressed a desire to record lessons again but is worried about what application to use so they will last.

Bonnie

One of the longest staff members at Cornerstone is Bonnie. She has been teaching there for over ten years. She has a degree in Environment Biology and a Masters in Conservation and Biodiversity. She is certified through Florida and currently teaches middle school and a Faith Formation class. She expressed disappointment with the amount of technology her school lost after the pandemic. She had many videos recorded to a medium the school no longer pays for, so they are gone. She also had a unique perspective because she lived alone during the pandemic and found comfort in seeing the students every day.

Brynn

Brynn is the only African American participant in this study. She is new to Cornerstone and was at a Title 1 school during the pandemic, so her perspective centers around technology

issues that did not exist for some of the other participants. She also had different guidelines she had to follow during the pandemic. She had to stay online throughout the school day, not just for a few hours. She has two bachelor's degrees and two master's degrees.

Carol

Carol is a white female that has been with Cornerstone for about ten years. She has been teaching more than twenty years and was just given an administrative promotion for the next school year. She has an Educational Leadership masters and teaches seventh and eighth grade Language Arts. She did not mind the overall transition to learning technology but loved getting back to pencils and paper for her students. She tends to resist technology because she feels that students lost so much time writing with paper and pencil.

Christina

Christina has been teaching for over ten years at Cornerstone and had a former career as a journalist. She has a master's in education and teaches middle school ELA, Advanced Placement Language and Advanced Placement Literature in high school. She stated that she wasn't a "techy" but did like to use technology to engage her students. She also stated that she was quick to abandon technology that wasn't useful to her or her students. She found teaching virtually meant longer days for teachers because she felt she had to make her lessons more engaging to keep students challenged.

Donna

Donna is another veteran employee at Cornerstone. She has been the Art teacher there for over ten years and provides the student led news show and she is the yearbook editor. She has a bachelor's in art and a master's in art history. She teaches all the grade levels and had unique challenges during the pandemic. She had to change her curriculum because students could only

work with the materials they had at home. She could not give a lesson using paint, chalk or any other mediums during the pandemic. She recorded directed drawing lessons for her students. She is also unique because she embraces all types of technology and has even taught technology courses in the past.

Eva

Eva is the only Hispanic/Latino participant in this study. She has a Fine Arts degree from Venezuela and currently teaches Spanish to students at Cornerstone. The school she taught at during the pandemic had more serious technology issues than the other participants in the study based on her accounts. The school and students did not have steady Wi-Fi or a platform to use to teach. She was not allowed to see her students on Zoom, which was the opposite expectation for the other participants. She also got little to no help from parents during the pandemic and had issues the other participants didn't express, for example, she would sometimes hear parents fighting during a Zoom session.

Francis

Francis has a Bachelors in Secondary Education and teaches US History and Advanced Placement classes for high school. She has many responsibilities at Cornerstone including Government Student Coordinator and Student Council Advisor. She learned an application during the pandemic that she still uses every day in her lessons. She has a passion for technology and felt excited at the onset of the pandemic. She was excited about taking on a new challenge.

Paula

Paula has been teaching for over twenty years but is new to Cornerstone. She has a master's in Reading and teaches at the elementary level. She has a unique perspective because she virtually for over a year in the public school system and had the challenge of being the only

virtual teacher for a grade level. Many parents did not feel safe enough to send their child back, so they had the option to keep them virtual. When one student got quarantined who was normally face-to-face, she would have them in her class. She would have a revolving door of students and at one point she had over thirty-five fourth graders in a virtual class.

Renee

Renee is a white female that has been teaching five to ten years. She has a master's degree in educational leadership and teaches sixth, seventh, and eighth grade math. She aspires to be an administrator. Most of her years have been with the public school system but expresses how much she likes Cornerstone School. She misses the free technology she had access to in the public school system during the pandemic and looks forward to using many of the technology resources she learned again.

Table 1

Teacher Participants

Teacher Participant	Years Taught	Highest Degree Earned	Content Area	Grade Level
Bill (M)	20+	Masters	English Language Arts/Social Studies	5th - 8th
Blyth (F)	5-10	Masters	English Language Arts	9th - 11th
Bonnie (F)	10-20	Masters	Science/Faith Formation	7th - 8th
Brynn (F)	5-10	Masters	English Language Arts	7th - 9th
Carol (F)	20+	Masters	English Language Arts	7th - 8th
Christina (F)	10-20	Masters	English Language Arts	6th - 11th
Donna (F)	10-20	Masters	Art	5th - 11th
Eva (F)	10-20	Bachelors	Spanish	7th - 11th
Francis (F)	5-10	Bachelors	Social Studies	9th -11th
Paula (F)	20+	Masters	All Content Areas	4th -5th
Renee (F)	5-10	Masters	Math	6th - 8th

Results

This section contains the results of the demographic survey, interviews, reflective prompts, and the artifact analysis. The survey provided information about the participants and gave an overall view of whether the subject taught would impact the findings. The teacher

interviews, reflections, and artifact analysis were used for triangulation to provide validity (Creswell, 2015; Yin, 2018). Qualitative data was collected through interviews and reflections. Interviews were recorded and transcribed and lasted about 20 minutes. Themes were supported with at least 80% participant quotes to support the theme for validity purposes. The data was color coded based on the answer the participant was providing and underlined if the response had a negative connotation. Negative connotation comments included word examples like; frustrated, had to, and anxious. Artifact analysis proved data regarding the types of tools the participants still use in their classrooms today to determine if they are using technology. The following themes and sub-themes were determined.

Table 2

Themes and Sub-themes

	Theme 1	Theme 2	Theme 3
	Pre-Pandemic Attitude Toward Technology	Successful Practices Using Technology During the Pandemic	Post-Pandemic Attitude Toward Technology
Sub-theme 1	Importance of Using Technology	Technology Applications Most Used	Positive Attitude Toward Technology
Sub-theme 2	Aversion to Technology	Barriers to Technology Use in the Transition to Online	Anti-Climactic Attitude about Technology Post-Pandemic

Pre-Pandemic Attitude Toward Technology

Teachers like having the option to use technology whey they want to incorporate it in a lesson, but when Carol was asked about her thoughts regarding her attitude about technology pre-pandemic, she replied that she, “used it as necessary.” Many teachers only incorporated technology in their classrooms as they were required to do so or when they wanted to try something new. Carol went on to say that she “was going to try Pear deck, but it was quickly overused so I kept it out of my classroom.”

Importance of Using Technology

Teachers overall understand the importance of incorporating some amount of technology in their classrooms. Renee stated that, “It (technology) is in every career, it is important for students to have a working knowledge of technology.” Brynn and Blyth expressed genuinely enjoying using technology. Brynn said, “I love it, and use Booklet and Google Slides daily.” Blyth referred to a memory she had in elementary school, “I loved going to the computer lab and playing Oregon’s Trail, it (technology) can provide students with enriched lessons and access to ideas they couldn’t get elsewhere.” These references are based on the enjoyment technology can bring by introducing something different to the students.

Many participants discussed the importance of technology for students out of a sense of obligation to their students. Bill, although rarely uses technology stated that, “technology can enhance student learning and should be used sometimes.” Francis made that point that resisting it (technology) leads to missed opportunities that allow students to make connections to course material in a way that is meaningful and comfortable to them.” Paula recognized the importance of using technology with her elementary students because she has “seen progress in literacy and mathematics.” Christina stated that her students wouldn’t know what to do if she didn’t use Nearpod or Peardeck for her lessons she goes on to say, “she couldn’t live without it.”

Aversion to Technology

Over 80% of the participants expressed some aversion to technology prior to the pandemic either because they were worried about what students were doing with their devices or just don't like technology driven instruction. Donna explained, "I like using technology to a point; I used it in a limited way since most of what I like to do in my class is hands-on. I just don't care about learning things like Peardeck because they don't pertain to my class." Christina stated that, "I always wanted to learn new things, but I didn't want to teach with noses to a screen looking at who knows what." Renee mentioned that she just gets sick of "dealing with Wi-Fi issues." Brynn's aversion to technology focused more on lack of training. She stated, "I just wish I knew more about Google Suites before the pandemic."

Some of the negative comments regarding technology focused on the fact that certain programs, or technology altogether was overused. Carol said she would never use Peardeck because it was "so overused." Bonnie also expressed a reluctance to use Peardeck or Nearpod. She said, "It seemed like a lot of work for a slight increase in engagement." Blyth referred to Kahoot type games and said "are superficial and hollow. They allow a crutch for teachers and for students just to memorize facts." Eva said, "I am very concerned about elementary school kids (and that they) were using excessively technology at school." Renee didn't really have an aversion to technology, just certain types. She stated, "I check it out, if it doesn't stick or I find it boring, I pass on it."

Successful Practices Using Technology During the Pandemic

All but one of the participants of the study could list one successful technology practice they used during the pandemic. Some of the teachers referred to recording lessons and others focused on games and lesson delivery. Blyth stated, "The thing that worked the most for me was

online videos that they (students) could watch at their convenience." While Eva said, "I liked games like Kahoot and Edpuzzle." Almost all the participants referred to Google Classroom and the importance it was for students to turn work into their teacher.

Technology Applications Most Used

The technology listed by more than 80% of the participants as the most used type of technology used during the pandemic was Google Classroom (See appendix E). Carol stated, "It (Google Classroom) provided technology for the students keeps them accountable even though we are not virtual anymore. So that when they are missing work, we can still provide them with work if they are ill. It really helps protect the teacher too, because everything is provided." Renee posted all assignments on Google Classroom throughout the pandemic. Zoom, Teams, and Meets were also listed with the same frequency. Blyth explained that "it was had being on camera, so I always tried to be more engaging using Zoom." Paula used Zoom to be more engaging by, "Providing books with print accessible in Google Classroom and then providing the recorded version through Zoom," she explained how using Google Classroom and Zoom together worked best for her students. Bonnie used Google Classroom to post her recorded YouTube videos for her students. She said, "I just decided to do a flipped classroom and that worked for me."

Applications like Flipgrid, Nearpod, Peardeck, and Jam board were used by 36% during covid, while drill and practice applications and games like Kahoot and Quizzes were used by 56% of the participants. Renee stated that she, "started using Quizizz more during the pandemic and still uses it regularly." Brynn said, "Blooket was a game changer for me, it allowed my students to learn with a game and I still use it." Francis learned Peardeck "out of necessity during Covid, but it continues to provide formative feedback for both me and my students." Bill, a self-described "non-techy" used the materials provided by the resources he was used to during the

pandemic. He states, “I focused on what Sadlier, Studies Weekly, and Scholastic provided throughout the pandemic.”

Barriers to Technology Use in the Transition to Online

All the participants mentioned student engagement as a main barrier to technology use during the pandemic. “Students just weren’t there at all,” said Brynn. Francis said it is important for her to, “feel connected with my students, without my presence it is difficult to motivate them.” Carol said, ‘I struggled to keep them engaged with each other, the material, and me.” Blyth stated, “she knew they were on their phones the whole time and was frustrated with looking at blank screens.” Eva had a similar experience at her old school because students weren’t allowed to have cameras on so she, “felt like she was talking to herself.”

Many participants commented on lack of training in the transition to going online. Renee remembers, “I didn’t know how to share my screen, turn off videos, mute, just lots of anxiety.” Christine stated that she was uncomfortable with “chatty” lectures for recording using zoom and did not like virtual lectures for her style of teaching. Four of the participants had no training while the rest had one or two videos sent to them by their administration or district. Renee was frustrated in the use of technology as a teaching tool instead of supporting learning. Renee said, “Iready was so frustrating to implement, it was not supposed to be a teaching tool and we were told to use it as one.” Paula was most frustrated with the “amount of cheating” that she could not stop virtually.

Carol focused on her own struggles by saying, “I had no idea how to video lessons and upload them, which is what deterred by willingness.” Brynn also focused on her lack of training by stating, “We had no idea how to use Microsoft Team and had no clear directions…I had no choice.” Eva pointed out that she “was learning all this new technology and it was not a

guarantee that there would be student gain." Bill referenced the fact that other online aspects also had to be learned, he stated he "had to learn a new gradebook, administrative paperwork, and email parents."

Post-Pandemic Attitude Toward Technology

All the participants in this study found some positive aspects toward their attitude regarding technology in the post pandemic classroom and most responded with an increased about of confidence towards technology because of the pandemic. Many of the participants acknowledged the usefulness of using technology. Blyth stated that she, "is way more confident and wouldn't grumble as much is she were to attend professional development training on technology now." Eva summed up her thoughts by saying, "I am absolutely more confident to learn new things because of this experience."

Positive Attitude Toward Technology

Although most of the participants said they were always open to using new types of technology, many commented that they were not as committed to learning something new if they must do it immediately or did not see the immediate need for their students. Renee said, "I feel more confident to learn something new, if it is not all at once. It took me two years to really understand Google Classroom." She also stated that she, "likes that students can take the lead on their learning and move into different areas without teacher assistance with some programs." Brynn says, "that we should always think about what else can we use to make things work and engage students." Bonnie said her attitude toward technology was positive if it "doesn't overwhelm me and there is a practical tie so it useful for my students." One of the practical applications that more people have confidence in using is Zoom or Google Meets. Christine

stated that “many in person meetings, field trips, and interviews have been successfully replaced with Zoom.”

Some of the participants said they always had a positive attitude towards technology because they just like learning new things. Paula, Francis, Blyth and Renee stated repeatedly that they were open to anything regarding technology. They also stated that they felt more confident with technology having gone through the virtual challenges of teaching from the pandemic. Eva commented that it is not only teachers that have a new confidence regarding technology, but “so do many people after working from home during the pandemic”.

Ant-Climactic Attitude about Technology Post-Pandemic

Some of the participants mentioned the possible damage to students with all the technology we used during the pandemic. Many made the point that there is a real need for students to go back to paper and pencil. Christine said, “I like learning new things if it will benefit my students, but I do still think students should use paper and pencil.” Bill agrees by stating that, “technology has a place, but should not replace everything.” Renee also made a similar comment regarding pencil and paper. She said, “I love technology, but math needs to be done on paper.” Another participant, Carol, stated that, “students were in front of computers too much, now they need to write.” Many teachers agree that there should be a balance between computer time and a traditional classroom setting.

Another observation from many participants centered around the loss of free resources. Bonnie pointed out, “We no longer have a Nearpod subscription, (because it isn’t free anymore) so all my lessons are gone.” Renee also expressed frustration in the lack of resources at the private school by saying, “I loved IXL math, I can’t believe I don’t have it to share with my students.” Many participants said that they lost some sort of lesson because the technology was

gone. For example, many teachers recorded lessons with Zoom that they can no longer access. Eva stated, “Everything I did is just gone.”

Outlier Data and Findings

This section explains outliers that were identified during the interview and reflection prompts. While all the participants agreed on most of the aspects to themes, there were two outliers that were identified that did not align with the themes and research questions.

Outlier Finding #1

All participants found something positive that happened to them while teaching virtually using technology, except one teacher. This teacher could not list a single thing that worked during the pandemic. This participant did not see the need to be virtual and found it bothersome because this person did not know anyone that was sick. The other participants listed many negative aspects to teaching virtually but could not comment on something that worked well. Whether it was Google Classroom, Zoom, or just to communicate with students during such an isolated time, this participant could not list something that worked during the pandemic.

Outlier Finding #2

The participants listed their use of technology in the classroom now with the frequency to which they use it on the Digital Tools document. One teacher said that she never uses Google Classroom or any drill and practice games in her classroom now. This is an outlier because most of the participants use Google Classroom daily and use drill and practice tools at least occasionally. The explanation for this outlier has to do with the fact that this is an Art teacher and does not teach a traditional class and does not find the usefulness for these tools for her classroom.

Research Question Responses

This section provides answers to the research questions. Participants' responses were taken directly from the interviews, journal prompts, and the Digital Tools document. The responses provided in the central research question and the sub questions support the purpose of this study.

Central Research Question

How do educators perceive the influence of the Covid-19 pandemic on their attitudes and use of technology in the classroom?

The perceptions of the participants in this study suggest that most claim they are open to technology and used it a great deal before the pandemic. Although, with closer analysis, the amount of technology and types of technology used is difficult to determine, so the perceptions of their attitudes are what is measured. The participants found working under the conditions of the pandemic very frustrating. Some found that we were wrong to be virtual in the first place and questioned the political motivation behind the pandemic. Some of the participants were scared they would get sick or watch their students get sick. One of the participants recalled one of her students losing a parent, while other participants thought the pandemic was a political joke. These concerns influenced the attitudes of the participants regarding the pandemic regardless of their technological abilities or attitudes regarding technology.

The participants listed several reasons why they had a negative attitude regarding technology at the onset of the pandemic. They were not trained for the virtual environment they were thrown into, and they were forced to learn how to navigate the technological obstacles they faced on their own. The conditions the participants were teaching in were also changing. Blyth commented, "Adding Zoom and recordings to what I was already doing was exhausting, then I

had to multitask with some (students) face-to-face and some (students) online, it was awful." There was also pressure put on teachers to make sure students did have gaps in their learning. Teachers had to take extra measures to make sure students were engaged. They had to send multiple emails home for missing work, provide paper copies, and Paula said, "At one point, administrators would pop into our Zoom classes and embarrass us because we could not get our students to turn their cameras on and comment on why only a few students were there. As if there was something I could do about any of it." This negative attitude regarding technology applies to the frustrations around their administrators during the pandemic, more than learning new technology.

Many of the participants listed many applications, games, websites, and skills they use regularly as a result of the pandemic. Some participants listed resources that were not readily available before the pandemic. It is likely that some of the participants had difficulty remembering exactly what they used before the pandemic. Most of the participants described that they do use technology with more consistency than they did before the pandemic. This reinforces that experience gained from the pandemic carried over into the post pandemic classroom, while the teachers' attitudes regarding technology differ, their confidence to use technology increased.

Sub-Question One

What impact did the pandemic have upon the attitudes of technology use among educators in the classroom?

The attitudes of many of my participants were negative because teachers thought students needed a break from all the technology they had been subjected to during the pandemic. When students got back into the classroom, many teachers couldn't wait to close the Chromebooks and get out textbooks. Many teachers felt that it was time to get back to paper and pencil. Carol

stated, “Truthfully, I probably avoided a lot of it just to get the kids back to a norm rather than continuing with what was the same. Welcome to school, this is how it should be.” Math, English, and elementary teachers seemed to have the attitude that students were spending too much time on devices. A math teacher, Renee said, “I am open to technology, but now math needs to be done on paper.” An elementary teacher, Eva said, “Despite the fact that I always used technology, I am very concerned that elementary kids are using technology excessively.” The idea that too much technology use is damaging to students has been justified by research around the pandemic (Nagata et al., 2021). Parents and teachers have been warned that many negative behaviors can come from too much screen time for example, bullying, exclusion, anxiety, depression, sleep deprivation, and many other disorders (United States Surgeon General, 2021). Teachers also commented on the constant struggle to make sure students are staying on task on their devices. Some of the participants had technology so they could see their students’ screens while others complained of constantly trying to redirect students. Blyth also suggested, “technology can be used by teachers as a crutch.” She went on to say that some teaches don’t care what students are doing, if they (students) are busy.

Another impact the pandemic had on attitudes regarding technology among educators centered around student accessibility. The participants commented on how nice it was to just give an assignment online and the students didn’t have questions on how to do anything on their devices. Students now can easily log on, get to Google Classroom, open a document, write on it, and send it back to the teacher. Students know how to fix their own problems with a device and connection issues. Carol recalls, “With early middle school there were always basic issues. How do I connect? How do I send an email? How do I save a doc? And now those issues are gone

thanks to Covid." Students can no longer act like they don't know how to do a simple task on their devices.

Sub-Question Two

What are the experiences of educators using technology in the post-pandemic era?

The participants listed a range of applications and programs they use and how often they use them. The most prevalent application was Google Classroom. Some teachers did not use at it all before the pandemic and some used it slightly. This research supports prior research by Hussein et al. (2020) that found that one of the biggest tools that became common practice during the pandemic was the use of Google Classroom. Now, almost all the teachers (91 %) in this study use Google Classroom daily or weekly (see table 2). Bonnie stated, "Now, students are accountable to turn things in, watch a video, or get another copy of something." Google classroom is just one aspect of Google that is currently getting more use in the post pandemic era. Francis said, "I still use Peardeck regularly, Google Classroom is more of my routine than ever. All the Google products are my big ones (technology used today)."

Other aspects of Google that the participants said they used were Google Forms for quizzes and surveys. Google docs are used for class projects and papers. Participants explained that Google Slides are used almost daily, and a shared Google Calendar allows them to keep track of meetings and school events. Paula explained that "the huge school calendar in the front office is now gone. Everything is digital that used to be on paper." Brynn said she, "couldn't remember details of her lesson plans, but remembered standing at the copy machine all the time," she went on to say, "it is impossible to measure all the ways technology has changed me.

The other experience educators explained get used more often in the post pandemic era are games. Ten of the participants use games in their classrooms at least occasionally to reinforce

material. This research is constant with Bice & Tang (2022) that found that most teachers use drill and practice tools weekly. Some of the games listed include Quizzes live, Quizlet, IXL, Blooket, Gimkit, Prodigy, and Kahoot. Blyth said, “I began using Quizlet for the students to practice questions and study vocabulary. I have discovered (I know, late to the party) that this is an excellent way for students to test their understanding of the material.”

Sub-Question Three

How have teachers’ attitudes changed concerning learning new technology?

One-way teachers’ attitudes changed concerning learning new technology was how they perceive teacher training. All eleven of the participants stated that they did not have proper training to teach virtual classes. This research is consistent with Siddiqueil & Kathpal (2021) that showed that one of the many challenges for teachers during the pandemic was that teachers felt they were not prepared and lacked training. Many of the participants took some responsibility for this lack of training. Blyth said, “I was always open to learning new technology, but I would always grumble when I had to go to training, now I won’t grumble so much. I understand the benefit for students now and the usefulness of technology.” Brynn explained that her school had four training courses a year and she could choose what she wanted to do in these trainings. She went on to say, “I always chose data analysis type training, and maybe looking back that wasn’t so useful for Covid. If I could go back, I would have gone to communication and techie stuff (training).”

Another way teachers’ attitudes changed concerning learning new technology was now having the negativity towards losing technology. At some point every participant mentioned that something they loved using during the pandemic, either an application, program, or entire curriculum that was gone because of funding. During the pandemic public and private school

educators could access all types of technology for the classroom that were free. When the pandemic ended, so did all the useful technology teachers have had access to for free. Renee said, “For the first time in years, I don’t have IXL. I am very disappointed I do not have it, I absolutely loved it.” Bonnie explained that she put many of her lessons on Nearpod but now, “we no longer have a subscription, so all those lessons are gone.” Christine said she thinks the time to adapt a new form of technology is when, “we are developing a new curriculum.” There is a mistrust among educators regarding technology because of the “here today, gone tomorrow” problem referred to by Renee.

Summary

In this chapter, the attitudes of eleven teachers from a small, private, Christian school were examined regarding technology prior to the pandemic and after the pandemic. The teachers shared their experiences through surveys, interviews, and writing prompts. Analysis their experiences and types of digital tools used were categorized. The analysis presented the themes and sub themes found in the research. The common thread throughout the research focused on a newfound confidence felt by all the participants when reflecting on their attitudes regarding technology. The confidence was obtained through the necessity of having to become more familiar with technology as a result of the pandemic. The research provided themes there were found through interviews, reflective prompts, and a digital tool artifact. The themes included pre-pandemic attitudes toward technology, successful practices using technology during the pandemic, post-pandemic attitudes toward technology. The central research question and sub-questions were analyzed to understand the findings that focused on how teachers’ attitudes about technology were impacted by the pandemic. The central research question regarding how educators perceive the influence of the Covid-19 pandemic on their attitudes and use of

technology in the classroom research showed that teachers' attitudes toward technology did change in different ways for different participants.

CHAPTER FIVE: CONCLUSION

Overview

This case study described how the attitudes of educators concerning the usage of technology changed after the experience of online teaching during the pandemic at Cornerstone School. Data was collected through interviews, reflective prompts, and artifact analysis. The data was analyzed as described by Creswell & Poth (2018). These features include identifying themes, intent is examined, and an in-depth understanding is evident in this study. This chapter includes a discussion, interpretation of findings, implications for policy and practice, theoretical and methodological implications, limitations and delimitations, and recommendations for future research.

Discussion

The purpose of this qualitative, single case study was to understand how the attitudes of educators concerning the usage of technology changed after the experience of online teaching during the pandemic at Cornerstone School. Research examined the pre-pandemic attitudes toward technology, successful practices using technology during the pandemic, and post-pandemic attitudes towards technology. Previous research showed that using and being trained to use technology led to the use of technology among educators (Altun, 2019). The findings of this case study added to the existing research discussed in Chapter Two regarding the impact that the Covid-19 pandemic had on the use of technology in the classroom through the attitude of teachers. The following section discusses how educator attitudes regarding technology changed after the pandemic and has five major subsections including: (a) Interpretation of Findings; (b) Implications for Policy or Practice; (c) Theoretical and Empirical Implications; (d) Limitations and Delimitations; and (e) Recommendations for Future Research.

Interpretation of Findings

This research information was obtained from using a case study approach using a real-life setting to explore an issue (Yin, 2014). Bruner's (1986) theory that learning comes from experience is the guiding framework for this research. All the participants are employed at Cornerstone school as educators. Data collection included a demographic survey, semi-structured interviews, reflective journal prompts, and artifact analysis. The data was collected, analyzed and coded based on common themes.

The three themes that surfaced from the research include pre-pandemic attitude toward technology, successful practices using technology during the pandemic, and post-pandemic attitudes toward technology. These themes aligned with the central research question and the sub-questions. One of the findings of this study concluded that the participants understood the importance of using technology. The importance of technology as understood by teachers was also presented by Koparan (2022) that found there was an increase in achievement from students that were exposed to games and simulations during their education on a topic.

Another theme that emerged in this research was the newfound pride and success teachers found while using technology during the pandemic. The participants found many useful applications that made their lessons more engaging. At least 90% of the participants reported that they continue to use drill and practice tools at least occasionally while 46% report using them daily or weekly. This goes along with research from Bice & Tang (2022) who found that most teachers report having used drill and practice tools at least once a week. Although drill and practice tools only give correct and incorrect answers, they are still engaging for students. Google Classroom and drill and practice applications were found to be effective for the participants for students that struggle with absences. This finding is supported by research from

Zaripova-Drozdikova, et al. (2020) who found that many digital tools were very effective and convenient when managing student absences. The participants stated they will continue to use Google Classroom and have a higher opinion of the application which coincides with research by Hallel et al. (2020) that teachers had an overall increase in use despite some shortcomings found with Google Classroom.

The final theme that emerged from this research was that some educators still cite various barriers that hold them back from using technology in their classrooms. One of the biggest reasons teachers cite their lack of use of technology is that they feel teachers still need to use paper and pencil. This idea is explained by research by Dincher & Wagner (2021) by stating that educators state two main reasons for this idea. They just feel that students need to learn how to write, or the educator is just more comfortable doing what they have always done in the classroom and resist the idea of changing their classroom lessons (Dincher & Wagner, 2021).

Summary of Thematic Findings

Eleven teachers that teach a variety of subjects, grade levels, and have diverse levels of experience were interviewed through a semi-structured interview, they answered reflection prompts, and categorized their digital tool use in the classroom. Data was collected through transcriptions of the interviews and coding used to determine themes. These themes include pre-pandemic attitudes toward technology, successful practices using technology during the pandemic, and post-pandemic attitudes toward technology.

Lack of Technology Use Justified. In this study, participants asserted that they understood the usefulness of technology in the classroom which is consistent with Thacker (2017) citing that technology-integrated lessons can address many aspects of a student's needs and help support teachers by providing tutoring systems for students that need more help. This is

consistent with research by Hillmayr et al. (2020) that found that tutoring systems were beneficial to students because they offered pacing specific to the learner. Participants also found learners were more engaged when they could research topics that interested them using technology which aligns with research by Singh et al. (2022) that found that tutoring systems that allow students to choose what was fascinating to them was more meaningful to students.

Administrators and school district personnel have tried to implement technology in the classroom by offering training to teachers and by providing teachers with standards that they are expected to cover regarding technology (ISTE, 2022). Although educators have been aware of these technological expectations, they provided explanations as to why they limit the use of technology in their classrooms. One of the reasons educators gave is concern about unmonitored screen time. This reason is consistent with the United States Surgeon General (2021) that stated that excessive screen time among children can be harmful. Sangeeta & Tandon (2020) cite problems that can occur when online student activity is not monitored. The teachers in this study felt it was very difficult to monitor student use of technology in the classroom and at home and found some students did not have the ability to stay focused and had difficulty finishing tasks. This goes with research by Cebi & Guyer (2022) who found that if others are not guiding a student, the learning rests on the student's abilities.

Technology availability was also cited by the teachers as a reason they did not use technology in the classroom. Many teachers commented that the internet was not stable for some of their students and that created problems for the students to complete assignments. Some teachers in this study resorted to making packets of work for students that could not connect to the internet. This concern for internet availability was studied by Hussein et al. (2020) and was listed as the largest hindrance for online learning. Technology availability was also a

consideration regarding the types of applications that were available after the pandemic by the participants. The frustration regarding lack of technology resources was also cited by Kuhfeld et al. (2020) as a common barrier for technology use.

Some participants in this study asserted that prolonged screen time during the pandemic was a justification not to use technology in the classroom. Students spent a lot of time in front of screens suffered because of it. These teachers said they did not feel that way prior to the pandemic, but because of the pandemic, they felt that students were on devices too much. This explanation is consistent with Chakraborty et al. (2020) that said that 74.6% of students felt that they had excessive screen time and that their sleep was affected. There are constant reminders for some of the participants of this study that there are gaps in student learning and student writing is more difficult to read, particularly noted by Christina, and Blyth, when these English teachers were interviewed. These are the explanations as to why these teachers have chosen not to incorporate technology in classrooms. These reasons align with Friallon et al. (2020) whose research cited similar reasons why teachers do not use technology in the classroom.

Analyzing the amount of technology used by the teachers proved difficult for this study because teachers had difficulty remembering what they did before the pandemic, and it was not possible to get accurate data based on memory. However, all the participants reported that they used technology in their classrooms that was not common before the pandemic. Some of the applications were not available to them because of cost or were not mainstreamed yet for education. For example, no one in this study ever used Zoom, Google Meets, or Teams before the pandemic, but many of the participants still use Zoom, Meets, or Teams when necessary for virtual field trips or meeting with parents. This is consistent with research regarding these

applications and their use post pandemic. They were used by other professions prior to the pandemic, but the pandemic made them more prevalent in education Riyadh et al. (2022).

Building Confidence. The one attitude shift that was apparent in this research was the added confidence the participants had regarding technology because of the hands-on learning during the pandemic. The confidence they achieved was because they had more experience using technology during the pandemic. This research is consistent with Guggemos & Seufert (2021) who found that teachers were more likely to use technology when they used it themselves. This research was also consistent with Karchmer-Klein & Konishi (2021) claiming that a lack of training by educators was a reason for not using technology in the classroom. Every teacher in this study said they were more confident using technology now than they were before the pandemic. Whether the participant was referring to learning something new digitally, or if they had to go virtual again, the common thread about their attitude now was that they were more confident with technology. This research was consistent with Saubern et al. (2020) regarding confidence and proficiency of technology use.

Each participant wrote about a hurdle they had to overcome using technology while virtual in their reflection prompts. All of them shared a feeling of pride or confidence as a result of that experience which connects to research by Kim & Asbury (2020) that also described similar highlights regarding confidence and resilience during the pandemic. Research shows that online educators had a higher positive attitude regarding technology than face-to-face educators (Adhya & Panda, 2022). That would imply that with the experience educators had going virtual, they have a more positive attitude regarding technology post-pandemic which is consistent with this research and Adhya & Panda (2022).

Funding Determines Technology Use in the Classroom. Throughout this research it was made evident that funding determines how much and what kind of technology is used in the classroom. Funding for technology can improve student achievement in elementary and middle school students (Bass, 2021). Teachers got to use technology they were not familiar with because it was free. Many of the applications available for schools during the pandemic were no longer free when students went back to school. Several teachers in this study complained that they found technology they liked and no longer have access to it. The participants in this study went to great lengths to learn how to use different types of technology in their online classrooms. The technology challenges that they suffered during the pandemic are like prior literature relating to support and developing new material (Siddiquei & Kathpal, 2021).

Although there are many free and almost free applications, many of the most engaging applications are expensive. The NWEA (Northwest Evaluation Association) lists seventy-five digital tools and applications teachers can use that are free or close to free (Dyer, 2023). The participants in this study found participating in online games and creating presentations the most important for student engagement and achievement. This research is supported by prior literature by Karchmer-Klein & Konishi (2021). Many of the free applications or websites are not the most valuable for teachers to use in their classrooms. The participants in this study repeatedly stated that they missed some kind of technology they no longer have access to after the pandemic.

In 2021, South Carolina public schools received $2.1 billion in funding from the state (Mintzer, 2021). Private schools were not included in that funding. Private schools struggle with budget choices and a board to oversee decision making in a different manner than public schools. Public schools are driven by data and get discounts for technology because they are purchasing licenses in large numbers. Private schools do not have the luxury of huge technology budgets so

they must be wise in their purchases. The funding for technology in private schools is sometimes provided by the teacher that wants the technology. Some of the participants commented on technology they paid for with their own money.

Implications for Policy or Practice

The implications for policy related directly to Cornerstone School, as well as other private institutions that must carefully determine budgets without a large technology budget. The implications for policy and practice are suggestions for Cornerstone School and their stakeholders, policymakers, administrators, teachers, and parents. These changes are important because as a private school, Cornerstone must compete with public schools regarding technological resources, but also be mindful of the cost of the tuition each family must pay. The cost of not keeping up with technology in a private school may impact the effectiveness of student learning (Ainley et al., 2008; Blumenfeld et al., 2006; Lai, 2008; Mayer, 2019; Zhu & Urhahne, 2018) compared to their public-school counterparts.

Implications for Policy

This study highlights the implications for policy. Previous research outlined which digital tools provide the best outcome for student growth (Hillmayr et al, 2020; Singh et al., 2022; Bice & Tang, 2020). Although this study confirmed that most teachers use drill and practice tools (Bice & Tang, 2020), drill and practice tools did not offer new content knowledge and is not the most effective tool for teaching (Hillmayr et al., 2020). This study found that many teachers found drill and practice tools engaging, but not beneficial in learning new material. Tutoring systems have a more positive impact on student learning but may not be beneficial to all the students based on their needs and abilities (Singh et al., 2022). Simulation tools that offer interactive math or science concepts are most beneficial to most students and show the greatest

learning gains for learning (Hillmayr et al., 2020). This implies that funds used for technology programs and applications should focus on simulation tools over other types of digital tools. Funding for technology in schools must be modified to align with the Department of Education's vision for technological advancement in schools (Department of Education, 2022).

There are also implications for policy regarding students that need additional support. Technology can be used to assist students that need to make up classes or can be used to create additional assignments to help them succeed. Tutoring systems offer learners the chance to learn at their own pace (Singh et al., 2022), but that may not be necessary at a private school. Many private schools do not provide services for students that need differentiated material or additional practice using a tutoring system. Budget concerns regarding technology should be specific to the needs of the school and not it should not be assumed that what is beneficial to most schools would be beneficial to all schools when considering types of technology to buy.

If the school chose to purchase technology that was beneficial to student learning and engagement, it is imperative that the teachers are committed to learning the new technology and will use it with consistency. The participants stated that they had to find technology useful for them and their students or it would be disregarded. A private school with a limited budget should be cautious of the purchases they decide to make regarding technology. Policies should be made for private schools like school districts to determine budget size and useful types of technology. Developing and implementing technology budgets should be considered before allocating funds for any specific type of technology or before fundraising funds get dispersed.

Implications for Practice

Technology is not meant to replace the instruction given by the teacher, but enhance it (Hillmayr et al., 2020). Students and teachers alike struggled during the pandemic and had

similar experiences regarding the usefulness of technology (Riyath et al., 2022; Bice & Tang, 2022). Teachers struggled to keep students engaged finding useful methods to teach (Dorji, 2021) and students did not participate if the material wasn't useful to them (Bice & Tang, 2022). The participants in this study gained confidence regarding technology after learning through the hands-on experience from the pandemic but additional training would have been beneficial prior to the pandemic. Recent research states that there is a greater need for preservice teachers to learn digital learning platforms as a result of the pandemic (Gameil & Al-Abdullatif, 2023). Introducing new technology to teachers should always provide some training by the school staff or district officials. Howell (2021) states that teachers with technology training will continue to be valuable to all staff members because they can help other teachers. Additional training for veteran teachers and preservice teachers is necessary in today's classroom. It is up to teachers to engage in training to have a successful outcome for the school.

Teachers not only require training for any purchased technology, but they must also be assured it will not disappear when another administrator takes over since the resources available are cited as one of the most important factors for using technology in the classroom (Kuhfeld et al., 2020) Funding should not change year to year so the teachers can have time to be proficient in the technology purchased by the school. Educators should use any purchased technology with diligence. This can be addressed by building professional development in technology as goals related to school operational plans. Gameil & Al-Abdullatif (2023) suggest teachers should be measured on their digital effectiveness and competency. Current technology teams or administrators should at least monitor the use of any purchased technology tool to justify future spending. Textbook purchases that include technology often get ignored. Any technology that is available at no cost should be explored for student use. Teachers at Cornerstone have a new

confidence regarding technology post-pandemic. The exposure they received to technology during the pandemic should be the groundwork to integrating it in their classrooms. This new confidence should be explored to enhance student engagement and create schoolwide culture that promotes technology use in the classroom.

Theoretical and Empirical Implications

This study used Bruner's theories technology in the classroom. Bruner (1990) stated that technology should be used with a hands-on approach and learning comes from experience. This study is not focusing on the student as the learner, but the teacher. Teachers became learners of technology during the pandemic by necessity. One significant finding of this study is that the participants felt a new confidence when it came to teaching with technology. Self-efficacy is related to one's own perception (Tondeur et al., 2020). Teachers' self-efficacy regarding technology changed with how they perceive their competency using technology to support their own teaching styles.

This study corroborates previous research by recognizing that although teachers recognize the need and usefulness of technology in the classroom, some teachers rarely adopt using it (Fraillon et al., 2020). This was made evident by the responses articulating why some teachers felt technology should be limited. This study also corroborated that most teachers are comfortable using drill and practice tools over other types of digital tools (Bice & Tang, 2022). It also corroborated confirms previous research that Google Classroom is one of the biggest tools that became common practice during the pandemic (Hussein et al., 2020) and still is used by the participants in this study.

This study extends previous research by emphasizing that teachers with an increased use of technology, also increased their positive attitude toward technology and were more likely to

use it in their classrooms (Atabek & Burak, 2020). Previous research focused on preservice teachers that were more likely to use technology if they were trained or had more experience with it (Atabek & Burak, 2020). This research shows that even though many teachers said they felt technology should be limited, did in fact use technology daily by using Google Classroom at the very least.

The novel contribution my study adds to this field is the frustration my participants feel by not having access to technology they got used to during the pandemic. Many of the programs purchased by Cornerstone are limited and do not include full features. Some of the participants came from a public setting where they could monitor students' devices regularly. The transition to the technology that Cornerstone uses has caused frustration in many of the participants. This contribution is important because it shows that many of these participants would use more technology if it were available.

The most interesting thing that emerged regarding my use of method and design is that some my participants had difficulty recalling what technology they used before the pandemic. Some of the answers were vague or incorrect. Some of the technology listed wasn't available prior to the pandemic and regularity of what they used seemed inconsistent. The only way technology could be measured with accuracy would be to compare lesson plans prior to the pandemic and lesson plans post-pandemic from the same participants. Lesson plans are not required at Cornerstone, and this did not appear to be an option for this study.

The pandemic offered exposure to technology for educators. This exposure led to a more confident group of teachers at Cornerstone School. Whether we ever experience a virtual environment again, these teachers know they can learn how to do anything. Teachers may not

have learned this technology if they didn't have to, but they did learn it. They learned it through a hands-on, real-world experience as Bruner suggested is the best way to learn (1996).

Limitations and Delimitations

One limitation of this study is that the school did not have a very diverse population of teachers. There are two teachers of Asian descent but could not participate in the study because they did not teach during the pandemic. Another ethnicity limitation includes the African American population and the Hispanic population. Only one African American person participated and only one Hispanic person participated. Other limitations include gender because only one man participated in the study. The male population was not prevalent at the school. The last limitation includes religion diversity. All of the participants were Christian because the school requires it from their employees.

The delimitations helped me to refine my criteria of the study. The delimitations include the 1-month requirement for all teachers to have been virtual and the requirement of certified teachers that taught prior to and after the pandemic. These requirements were made to define the scope of the study to only research teachers that were influenced by the pandemic regarding technology. The participants also had to be current teachers at Cornerstone School.

Recommendations for Future Research

There is a need for students to be proficient with technology in school. This proficiency will most likely come from the educators the student encounters. There is an obligation for schools and teachers to prepare students for a profession where technology will be used and there is an obligation for schools and teachers to go to great lengths to engage their students, regardless of one's pedagogy. The information in this study may shed light on the importance of offering technology and training to teachers.

The results of this study may also provide insight to how confidence was gained by teachers during the pandemic and how they overcame learning obstacles students face in the classroom. It is also useful to recognize the accountability required when training teachers new technology. It is important that teachers try to use new technology and not just attend training on it. Meneske et al. (2020) found that the reasons for low confidence concerning technology among students was likely centered around experience. Teachers should use the hands-on approach they were faced with during the pandemic to educate and give their students confidence.

Future research could collect data from lesson plans prior to the pandemic and compare them to current lesson plans to see if it would provide accurate information on what technology was used and how often it was used to compare technology usage pre-pandemic and post-pandemic. While this research focused on teachers' attitudes, learning specific details might reveal a more unique perspective to see if the pandemic changed how we teach. It would also be helpful to collect data on attitudes from teachers that are in a public setting. Ultimately it would be helpful if the participants did not change schools and had the exact same technology available today that they had during the pandemic to see if they are more favorable to using technology now.

Conclusion

This qualitative case study enhanced the research on understanding perceived attitudes of teachers regarding technology pre-pandemic and post-pandemic at Cornerstone School. The theory on which this research was based is Bruner's Constructivist Theory (1985). This research was conducted using in-person interviews, reflective journal prompts, and the analysis of the digital tool artifact provided by the participants. The participants included eleven teachers who

work at Cornerstone School. The participants were classroom teachers prior to the pandemic and post-pandemic. They also were virtual for at least one month during the pandemic.

The first significant finding of this study was that the attitudes of the participants changed through Bruner's Constructivist Theory (1985). The teachers gained more confidence using technology because they were forced to learn new applications and types of digital tools. Bruner (1985) explained that knowledge comes from one's own self-discovery, it was determined that learning out of necessity, built confidence for the participants. By building confidence in what the participants could accomplish virtually, their attitude towards learning new technology improved. This study stresses the need for educator training and practice using technology, so they are more likely to be able to share technology with their students (Guggemos & Seufert, 2021).

The second significant finding was a commonality among the three themes. The second significant finding is that all the themes had negative aspects to them. The participants were open about their responses and almost all had positive and negative comments to share. Teachers were negative at the onset of the pandemic about learning new things, they were frustrated while virtual concerning student engagement, and they had negative attitudes towards technology after the pandemic because of the lack of digital tools that were available. The pandemic had a profound impact on teachers and in reflection, they had a difficult time letting go of the negativity from the experience.

The third significant finding was that factors that were not a part of this study influenced attitudes regarding technology. It was not expected that political views would be a common topic among the participants. The political views of the teachers regarding the pandemic were not the focus of this study so those comments were disregarded during data collection. Some of the

teachers were still upset that they were virtual at all and blamed the media or political parties. One participant did not believe there was a pandemic at all and resented having to be virtual. Some participants maintained a negative attitude regarding the experience and had a difficult time separating their views from their attitude regarding technology.

References

Adhya, D. & Panda, S. (2022). Teacher educators' attitude towards technology-enabled learning and its incorporation into teaching-learning during and post-pandemic. *Educational Media International, 59*(2). 131-149. https://doi.org/10.1080/09523987.2022.2101204

Agyei, D.D. & Voogt, J.M. (2010). Exploring the potential of the will, skill, tool model in Ghana: Predicting prospective and practicing teachers' use of technology. *Computers and Education, 56,* 1-10. https://doi.org/10.1016/j.compedu.2010.08.017

Ainley, J., Enger, L., & Searle, D. (2008). Students in a digital age: Implications of ICT for teaching and learning. *International Handbook of Information Technology in Primary and Secondary Education, 20*. 63-80. https://doi.org/10.1007/978-0-387-73315-9_4

Alfy, S., Gomez, J.M., & Ivanov, D. (2017). Exploring instructors' technology readiness, attitudes and behavioral intentions towards e-learning technologies in Egypt and United Arab Emirates. *Educational Information Technology, 22,* 2605-2627. http://doi.org/10.1007/sl0639-016-9562-1

Altun, D. (2019). Investigating Pre-service early childhood education teachers' technological pedagogical content knowledge (TPACK) competencies regarding digital literacy skills and their technology attitudes and usage. *Journal of Education and Learning, 8*(1), 249-263. https://doi.org/10.5539/jel.v8n1p249

Akram, H., Abdelrady, A.H., Al-Adwan, A., & Ramzan, M. (2022). Teachers' perceptions of technology integration in teaching-learning practices: A systematic review. *Frontiers in Psychology, 13,* 920317, 1-9. http://doi:10.3389/fpsyg.2022.920317

Aksu, F.N. & Ozturk, G. (2018). Examining schoolteachers' self-efficacies in interactive whiteboard use. *Journal of Educational Technology and Online Learning, 1*(2), 16-32.

http://dergipark.gov.tr/jetol

Alexander, R. (2004). Still no pedagogy? Principle, pragmatism, and compliance to primary education. *Cambridge Journal of Education, 34*(1), 7-33.

Atabek, O. & Burak, S. (2020). Pre-school and primary school pre-service teachers' attitudes towards using technology in music education. *Eurasian Journal of Educational Research 90*, 205-226.

Awofala, A., Alkinoso, S., & Fatade, A. (2017). Attitudes towards computer and computer self-efficacy as predictors of pre-service mathematics teachers' computer anxiety. *Acta Didactica Napocensia, 10*(2), 91-108.

Awofala, A., Olabiyl, O., Awofala, A., Arigbabu, A., Fatade, A., & Udeani, U. (2019). Attitudes toward computer, computer anxiety and gender as determinants of pre-service science technology, and mathematics teachers' computer self-efficacy. *Digital Education, 36*. https://greav.ub.edu/der/

Bandura, A. (1986). The explanatory and predictive scope of self-efficacy theory. *Journal of Clinical and Social Psychology, 4*(3), 359-373. https://dx.doi.org/10.1521/jscp.1986.4.3.359

Bass, B. (2021). The effect of technology funding on school-level student proficiency. *Economics of Education Review, 84*(102151), 1-22.

Bayraktar, S. (2002). A meta-analysis of the effectiveness of computer-assisted instruction in science education. *Journal of Research on Technology in Education, 34*(2), 173-188.

Beardsley, M., Albo, L., Aragon, P., & Hernandez-Leo, D. (2020). Emergency education effects on teacher abilities and motivation to use digital technologies. *British Journal of Educational Technology, 52,* 1455-1477. https://doi.10.1111/bjet.13101

Bhat, S.K. (2016). Usage and attitude of teacher educators towards educational technology: A study. *World Digital Libraries, 9*(2), 91-110.

Bice, H. & Tang, H. (2022). Teachers' beliefs and practices of technology integration at a school for students with dyslexia: A mixed methods study. *Education and Information Technologies, 27*, 10179-10205. https://doi.org/10.1007/s10639-022-11044-1

Blau, L. & Shamir-Inbal, T. (2017). Digital competences and long-term ICT integration in school culture: The perspective of elementary school leaders. *Education and Information Technologies, 22*, 769-787. https://doi.org/10.1007/s10639-015-9456-7

Blumenfeld, P.C., Kempler, T.M., & Krajcik, J.S. (2006). Motivation and cognitive engagement in learning environments. *The Cambridge Handbook of the Learning Sciences.* 475-488. https://doi.org/10.1017/CBO9780511816833.029

Borup, J., Graham, C.R., West, R.E., Archambault, L., & Spring, K.J. (2020). Academic communities of engagement: An expansive lens for examining support structures in blended and online learning. *Education Technology Research and Development, 68.* 807-832. https://doi.org/10.1007/s11423‐020‐09744‐x

Brinkman, S. & Kvale, S. (2015). *Interviews: Learning the craft of qualitative research interviewing*, (3rd ed.). Sage.

Bruner, J. (1966). *Toward a Theory of Instruction*. Norton for Harvard University Press.

Bruner, J. (1990). *Acts of Meaning*. Harvard University Press.

Bruner, J. (1985). Models of the Learner. *Educational Horizons, 64*(4). 197-200. https://www.jstor.org/stable/42926834

Bruner. J. (1997). *The culture of education*. Harvard University Press.

Bruno, P. & Goldhaber, D. (2022). What pandemic-related test waiver requests suggest about states' testing priorities. *Phi Delta Kappa, 103*(3). 48-53. https://doi-org.ezproxy.liberty.edu/10.1177/00317217211058525

Buckley, B., Gobert, J., Kindfield, A.C.H., Horwitz, P., Tinker, R.F., Gerlitz, R., Willett., J. (2004). Model-based teaching and learning with Biological TM: What do they learn? How do they learn? How do we know? *Journal of Science Education and Technology, 13*(1), 23-41. http://www.jstor.org/stable/40186688

Buric, I. & Kim, L.E. (2020). Teacher self-efficacy, instructional quality, and student motivational beliefs: An analysis using multileveled structural equation modeling. *Learning and Instruction, 66.* https://doi.org/10.1016/j.learninstruc.2019.101302

Bushweller, K. (2020). *EdWeek Research Center surveys reveal good and bad trends.* http://www.palaumoe.net/docs/ed_conv_handouts/minister/How%20COVID-19%20Is%20Shaping%20Tech%20Use.%20What%20That%20Means%20When%20Schools%20Reopen%20-%20Education%20Week.pdf

Butnaru, G.I., Nita, V., Anichiti, A., & Brinza, G. (2021). The effectiveness of online education during Covid 19 pandemic – A comparative analysis between the perceptions of academic students and high school students from Romania. *Sustainability, 13.* https://doi.org/10.3390/su13095311

Byrne, B.M. (1996). Academic self-concept: Its structure, measurement, and relation to academic achievement. In B. A. Bracken (Ed.). *Handbook of self-concept: Developmental, social, and clinical considerations.* (287-316). New York: Wiley.

Casacchia, M., Cifone, M. G., Glusti, L., Fabiani, L., Gatto, R., Lancia, L., Cinque, B., Petrucci, C., Giavvoni, M., Ippoliti, R., Frattoroli, A., Macchiarelli, G., & Rocone, R. (2021). Distance education during COVID 19: An Italian survey on the university teachers' perspectives and their emotional conditions. *BMC Medical Education, 21* (335)1-17.

Chakraborty, P., Mittal, P., Gupta, M, Yadav, S., & Arora, A. (2020). Opinion of students on online education during the COVID-19 pandemic. *Human Behavior & Emerging Technology, 3*. 357-365.

Clandinin, D.J. & Connelly, F.M. (2000). *Narrative inquiry: Experience and story in qualitative research.* Jossey-Bass.

Choppin, J. & Borys, Z. (2017). Trends in the design, development, and use of digital curriculum materials. *ZDM Mathematics Education, 49*. 663-674. http://doi.org/10.1007/s11858-017-0860-x

Christensen, R.W. & Knezek, G.A. (2009). Construct validity for the teachers' attitudes towards computers questionnaire. *Journal of Computing in Teacher Education, 25*(4), 143-155.

Coe, W., Fang, Z., Hou, M., Xu, X., Dong, J., & Zhen, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research, 287*.

Cornman, S., Ampadu, O., & Hanak, S. (2020). *Documentation for the NCES School District Finance Survey (F-33).* Washington, DC: National Center for Education Statistics, Institute of Educational Sciences, U.S. Department of Education. https://necs.ed.gov/pubsearch

Creswell, J.W. (2013). *Qualitative inquiry & research design: Choosing among the five approaches* (3rd ed.). Sage.

Creswell, J.W. & Poth, C.N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage.

Cross. (2022). Senior Leadership. https://www.crossschools.org/about/senior-leadership

Cross Tuition (2022). Tuition. https://www.crossschools.org/application/files/5516/4485/9781/Tuition_2022_23.pdf

Danzin, N.K., & Lincoln, Y.S. (2011). *Introduction: The discipline and practice of qualitative research. The SAGE handbook of qualitative research* (4th ed.). Sage

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 1*3, 319-340. https://doi.org/10.2307/249008

Department of Education. (2022) Educational Technology. https://tech.ed.gov/deer/

Dewey, J. (1933). *How we think.* Health and Company.

Dincher, M., & Wagner, V. (2021). Teaching in times of COVID-19: determinants of teachers' educational technology use. *Education Economics, 29*(5), 461-470. https://doi.org/10.1080/09645292.2021.1920000

Dindar, M., Suorsa, A., Hermes, J., & Karppinen, P. (2021). Comparing technology acceptance of K-12 teachers with and without prior experience of learning management systems: A COVID-19 pandemic study. *Journal of Computer Assisted Learning, 37,* 1553-1565. https://doi.org/10.1111/jcal.12552

Dorji, K. (2021). Online teaching during the COVID pandemic: Attitude of teachers towards e-leaning in Bhutanese classroom. *The Journal of Open, Distance, and e-Learning, 36*(2). 149-163. https://doi.org/10.1080/026805

Drozdikova-Zaripova, A.R. & Sabirova, E.G. (2020). Usage of Digital Educational Resources in teaching students with application of “Flipped classroom” Technology. *Contemporary Educational Technology 12*(2). https://doi.org/10.30935/cedtech/8582

Dyer, K. (2023, June 5). 75 *Digital tools and apps teachers can use to support formative assessment in the classroom.* NWEA.org. https://www.nwea.org/blog/2021/75-digital-tools-apps-teachers-use-to-support-classroom-formative-assessment/

Early Childhood Australia (ECA). (2018). Statement on young children and digital technologies. Canberra: ACT. ECA. http://doi.org/10.1111/bjet.12882

Ertekin, E., Dilmac, B., & Yazici, E. (2009). The relationship between mathematics anxiety and learning styles of pre-service mathematics teachers. *Social Behavior and Personality, 37*(9), 1187-1196.

Eksail, F.A. & Afari, E. (2020). Factors affecting trainee teachers’ intention to use technology: A structural equation modeling approach. *Education and Information Technologies, 25*, 2681-2697. http://doi.org/10.1007/s10639-019-10086-2

Faber, J., Glas, C., & Visscher, A. (2018). Differentiated instruction in a data-based decision-making context. *School Effectiveness and School Improvement, 29*(1), 43-3. https://doi.org/10.1080/09243453.2017.1366342

Farjon, D., Smits, A., & Voogt, J. (2019). Technology integration of pre-service teachers explained by attitudes and beliefs, competency, access, and experience. *Computers & Education 130*, 81-93.

Ferdig, R.E., Baumgartner, E., Hartshorne, R., Kaplan-Rakowski, R., & Mouza, C. (2020). *Teaching, technology, and teacher education during the COVID-19 pandemic. Stories from the field*. Association for the Advancement of Computing in Education (AACE).

Fernadez-Batanero, J., Roman-Gravan, P., Reyes-Rebollo, M., & Montenegro-Rueda, M. (2021). Impact of educational technology on teacher stress and anxiety: A literature review. International *Journal of Environmental Research and Public Health, 18*(2). 548.

Fernandez, A.A. & Shaw, G.P. (2020). Academic leadership in a time of crisis: the coronavirus and COVID-19. *Journal of Leadership Studies, 14*(1), 39-45.

Figlio, D. & Ozek, U. (2020). An extra year to learn English? Early grade retention and the human capital development of English learners. *Journal of Public Economics, 186*. 104-184. https://doi-org.ezproxy.liberty.edu/10.1016/j.jpubeco.2020.104184

Fraillon, J., Ainley, J., Schulz, W, Friedmand, T., & Duckworth, D. Gebhart, E., (2014). *Preparing for life in a digital age: IEA International computer and information literacy study 2018 international report* (1st ed., pp 195-228). https://doi.org/10.1007/978-3-319-14222-7

Futterer, T., Scheiter, K., Cheng, X., & Sturmer, K. (2022). Quality beats frequency? Investigating students' effort in learning when introducing technology in classrooms. *Contemporary Educational Psychology, 69*. 1-20. https://doi.org/10.1016/j.cedpsych.2022.102042

Gameil, A.A. & Al-Adbullatif, A.M. (2023). Using digital learning platforms to enhance the instructional design competencies and learning engagement of preservice teachers. *Education Sciences, 13*(334). 1-15. https://doi.org/10.3390/educsci13040334

Guba, E.G., & Lincoln, Y.S. (1988). Do inquiry paradigms imply inquiry methodologies? *Qualitative approaches to evaluation in education*. Preger.

Guoyan, S., Khaskheli, A., Raza, S., Khan, K., Hakim, F. (2021). Teachers' self-efficacy, mental well-being and continuance commitment of using learning management system during

COVID-19 pandemic: a comparative study of Pakistan and Malaysia. *Inter Learn Env. 2021*, 1-23. https://doi:10.1080/10494820. 2021.1978503

Guzzemos, J. & Seufert, S. (2021). Teaching with and teaching about technology – Evidence for development of in-service teachers. *Computers in Human Behavior*, 115. 1-11. https://doi.org/10.1016/j.chb.2020.106613

Halonen, N., Hietajarvi, L., Lonka, K., & Salmela-Aro, K. (2017). Sixth graders' Use of Technologies in Learning, Technology and Attitudes and School Well-being. *The European Journal of Social and Behavioral Sciences, 18,* 2301-2218. http://doi.org/10.15405/ejsbs.205

Hallal, K., HajjHussein, H., & Tlais, S. (2020). A quick shift from classroom to Google classroom: SWOT analysis. *Journal of Chemical Education, 97*, 2806-2809. https://pubs.acs.org/action/showCitFormats?doi=10.1021/acs.jchemed.0c00624&ref=pdf

Hammersley, M., & Atkinson, P. (1995). *Ethnography: Principles in practice*, (2nd ed.). Routledge.

Harris, A. & Jones, M. (2020). COVID 19- School leadership in disruptive times. *School Leadership and Management, 40*(4), 243-247. https://doi.org/10.1080/13632434.2020.1811479

Heo, H., Bonk, C.J., & Doo. M.Y. (2020). Enhancing learning engagement during COVID-19 pandemic: Self-efficacy in time management, technology use and online learning environments. *Journal of Computer Assisted Learning, 37*, 1640-1652. http://doi.org/10.111.jcal.12603

Herman, P. C. (2020) Online learning is not the future. *The Chronicle of Higher Education*. https://www.insidehighered.com/digital-learning/views/2020/06/10/online-learning-not-future-higher-education-opinion

Hermans, R., Tondeur, J., van Brask, J., & Valcke, M. (2008). The impact of primary school teachers' educational beliefs on the classroom use of computers, *Computers and Education, 51*(4), 1499-1509. https://doi.org/10.1016/j.compedu.2008.02.001

Hernandez-Ramos, P.J., Martinez-Abad, F., Penalvo, F.J., Garcia-Herrera, E.M., & Rodgriguez-Conde, J.M. (2014). Teachers' attitude regarding the use of ICT. A factor reliability and validity study. *Computers in Human Behavior, 31,* 509-516.

Higgins, K., Huscroft-D'Angelo, J., & Crawford, L. (2022). Effects of technology in mathematics on achievement, motivation, and attitude: A meta-analysis. *Journal of Education, 57*(2), 283-319. https://doi-org.ezproxy.liberty.edu/10.1177/0735633117748416

Hillmayr, D., Ziernwald, L., Reinhold, F., Hofer, S.L. & Reiss, K.M. (2020). The potential of digital tools to enhance mathematics and science learning in secondary schools: A context-specific meta-analysis. *Computers & Education, 153.* https://doi.org/10.1016/j.compedu.2020.103897

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Frontiers in Education 7*, 1-12. https://doi.org/10.3389/feduc.2022.921332

Hoffman, M. M. & Ramirez, A.Y. (2018). Students' attitudes towards teacher use of technology in classrooms. *Multicultural Education 25*(2), 52-56.

Howell, R.A. (2021). Engaging students in education for sustainable development: The benefits of active learning, reflective practices and flipped classroom pedagogies. *Journal of Cleaner Production, 325*. http://doi.org/10.1016?j.jclepro.2021.129318

Hu, X., Chiu, M.M., Leung, W.M., & Yelland, N. (2020). Technology integration for young children during COVID-19: Towards future online teaching. British Journal of Educational Technology, 52, 1513-1537.

Huff, A.S. (2009). *Designing research for publication.* Sage.

Hussein, M.H., Siew, H.O., Ibrahim, I., & Mahmoud, M.A. (2021). Measuring instructors continued intention to reuse Google Classroom in Iraq: a mixed method study during COVID-19. *Interactive Technology and Smart Education, 19*(3), 380-402.

International Society for Technology and Education. (n.d.). *ISTE standards for teachers.* https://www.iste.org/standards/iste-standards-for-teachers

Ibanez, M.B., Portillo, A.U., Cabada, R. Z., & Barron, M. L. (2019). Impact of augmented reality technology on academic achievement and motivation of students from public and private Mexican schools. A case study in middle-school geometry course. *Computers and Education, 145*(360), 1-9. https://doi.org/10.1016/j.compedu.2019.103734

International Society for Technology and Education. (n.d.). *ISTE standards for teachers.* https://www.iste.org/standards/iste-standards-for-teachers

Jimoylannis, A. & Komis, V. (2001). Computer simulations in physics teaching and learning: A case study on students' understanding of trajectory motion. *Computers & Education, 36*(2), 183-204. https://doi-org.ezproxy.liberty.edu/10.1016/S0360-1315(00)00059-2

Jones, W.M. (2020). Teachers' perceptions of maker-centered professional development experience: a multiple case study. *International Journal of Technology and Design Education, 31*. https://doi.org/10.1007/s10798-020-09581-2

Juhanak, L., Zounek, J., Zaleska, K., Ondrej, B., & Vickova, K. (2019). The relationship between the age at first computer use and students' perceived competence and autonomy in ICT usage: A mediation analysis. *Computers and Education, 141*. https://doi.org/10.1016/j.compedu.2019.103614

Karchmer-Klein, R. & Konishi, H. (2021). A mixed-methods study of novice teachers' technology integration: Do they leverage their TPACK knowledge once entering the profession? *Journal of Research on Technology in Education 55(3),* 405-506. https://doi.org/10.1080/15391523.2021.1976328

Kim, L.E. & Asbury, K. (2020). Like a rug had been pulled from under you: The impact of COVID-19 on teachers in England during the first six weeks of the UK lockdown. British *Journal of Educational Psychology, 90.* 1062-1083. https://doi.org/10.1111/bjep.12381

Kisanga, D.H. & Ireson, G. (2016). Test of e-learning related attitudes (TeLRA) scale: Development, reliability and validity study. *International Journal of Education and Development Using Information and Communication Technology, 12*(0), 20-36. https://files.eric.ed.gov/fulltext/EJ1099575.pdf

Kitchen, J.A., Cole, D., Rivera, G, & Hallett, R. (2021). The impact of a college transition program proactive advising intervention on self-efficacy. *Journal of Student Affairs, Research, and Practice, 58(*1), 29-43. https://doi-org.ezproxy.liberty.edu/10.1080/19496591.2020.1717963

Koparan, T. (2022). The impact of game and simulation-based probability learning environment on the achievement and attitudes of prospective teachers. *International Journal of Mathematical Education in Science and Technology, 53*(9), 2319-2337. https://doi.org/10.1080/0020739X.2020.1868592

Korstjens, I. & Moser, A. (2018). Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. *European Journal of General Practice, 24*(1), 120-124. https://doi.org/10.1080/13814788.2017.1375092

Kuhfeld, M., Soland, J., Tarasawa, B., Johnson, A., Ruzek, E., & Liu, J. (2020). Projecting the potential impact of COVID-19 school closures on academic achievement. *Educational Researcher, 49*(8), 549-565. https://doi.org/10.3102/0013189X20965918

Kwon, J.E. & Woo, H. R. (2018). The impact of flipped learning on cooperative and competitive mindsets. *Sustainability, 10*(79). https://doi.org/10.3390/su10010079

Lee, C. & Kim, C. (2014). An implementation study of TPACK based instructional design model in a TI course. *Educational Technology Research & Development*, *62*(4). 437-460.

Lei, J. & Zhao, Y. (2007). Technology uses and student achievement: *A longitudinal study. Computers & Education*, *49(*2), 284-296. https://doi.org/10.1016/j.compedu.2005.06.013

Levy, Y. (2006). Assessing the value of E-learning systems. Retrieved from https://eric.ed.gov/?id=ED508865

Lichti, M. & Roth, J. (2018). How to foster functioning thinking in learning environments using computer-based simulations or real materials. *Journal for STEM Education Research, I,* 148-172. https://doi.org/10.1007/s41979-018-0007-1

Lincoln, Y. & Guba, E. (1985). *Naturalist inquiry*. Sage.

Lincoln, Y.S., Lynham, S.A., & Guba, E.G., (2011). Paradigmatic controversies, contradictions, and emerging confluences. *The Sage Handbook of qualitative research (4th ed.)* Sage.

Lui, H., Wang, L, & Koehler, M.J. (2019). Exploring the intention-behavior gap in the technology acceptance model: A mixed: methods study in the context of foreign-language teaching in China. *British Journal of Educational Technology, 50*(5), 2536-2556. http://doi.org/10.1111/bjet.12824.

Luik, P., & Taimalu, M. (2021). Predicting the intention to use technology in education among student teachers: A path analysis. *Educational Sciences, 11*, 563-577. http://doi.org/10.3390/educaci11090564

Ma, W., Adesope, O., Nesbit, J.C., & Liu, Q. (2014) Intelligent tutoring systems and learning outcomes: A meta-analysis. *Journal of Educational Psychology, 106*(4), 901-918. https://doi.org/10.1037/a0037123

Marsh, J.A., Pane, J.F., & Hamilton, L.S. (2006). Making sense of data-driven decision making in education: Evidence from recent RAND research. Rand Corporation.

Marshall, C. & Rossman, G. (2015). *Designing qualitative research (6th ed.).* Sage.

Matthews, R.A., Wayne, J.H., Smith, C., Casper, W.J., Wang, Y., & Streit, J. (2021). Resign or carry-on? District and principal leadership as drivers change in teacher turnover intentions during the COVID-19 crisis: A latent growth model examination. *The British Psychological Society, 95*, 687-717. https://doi.org/10.1111/joop.12397

Mayer, R.E. (2014). Cognitive theory of multimedia learning. *The Cambridge Handbook of Multimedia Learning,* (2nd ed), 31-48.

Mayer, R.E. (2019). Computer games in education. *Annual Review of Psychology, 70*(1), 531-549. https://doi.org/10.1146/annurev-psych-010418-102744

McElhaney, C.M. (2016). Pre-service elementary school teachers' perception of mathematics education experiences: A phenomenological study. [Unpublished doctoral dissertation]. Liberty University.

Menekse, M., Zheng, X., & Anwar, S. (2020). Computer science students' perceived needs for support and their academic performance by gender and residency: An exploratory study. *Journal of Applied Research in Higher Education, 12*(5), https://doi.org/10.1108/JARHE-07-2019-0194

Miles, M. & Huberman, A. (1994). *Qualitative data analysis: A sourcebook of new methods (2nd ed.).* Sage.

Miles, M., Huberman, A., & Saldana, J. (2014). *Qualitative data analysis: A sourcebook of new methods (3rd ed.).* Thousand Oaks, CA: Sage.

Mills, A. J., Durepos, G., & Wiebe, E. (2010). *Encyclopedia of case study research*. Sage.

Mintzer, A. (2021, March 19). *SC public schools to receive unprecedented amount of funding this year*. WISTV.com. https://www.wistv.com/2021/03/20/sc-public-schools-receive-unprecedented-amount-funding-this-year/

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017.

Naidoo, J., & Singh-Pillay, A. (2020). Teachers' perceptions of using the blended learning approach for stem-related subjects within the fourth industrial revolution. *Journal of Baltic Science Education, 19*(4), 583-593. https://doi.org/10.33225/jbse/20.19.583

Natata, J.M., Cortez, C.A., Cattle, C.J., Ganson, K.T., Iyer, P., Bibbins, D., Domingo, K., & Baker, F.C. (2021). Screen time use among US adolescents during the COVID-19

pandemic: Findings from the adolescent brain cognitive development (ABCD) study. *JAMA Pediatrics*. http://doi.org/10.1001/jamapediatrics.2021.4334

Nattland, A. & Kerres, M. (2009). Computer based methods in class. *Handbuch Unterricht (2nd ed)*, 317-324. Germany.

Nelson, M.J. & Hawk, N.A. (2020). The impact of field experiences on prospective preservice teachers' technology integration beliefs and intentions. *Teaching and Teacher Education, 89*. http://doi.org/10.1016/j.tate.2019.103006

Nguyen, G. H. & Bower, M. (2018). Novice teacher technology-enhanced learning design practices: The case of the silent pedagogy. *British Journal of Educational Technology 49*(6), 1027-1043. http://doi:10.1111/bjet.12681

Njiku, j., Maniraho, J.F. & Mutarutinya, V. (2019). Understanding teachers 'attitude towards computer technology integration in education: A review of literature. *Education and Information Technologies 24*. 3041-3052. https://doi.org/10.1007/s10639-019-09917-z

Oliver, T. & Shapiro, F. (1993). Self-efficacy and computers. *Journal of Computer Based Instruction, 20*(3), 81-85.

Oliveira, G., Teixeria, J.G., Torres, A., & Morais, C. (2021). An exploratory study on the emergency remote education experience of higher education students and teachers during the COVID-19 pandemic. *British Journal of Educational Technology, 52*, 1357-1376. http://doi.10.1111/bjet.13112

Ottenbreit-Leftwich, A, Liao, J, Sadik, O., Ertmer, P. (2018). Evolution of teachers' technology integration knowledge, beliefs, and practices: How can we support beginning teachers use of technology? *Journal of Research on Technology in Education, 4*(50), 292-304. http://doi/full/10.1080/15391523.2018.1487350

Pandya, B., Patterson, L., & Cho, B. (2021). Pedagogical transitions experienced by higher education faculty members-pre-covid to covid. *Journal of Applied Research in Higher Education, 14*(3), 987-1006. https://doi.org/10.1108/JARHE-01-2021-0028

Patson, T.J., Kennedy, J., Jaeschke, W., Kapoor, H., Leonard, S.N., Cropley, D.H., Kaufman, J.C. (2021). Secondary education in Covid lockdown: More anxious and less creative – maybe not? *Frontiers in Psychology*, *12*(613055), 1-14. http://doi:10.3389/psyg.2021.613055

Patton, M. Q. (1980). *Qualitative evaluation methods*. Beverly Hills: Sage.

Putnam, R. & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning*? Educational Researcher, 29* (1), 4-15. https://doi.org/10.3102/0013189X029001004

PwC. (2018). Technology in US Schools: Are we preparing our kids for the jobs of tomorrow? https://www.pwc.com/us/en/about-us/corporate-responsibility/library/preparing-students-for-technology-jobs.html

Riyath, M., Rijah, U., & Rameez, A. (2022). Students' attitudes on the use of Zoom in higher educational institutes of Sri Lanka. *Asian Association of Open Universities Journal, 17*(1), 37-52. https://doi.org/10.1108/AAOUJ-11-2021-0130

Rushton, S. (2011). Neuroscience, early childhood education and play: We are doing it right! *Early Childhood Education Journal, 39*(2), 89-94. https://doi.org/10.1007/s10643-011-0447-z

Saldana, J. (2015). The coding manual for qualitative researchers (3rd ed.). SAGE publication. https://books.google.com/books?hl=en&lr=&id=ZhxiCgAAQBAJ&oi=fnd&pg=PP1&dq

=Salda%C3%B1a+(2015)&ots=yISi1COVbW&sig=qbfKzTJmQO4T9nNe4VLx-_ckXTo

Salomon, G. (2002). Technology and pedagogy: Why don't we see the promised revolution? *Educational Technology Publications, 42*(2), 71-71. https://www.jstor.org/stable/44428740

Sang, G., Valche, M., van Braak. J., & Tondeur, J. (2010). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with educational technology, Computers & Education, 54(1). 103-102. https://doi.org/10.1080/09645292.2021.1920000

Sangeeta, M. & Tandon, U. (2020). Factors influencing adoption of online teaching by schoolteachers: A study during COVID-19 pandemic. *Journal of Public Affairs, 2503*. 1-11. https://doi.org/10.1002/pa.2503

Saubern, R., Urbach, D., Koehler, M., Phillips, M. (2020). Describing increasing proficiency in teachers' knowledge of the effective use of digital technology. *Computer Education, 147.* https://doi.org/10.1016/j.compedu.2019.103784

Scharmann, L.C.& Butler, W. (2015). The use of journaling to assess student learning and acceptance of evolutionary science. *Journal of College Science Teaching, 45*(1), 16-21.

Scherer, R. & Teo, T. (2019). Unpacking teachers 'intentions to integrate technology: A meta-analysis. *Educational Research Review 27*. 90-109. https://doi-org.ezproxy.liberty.edu/10.1016/j.edurev.2019.03.001

Schebusch, C.L. (2018). Computer anxiety, computer self-efficacy and attitudes towards the internet of the first students at a South African University of Technology. *Africa Education Review,* 1-19. https://doi.org/10.1080/18146627.2017.1341291

Schunk, D. H. (2012). *Learning theories: An educational perspective*. Boston: Pearson.

Siddiquei, M., Kathpal, S. (2021). Challenges of online teaching during COVID-19: An exploratory factor analysis. *Human Behavior and Emerging Technologies, 3*(5), 811-822. https://doi.org/10.1002/hbe2.300

Singh, N., Gunjan, V., Mishra, A., Mishra, R., & Nawaz, N. (2022). SeisTutor: A custom-tailored intelligent tutoring system and sustainable education. *Sustainability, 14*, 1-24. https://doi.org/10.3390/su14074167

Stake, R. (1995). *The art of case study research*. Thousand Oaks: Sage.

Stake, R.E. (2006). *Multiple case study analysis*. New York: Guilford Press.

Strengthening Computer Science (2019). Obtained 2022. https://www.purdue.edu/purduemoves/initiatives/stem/computerScience.php

Tang, Y. (2021). Does information and communication technology (ICT) empower teacher innovativeness: a multilevel, multisite analysis. *Education Technology Research and Development, 69*(3009-3028). https://doi.org/10.101007/s11423-021-10052-1

Taylor, S. & Todd, P. (1995). Decomposition and crossover effects in the theory of planned behavior: A study of consumer adoption intensions. *International Journal of research in marketing, 12*(2), 137-155.

Teo, T. (2018). Students and teachers' intention to use technology: Assessing their measurement equivalence and structural invariance. *Journal of Educational Computing Research*. https://doi.org/10.1177/0735633117749430.

Toquero, C. M., & Talidong, K. J. (2020). Socio-educational implications of technology use during Covid-19: A case study in General Santos City, Philippines. *Human Behavior & Emerging Technology, 3*(194-198). http://doi:10.1002/hbe2.214.

Thacker, L. (n.d.). *The Internet crisis in rural America.* Retrieved June 27, 2018, from https://emergence.farmersbusinessnetwork.com/the-internet-crisis-in-rural-america

Tondeur, J., Roblin, N.P., van Braak, J., Prestridge, S. (2017). Preparing beginning teachers for technology integration in education: Ready for take-off? *Technology, Pedagogy, and Education, 26*(2), 155-1576. http://doi.org/10.1080/1475939x.2016.1193556

Tondeur, J., Scherer, R., Siddiq, F., & Baran, E. (2020). Enhancing pre-service teachers' technological pedagogical content knowledge (TPACK): A mixed-method study. *Educational Technology Research and Development, 68*, 319-343. https://doi.org/10.1007/s11423-019-09692-1

Tourkzadeh, G. & Angulo, I. (1992). The concept and correlates of computer anxiety. *Behavior and Information Technology, 11*, 99-108.

Tyler-Wood, T.L, Cockerham, D., & Johnson, K.R. (2018). Implementing new technologies in a middle school curriculum: A rural perspective. *Smart Learning Environments, 5*(22), 1-16. https://doi.org/10.1186/s40561-018-0073-y

UNESCO Report. (2020). *COVID-19 educational disruption and response*. UNESCO.

UNICEF. (2020). *Reduced access to products for children and vulnerable families in the context of the COVID-19 pandemic*. https://www.unicef.org/romania/press-releases/unicef-report-reduced-access-basic-products-children-and-vulnerable-families-context

United Nations Educational, Scientific and Cultural Organization. (2020). *School closures caused by coronavirus (Covid-19).* https://en.unesco.org/covid19/educationresponse

United States Surgeon General's Advisory. (2021). *Protecting youth mental health.* https://www.hhs.gov/sites/default/files/surgeon-general-youth-mental-health-advisory.pdf

Uzun, E.M., Kar, E.B., & Ozdemir, Y. (2020). Examining first-grade teachers' experiences and approaches regarding the impact of COVID-19 pandemic on teaching and learning. *Educational Process, 10*(3), 13-38. https://dx.doi.org/10.22521/edupij.2021.103.2

Venkatesh, V. & Davis, F.D. (2000). A theoretical extension of the technology acceptance models: Four longitudinal field studies. *Management Science, 46*(2), 186-204.

Venkatesh, V., Morris, M. G., Davis, G.B.& Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly: Management Information Systems, 27*, 425-478. https://doi.org/10.2307/30036540

Venkatesh, V., Thong, J., Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology, *MIS Quarterly, 36*(1), 157-178.

Ventura, M.D. (2017). Creating inspiring learning environments by means of digital technologies: A case study of the effectiveness of WhatsApp in music education. *EIA Endorsed Transactions, 4*(14), 1-10. http://doi:10.4108/eai.26-7-2017.152906

Voet, M. & De Wever, B. (2017). Towards a differentiated and domain-specific view of educational technology: An exploratory study of history teachers' technology use. *British Journal of Educational Technology, 48*(6), 1402-1413. http://doi.org/10.1111/bjet.12493

Vongkulluksn, V.W., Xie, K., & Bowman, M.A. (2018). The role of value on teachers' internalization of external barriers and externalization of person beliefs for classroom technology integration. *Computers & Education, 118*. 70-81.

Watson, C. (2018). *Jobs available after a BSC in computer science*. https://work.chron.com/jobs-available-after-bsc-computer-science-18825.html

Walker, S.K. & Kim, H. (2015). Family educators' technology use and factors influencing technology acceptance attitudes. *Family and Consumer Science Research Journal, 43*(4), 328-342. http://doi.org/10.1111/fcsr.12113

Watson, J.H. & Rockinson-Szapkiw, A. (2021). Predicting preservice teachers' intention to use technology-enabled learning. *Computers and Education, 168,* 1-10. http://doi.org/10.1016/j.compedu.2021.104207

Wei, H. & Chou, C. (2020). Online learning performance and satisfaction: Do perceptions and readiness matter? *Distance Education, 41*(1), 48-69. Https://doi.org/10.1080/01587919.2020.1724768

Wiggins, G & McTighe, J. (2021). *Understanding by Design.* EBSCO Publishing: eBook Collection. Liberty University.

Wilson, M.L., Ritzhaupt, A. D., & Cheng, L. (2020). The impact of teacher education courses for technology integration on pre-service teacher knowledge: A meta-analysis study. *Computers & Education, 156*. 1-16.

Wraga, W.G. (2019). The pragmatic progressives. *American Educational History Journal, 46*(2), 111-129.

Wilson, M.L., Ritzhaupt, A. D., & Cheng, L. (2020). The impact of teacher education courses for technology integration on pre-service teacher knowledge: A meta-analysis study. *Computers & Education, 156*. 1-16.

Yates, A., Starkey, L., Egerton, B., & Flueggen, F. (2021). High school students' experience of online learning during Covid-19: the influence of technology and pedagogy. *Technology, Pedagogy, and Education, 30*(1), 59-73. http://doi:10.1080/1475939x.2020.1854337

Yin, R.K. (2014). *Case study research: Design and method (5th ed.).* Sage.

Yin, R.K. (2018). *Case study research and application: Design and methods (6th ed.).* Sage.

Zacharis, G. & Nikoloupoulou, K. (2022). Factors predicting university students' behavior intention to use eLearning platforms in the post-pandemic normal: an UTAUT2 approach with learning value. *Education and Information Technologies, 5,* 1-18. https://doi.org/10.1007/s10639-022-11116-2

Zaripova-Drozdikova, A.R. & Sabirova, E.G. (2020). Usage of digital educational resources in teaching students with application of "flipped classroom" technology. *Contemporary Educational Technology, 12*(2), 1-13. https://doi.org/10.30935/cedtech/8582

Zhang, W., Wang, Y., Yang, L., & Wang, C. (2020). Suspending classes without stopping learning: China's education emergency management policy in the COVID-19 outbreak. *Journal of Risk and Financial Management, 13*(3), 55.

Zhenhua, X. & Jang, E.E. (2017). The role of math self-efficacy in the structural model of extracurricular technology-related activities and junior elementary school students' mathematics ability. *Computers in Human Behavior, 68,* 547-555. http://dx.doi.org/10.1016/j.chb.2016.11.063

Zhu, C. & Urhahne, D. (2018). The use of learner response systems in the classroom enhances teachers' judgement accuracy. *Learning and Instruction, 58,* 255-262. https://doi.org/10.1016/j.learninstruc.2018.07.011

Zimmerman, B.J. (2008). Investigating self-regulation and motivation: historical background, methodological developments, and future prospects. *American Educational Research Journal, 29*(3), 166-183.

Appendix A

Informed Consent

Title of the Project: Teachers' attitudes on technology resulting after a pandemic.
Principal Investigator: Leanne Hoiles, MEd, Liberty University

Invitation to be Part of a Research Study

You are invited to participate in a research study. To participate, you must be a teacher with at least three years of experience. Taking part in this research project is voluntary.

Please take time to read this entire form and ask questions before deciding whether to take part in this research.

What is the study about and why is it being done?

The purpose of this case study is to understand how the attitudes of educators concerning the usage of technology changed after the experience of online teaching during the pandemic at Cross Schools.

What will happen if you take part in this study?

If you agree to be in this study, I will ask you to do the following things:

1. Participate in an interview with the researcher. The interview will take approximately 20 minutes and will be conducted at your convenience. Interviews will be recorded and can be conducted in person, by phone, or by zoom.
2. Make at least 3 entries into a journal. Journal entries can contain any information you would like and be any length you like and may include lesson plans.
3. Complete a 10-item questionnaire at the end of the study. The questionnaire can be digital or printed. The questionnaire will be provided to you at the end of the study.

How could you or others benefit from this study?

Participants should not expect to receive a direct benefit from taking part in this study. Benefits to society include universities, schools, and school districts.

What risks might you experience from being in this study?

The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

How will personal information be protected?

The records of this study will be kept private. Research records will be stored securely, and only the researcher will have access to the records.

- Participant responses will be kept confidential through the use of codes. Interviews will be conducted in a location where others will not easily overhear the conversation.
- Data will be stored on a password-locked computer and may be used in future presentations. After three years, all electronic records will be deleted.

- Interviews will be recorded and transcribed. Recordings will be stored on a password locked computer for three years and then erased. Only the researcher will have access to these recordings.

How will you be compensated for being part of the study?

Participants will be compensated for participating in this study. Compensation will be in the amount of twenty-five dollars cash at the completion of the study.

What are the costs to you to be part of the study?

To participate in the research, you will need to pay for internet access or phone use.

Does the researcher have any conflicts of interest?

The researcher serves as a teacher at [redacted] To limit potential or perceived conflicts the researcher is not in a position of authority over any of the participants. Full disclosure is made so that you can decide if this relationship will affect your willingness to participate in this study. No action will be taken against an individual based on his or her decision to participate or not participate in this study.

Is study participation voluntary?

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University or [redacted] If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

What should you do if you decide to withdraw from the study?

If you choose to withdraw from the study, please contact the researcher at the email address/phone number included in the next paragraph. Should you choose to withdraw, data collected from you will be destroyed immediately and will not be included in this study.

Whom do you contact if you have questions or concerns about the study?

The researcher conducting this study is Leanne Hoiles. You may ask any questions you have now. If you have questions later, you are encouraged to contact her at [redacted] You may also contact the researcher's faculty sponsor.

Whom do you contact if you have questions about your rights as a research participant?

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515, or email at irb@liberty.edu.

Disclaimer: The Institutional Review Board (IRB) is tasked with ensuring that human subjects research will be conducted in an ethical manner as defined and required by federal regulations. The topics covered and viewpoints expressed or alluded to by student and faculty researchers are those of the researchers and do not necessarily reflect the official policies or positions of Liberty University.

Your Consent

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. You will be given a copy of this document for your records. The researcher will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

The researcher has my permission to audio-record me as part of my participation in this study.

_____

Printed Subject Name

_____

Signature & Date

.

Appendix B

Demographic Survey

Initial Questionnaire

1. Demographics (Age)?
2. Demographics (Gender)?
3. Demographics (Ethnicity)?
4. How many years have you been teaching?
5. Highest education completed?
6. Did you teach in a traditional classroom before the pandemic?
7. Did you teach virtually during the pandemic for a combined period that would equal at least a month?
8. Did you use technology in your classroom before the pandemic (2019)?
9. Do you use technology in your classroom today?

Questions one through four were used to gather basic demographic data. Questions five through nine were used to determine if the teacher could be a participant in the study based on the criteria listed.

Appendix C

Interview Questions

Individual Interview Questions

1. Please describe your educational background and career in your current position. CRQ
2. Describe the technology challenges you faced during the pandemic while you were teaching virtually. SQ1
3. Describe successful practices you used virtually. SQ1
4. What professional development experiences trained you for the virtual experience? SQ1
5. In what ways are you still using technology beyond just a smartboard? SQ1
6. Describe your challenges when working with lower socioeconomic status (SES) students in your classes. SQ2
7. Describe successful practices you used during the virtual experience. SQ2
8. What practices are you likely to continue to do now that you are in the classroom? SQ2
9. Describe your attitude concerning learning new technology before the pandemic. SQ3
10. Describe your attitude concerning learning new technology after the onset of the pandemic. SQ3
11. Describe your attitude concerning learning new technology now? SQ3

Interviews will be held by me with possible follow-up questions. Interview answers will be transcribed.

Appendix D

Reflective Journal Prompts

Reflective Journal Prompts

1. Explain a time when you felt frustrated trying to learn new technology. What exactly were you trying to learn? Did you feel like you had to learn it?

2. Describe a time when you learned a new type of technology and felt successful. Was it successful for your students? Are you still using it?

3. Describe your attitude regarding technology before the pandemic. Give an example of a type of technology that other teachers used, that you didn't want to learn.

4. Describe your attitude regarding technology now. Can you give an example of a type of technology you use now that you didn't use before?

Appendix E

Digital Tools Document

Digital Tool Document

	Drill and Practice Kahoot	Tutoring Systems khan academy	Simulation Tools Math/sci labs	Video conferencing Zoom	Classroom platforms GC
Carol	O	N	N	N	D
Renee	W	O	O	N	W
Brynn	D	O	N	N	D
Francis	O	O	N	O	D
Blyth	O	O	N	O	D
Bonnie	W	N	W	O	D
Donna	N	O	N	O	N
Eva	W	O	N	N	D
Bill	O	N	O	N	W
Paula	W	O	O	O	D
Christine	O	O	N	O	D
	D .09 W .36 O .45 N .09	D 0 W 0 O .73 N .27	D 0 W .09 O .27 N .64	D 0 W 0 O .54 N .45	D .73 W .18 O 0 N .01

91% use Daily or weekly GC

64% Never use simulation tools.

54% Still occasionally use video conferencing.

73 % Occasionally use tutoring systems.