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Pedagogical, Attitudinal, and Environmental Influences on Student-Centered Technology Practices of Elementary Teachers

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Walden University
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Abstract

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by

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MA, Concordia University, 2005

BS, Concordia University, 1999

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Learning, Instruction, and Innovation

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Abstract

While much is known about individual influences on teacher technology use, there is a lack of research explaining the overlapping factors of pedagogy, attitude, and environment that intersect to influence teachers' decisions to use student-centered technology. The purpose of this qualitative interpretive descriptive study was to examine how the intersection of these factors influenced the student-centered technology practices of 14 third through fifth grade teachers in faith-based schools across the United States. The study's conceptual framework was built on both social cognitive theory and first- and second-order barriers to technology use. Data were collected through virtual interviews with participants who were using student-centered technology. Data were analyzed using structural and pattern coding of emergent themes. Key findings revealed that students emerged as a key point of intersection that influenced student-centered technology use in three areas: pedagogical, attitudinal, and environmental. Student technological readiness allowed for high level pedagogical implementation of student-centered technology, yet teacher attitudes revealed concerns regarding the amount of time and manner in which students used screens at home, resulting in pedagogical decisions by teachers to limit screen time and student-centered technological experiences at school. Environmental influences unique to nonpublic faith-based schools were also discussed. This study has the potential to expand and deepen scholarly understanding of factors that intersect to influence teachers' decisions to use technology in student-centered practices. Such practices could improve professional development programing, empower teachers, and elevate learning for all students.

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Dedication

I dedicate this study to my husband, Jamie, who has been my steadfast supporter throughout every step of this journey- I would not have finished this degree without you; to my children, Korbin, Addison, and Trevin, you are the greatest joys of my life- thank you for your patience throughout this journey; to my parents, Reed and Sharolyn Sander, who always taught me to Love Jesus, love others, be humble, and do my best. Micah 6:8

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I would also like to acknowledge the 17 wonderful teachers I interviewed for this study. Their perspectives, technological practices, and love for their students inspired and informed me about the many joys and challenges regarding technology implementation in faith-filled schools.

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Chapter 1: Introduction to the Study

Introduction

Students who experience K-12 education in the US are expected to graduate with 21st century skills that will allow them to be successful in a digital and global world; however, many teachers fail to use student-centered and technology-enabled instructional practices that could support these types of skill development (Delgado, Wardlow, McKnight, & O'Malley, 2015; Eickelmann & Vennemann, 2017; Magana, 2017; Ruggiero & Mong, 2015). While technology has been used by educators in schools for so long, many teachers use it in low-level teacher-centered ways and struggle to implement student-centered technology practices that allow students to create, connect, and authentically produce content for real-world audiences (Delgado et al., 2015; Magana, 2017).

This study examined the pedagogical, attitudinal, and environmental factors that intersect to influence student-centered technology practices of third through fifth grade teachers. To date, there has been substantial quantitative research conducted regarding individual influences on teachers' decisions to use technology in general and in public schools; however, there is less currently known about how multiple factors work together to influence specifically the student-centered technology practices of teachers (Ottenbreit-Leftwich, Kopcha, & Ertmer, 2018; Yang & Chun, 2018). The findings of my study have the potential to influence professional practice by providing insight regarding pedagogical, attitudinal, and environmental factors that have supported the development of student-centered and, technology-enabled learning practices in elementary classrooms.

Administrators, technology coaches, and professional development coordinators could use this knowledge to better provide the supports necessary to develop teacher growth through effective uses of technology to promote student development for the 21st century.

In this chapter, I provide an overview of this interpretive descriptive qualitative study. After briefly summarizing background information regarding influences on teacher technology use, I specify the problem statement and purpose of the study. Then, research questions will be presented along with an articulation of the conceptual framework, which includes social cognitive theory and first- and second-order barriers to technology use. Next, the qualitative nature of the study will be outlined, followed by the assumptions, scope and delimitations, and limitations. The chapter concludes with an explanation of the significance of the study and the potential for social change.

Background

Researchers have investigated the influences on teacher technology use for several decades and have often studied this phenomenon through a study of first- and second-order barriers to technology use (Ertmer, 1999). First-order barriers are external to the teacher and consist of missing resources (equipment, time, training, and support) that are absent or inadequately provided for teachers. Many schools focused early integration efforts on removing or improving these challenges. Schools assumed that if technology was made accessible and teachers were trained to use it, technology implementation would naturally follow. When slow up-take occurred, researchers concluded that barriers are also deeply rooted in internal connections to how teachers understand the process of teaching and learning and were named second-order barriers

(Ertmer, 1999; Ertmer, 2005). These barriers are internal to the teacher and include beliefs about teacher and student roles, attitudes about technology in education, pedagogy, and assessment practices. Historically and presently, research on first and second-order barriers to technology implementation centers on individual factors such as teachers' pedagogical practices (Ertmer, & Ottenbreit-Leftwich, 2013; Liu, Lin, & Zhang, 2017; Taimalu & Luik, 2019), teachers' attitudes about teaching and technology (Ottenbreit-Leftwich et al., 2018), and the environmental influences present in the school context (Alenezi, 2017; Genlott, Gronlund, & Viberg, 2019; Gerick, Eickelmann, & Bos, 2017; Toh, 2016). These same issues will be investigated in this research study.

Researchers agreed that the use of technology for instruction is a phenomenon that is multifaceted and complex. Pedagogy is a highly influential predictor of technology use, yet discrepancies remain between teachers' pedagogical beliefs and technological pedagogical practices7). Affect, value beliefs, and self-efficacy strongly influence educational technology integration. While attitude and pedagogy strongly influence educational technology integration, the simultaneous investigation of these factors would likely yield the most accurate understanding of internal influencers on teacher technology use.

Other studies have investigated how factors that are external to the teacher (first-order barriers), such as school context, technology policy, administrative support, and peer collaboration are also known to influence teacher technology integration (Genlott et al., 2019; Petko et al., 2018; Toh, 2016). The educational setting is a complex system that contains many intersecting levels that reciprocally influence one another. A connected

system, engaged at the national, school, and classroom level, is best equipped to support and sustain change in technology practice (Genlott et al., 2019; Toh, 2016). Schools are varied, and each demonstrates unique contextual challenges. Administrators who oversee these complex environments play a crucial role in influencing the technology practices of teachers through the establishment of a clear vision (Gurfidan & Koc, 2016; Islam & Gronlund, 2016; ISTE Standards for Students, 2016), development of a supportive learning environment (Lindqvist, 2019; Sun & Gao, 2019), involvement of staff in ICT decision-making (Islam & Gronlund, 2016), and the development of a culture that embraces risk-taking (Lindqvist, 2019). Colleagues also strongly influence the technology practices of teachers, primarily through formal and informal peer collaboration experiences (Saudelli & Ciampa, 2016; Sun & Gao, 2019). These interlocking constructs of the complex school environment work together to influence the technology practices of teachers.

Sociocultural influences on teacher technology use are varied and require a decrease in the apparent boundary between internal and external factors. Simultaneous investigation of multiple factors that influence teacher technology use will provide a more realistic examination of the phenomenon of a teachers' decision to use technology (Yang & Chun, 2018). At present, there is a gap in the scholarly literature in terms of qualitative investigations that examine the intersection of internal and external factors that influence teachers' use of specifically student-centered technology (Ottenbreit-Leftwich et al., 2018; Yang & Chun, 2018). Further, there is lacking information regarding this phenomenon for teachers in grades 3-5 (Pittman & Gaines, 2015; Howley,

Wood, & Hough, 2011) who teach in nonpublic, faith-based schools (Swallow, 2017; Swallow & Olofson, 2017). This study addressed these gaps by finding themes based on qualitatively-explored student-centered technology use experiences of teachers in grades 3-5 in faith-based schools. By discovering insights on the multi-faceted factors that influence teachers' decisions to shift towards student-centered technology use, study outcomes have the potential to empower administrators, technology coaches, and professional development coordinators to better provide the supports necessary to develop teacher growth through effective uses of technology to promote student development for the 21st century.

Problem Statement

The problem addressed in this qualitative study was that while much is known about the individual factors that positively influence the technology integration practices of teachers, it is unclear how the intersection of pedagogical, attitudinal, and environmental factors influences the student-centered technology practices of teachers in grades 3-5. Students are expected to develop 21st century learning skills so that they can be successful in a globally-connected and technology-infused world (Gerick et al., 2017; Sias, Nadelson, Juth, & Seifert, 2017), however many teachers fail to use student-centered and technology-enabled instructional practices that support these types of skill development (Delgado et al., 2015; Eickelmann & Vennemann, 2017; Magana, 2017; Ruggiero & Mong, 2015). Political initiatives and large monetary investments have equipped schools with technology, but there are mixed results about the effect these

measures have had on student learning (Delgado et al., 2015) and shifts in the instructional practices of teachers (Sadaf & Johnson, 2017; Yang & Chun, 2018).

Many individual factors influence the general technology integration practices of teachers. Internal factors such as pedagogy and attitude, as well as external factors such as the complex school environment, technology policy, administrative support, and peer collaboration (Genlott et al., 2019; Petko et al., 2018; Toh, 2016), have been found to be highly influential in determining educational technology implementation. While these individual factors have been quantitatively studied in mostly public education settings with an emphasis on general technology use (Gerick et al., 2017; Petko et al., 2018; Yang & Chun, 2018), less is currently known about how these complex factors intersect to influence particularly student-centered technology practices (Ottenbreit-Leftwich, et al., 2018; Yang & Chun, 2018) in nonpublic settings (Swallow, 2017; Swallow & Olofson, 2017).

Purpose of the Study

The purpose of this qualitative study was to examine how pedagogical, attitudinal, and environmental factors intersect to influence the student-centered technology practices of teachers in grades 3-5 in faith-based schools. While many individual factors influence teacher technology use, the study of multifaceted influences on student-centered technology practices in nonpublic faith-based settings is very limited. Investigating the influences on teachers' decisions to implement specifically student-centered technology practices may expand the scholarly knowledge regarding high-level technology use that will best prepare students for the 21st century. Additionally, conducting this study in

faith-based schools allowed for the investigation of contextual influences that uniquely influenced technology use.

Research Questions

RQ1: How do grades 3-5 teachers in faith-based schools explain the pedagogical influences on their student-centered technology use?

RQ2: How do grades 3-5 teachers in faith-based schools explain the attitudinal influences on their student-centered technology use?

RQ3: How do grades 3-5 teachers in faith-based schools explain the environmental influences on their student-centered technology use?

Conceptual Framework

The conceptual framework for this research study included the social cognitive theory (Bandura, 1986) and first and second-order barriers to technology integration (Ertmer, 1999). These two ideas work together to explain the multi-faceted factors that influence a teachers' decision to use technology for instruction. According to Bandura's social cognitive theory, there is an interrelationship between personal, behavioral, and environmental factors that influence behavior triadically. The same internal and external factors influence the ability of teachers to integrate technology-enabled learning practices. In my study, the examination of pedagogical, attitudinal, and environmental influences on the student-centered technology practices of teachers were explored through the study of these reciprocal influences on behavior.

Ertmer (1999) identified first and second-order barriers (enablers) to technology integration. First-order barriers are external to the teacher and include training, support,

and access to resources. Second-order barriers are internal to the teacher and include attitudes and beliefs about technology, pedagogical methods, and surrounding social connections. In my study, first and second-order barriers provided structure for the investigation of pedagogical, attitudinal, and environmental factors that influence the student-centered technology practices of elementary teachers (Ertmer, 1999).

Social cognitive theory and first- and second-order barriers to technology use provided the groundwork for this interpretive descriptive qualitative study. Both of these components were foundational to the development of the problem statement, the purpose of the study, and research questions. In Chapter 2, I offer a more thorough explanation of the conceptual framework and its connection to all aspects of the study.

Nature of the Study

An interpretive descriptive qualitative approach was the best methodological design to examine how pedagogical, attitudinal, and environmental factors intersect to influence the student-centered technology practices of teachers in grades 3-5. Interpretive description is a form of basic qualitative research that provides the opportunity to explore the meaning of real-world experiences by eliciting participant perspectives (Creswell, 2013; Patton, 2015; Thorne, 2016). This approach is geared toward use in clinical practice settings and is common in education research (Kahlke, 2014; Thorne, 2016). It is intended for smaller qualitative studies that seek to capture themes within subjective experiences (Thorne, 2016). Interpretive description encourages the researcher to draw from models and concepts to frame the research (Merriam & Tisdell, 2015). In this study, social cognitive theory (Bandura, 1986) and first- and second-order barriers to technology

use (Ertmer, 1999) were used to frame the study. Interpretive description elicited descriptive accounts from participants about the various factors that influenced their student-centered technology use. Then, I interpreted and analyzed these accounts to discover relationships, associations, and patterns to better understand influences on teachers' use of student-centered technology (Thorne, 2016). According to interpretive descriptive design, the analysis of individual and collective expressions of inherently complex phenomena are then translated back into the practice setting, which in this study was grades 3-5 elementary teachers in faith-based schools.

In this study, I conducted interviews with 14 teachers of grades 3-5 who used student-centered technology in faith-based schools. To date, there has been substantial research into influences regarding teachers' decisions to use technology in general and in public schools; however, there is less currently known about third to fifth grade teachers in faith-based schools (Pittman & Gaines, 2015; Howley et al., 2011), who use student-centered technology (Ottenbreit-Leftwich et al., 2018) and teach in nonpublic school settings (Swallow, 2017; Swallow & Olofson, 2017). Due to the wide variance in nonpublic schools, for this study, I investigated faith-based schools in particular. The faith-based schools used in this study share a common faith denomination and are a part of a system of schools that will be referred to as the Faith System in this study. The 14 participants taught at geographically diverse Faith System schools throughout the country, so all interviews were conducted electronically via Zoom. A common interview guide was used for the 14 teachers. Interviews were 45-60 minutes long and recorded and transcribed verbatim. Data collection and analysis occurred simultaneously in accordance

with the interpretive descriptive approach (Thorne, 2016). The conceptual framework guided first cycle structural coding. Second cycle inductive pattern coding allowed for more divergent themes to emerge.

Definitions

Affect: Emotional aspect of attitude, including constructs such as anxiety, fear, liking, interest, and enjoyment (Cai, Fan, & Du, 2017; Whitley, 1997).

Attitude: What people say, think or do and can be further classified by emotion, behavior, and cognition (Olson & Zanna, 1993; Petty, Fabrigar, & Wegener, 2003).

Belief: In relationship to technology use in classrooms, this refers to the value a teacher places on technology use and its societal function (Cai et al., 2017; Whitley, 1997).

Environment: The setting in which school is conducted that includes a multi-leveled governance structure, policies, and influential peers (Genlott et al., 2019; Toh, 2016).

First-order Barriers to Technology: Factors that influence technology use that are external to the teacher and include training, support, and access to resources (Ertmer, 1999).

Pedagogy: Methods or practices of teaching (Shulman, 1986)

Pedagogical Beliefs: Educational beliefs about teaching and learning (Ertmer, 2005).

Second-Order Barriers to Technology: Factors that influence technology use that are internal to the teacher and include attitudes and beliefs about technology, pedagogical methods, and surrounding social connections (Ertmer, 1999).

Self-efficacy: A person's judgment about their capability to bring about desired outcomes (Bandura, 1986).

Student-centered technology use: Use of technology where students actively participate with technological tools, create products to represent their learning, and or use technology to develop real-life skills such as collaboration, higher-order thinking, and problem-solving (Dondlinge, McLeod, & Vasinda, 2016; Ertmer & Ottenbreit-Leftwich, 2013; Kang, Hahn, & Chung, 2015).

Assumptions

This interpretive descriptive study involved the use of a responsive interview format where each participant was viewed as a research partner. Semi-structured interview questions guided the conversation, yet this format allowed flexibility to add or modify questions in response to each participant's experiences. As I conducted this interpretive descriptive study, I made the following assumptions:

1. All participants were third to fifth grade teachers in faith-based schools who utilized student-centered technology practices. My recruiting procedures excluded those who did not fit these parameters.
2. Participants authentically, honestly, and willingly answered the interview questions.

3. Participants were able to accurately describe the pedagogical, attitudinal, and environmental influences on their technology use behaviors.

Scope and Delimitations

The purpose of this qualitative study was to examine how pedagogical, attitudinal, and environmental factors intersect to influence the student-centered technology practices of third through fifth grade teachers in faith-based schools. In this study, I explored the multiple factors that influence teachers' decisions to use technology through an interpretive descriptive approach that involved the use of semi-structured interviews in a responsive interview format.

The scope of the study was defined by the following delimitations. 14 participants were chosen based on purposive sampling. Participants were selected based on their current teaching position in grades 3-5 in a Faith System school and their self-reported use of student-centered technology. The study was not bounded by the geographical locations of participants.

Limitations

Limitations of this study were occurrences that were outside my control, including findings that were limited to the experiences of my participant pool, potential researcher bias, and the use of technology to gather data. Data collected in this study were limited to interviews based on teachers' self-reported influences regarding their use of student-centered technology rather than actual observed behaviors. The data was limited to the experiences of 14 teachers, so to address this limitation, purposive sampling strategies ensured that participants met study criteria.

Researcher bias can be a limitation when conducting a qualitative interview study. As the primary research instrument, I actively sought to refrain from bias through ongoing journaling and consultation with my dissertation committee during data collection and data analysis. All interviews were conducted via Zoom, which potentially limited participants due to a lack of technological access. Using technology for distance interviews may have also limited my access to the nonverbal cues of participants because Zoom generally only shows the head and shoulders of each participant.

Transferability and dependability are important considerations for this interpretive descriptive study. Transferability was supported by providing thick descriptions of the context of the study. This description included the culture and demographics of Faith System schools as well as specific information regarding each participant's school setting. Dependability is an essential consideration in a study that uses interviews as its sole data source. Dependability was enhanced through regular and ongoing consultation with my dissertation committee, researcher reflexivity carried out through ongoing journaling, and also the continuous development of an audit trail throughout the data collection and analysis process.

Significance

In this study, I examined how pedagogical, attitudinal, and environmental factors intersect to influence the student-centered technology practices of teachers in grades 3-5 in faith-based schools. The outcome of this study provides an original contribution to the literature because qualitative investigation of the complex intersection of factors that influence technology use are needed and less is known about this phenomenon when the

technology used is specifically student-centered and conducted in grades 3-5 in faith-based classrooms. This study is also significant in terms of its potential to impact positive social change. Outcomes could influence professional practice by providing insight regarding pedagogical, attitudinal, and environmental factors that have supported the development of technology-enabled learning practices in elementary student-centered classrooms. This knowledge could be used by administrators, technology coaches, and professional development coordinators to better provide the supports necessary to develop teacher growth through effective use of technology to promote student development for the 21st century.

Summary

Although there has been considerable research conducted regarding individual influences on teacher technology use, less is known about how multiple factors intersect to influence the student-centered technology practices of elementary teachers in faith-based schools. In Chapter 1, I provided a foundation for further investigation of this phenomenon through the sharing of background information and articulation of the problem, purpose of the study, and research questions. The conceptual framework, including the components of social cognitive theory and first and second-order barriers to technology use, was defined. Next, the nature of this qualitative interpretive descriptive study was explained, along with key definitions, assumptions, scope and delimitations, and limitations of the study. Study results have the potential to offer significant insights into current gaps in the literature as well as promote positive social change that can encourage teacher growth in terms of effective use of student-centered technology. In

Chapter 2, I discuss the conceptual framework for this study and provide a comprehensive review of literature that contributes to understanding how pedagogical, attitudinal, and environmental issues intersect to influence teachers' decisions to use technology for instruction.

Chapter 2: Literature Review

Introduction

Students are expected to develop 21st century learning skills so that they can be successful in a globally-connected and technology-infused world (Gerick et al., 2017; Sias et al., 2017); however, many teachers fail to utilize use instructional practices that are student-centered and use the appropriate and effective technology to support these types of skill development (Delgado et al., 2015; Eickelmann & Vennemann, 2017; Magana, 2017; Ruggiero & Mong, 2015). Political initiatives and significant monetary investments have equipped schools with technology, but there are mixed results about the effect these measures have had on student performance (Delgado et al., 2015) and the shifts in the instructional practices of teachers (Sadaf & Johnson, 2017; Yang & Chun, 2018). Student-centered learning and technology practices represent a needed variation compared to teacher-centered instruction so that flexible, inductive, and adaptive skills essential in the 21st century workforce can be developed (ISTE Standards for Students, 2016; Lee & Hannafin, 2016), yet research in the area of student-centered technology use is underrepresented in the literature (Ottenbreit-Leftwich et al., 2018).

The use of technology for instruction is a phenomenon that is multifaceted and complex (Petko et al., 2018; Yang & Chun, 2018), yet most studies have investigated these factors in isolation. Internal factors such as pedagogical beliefs (Ding et al., 2019; Prestridge, 2017; Tondeur et al., 2017) and technology-specific attitudes (Admiraal et al., 2017; Cheng & Xie, 2018; Pittman & Gaines, 2015; Vongkulluksn et al., 2018) have been found to be highly influential factors that influence educational technology

integration. External environmental factors such as school culture, technology policy, administrative support, and peer collaboration are also known to influence teacher technology integration (Genlott et al., 2019; Petko et al., 2018; Toh, 2016). The sociocultural influence on teacher technology use requires a decrease in the clear boundary between internal and external factors, and further investigation should address the interaction of these factors, especially in student-centered environments where technology is being used (Ottenbreit-Leftwich et al., 2018). This review of literature will explain student-centered technology use and what is known about how pedagogy, attitude, and the environment influence the technology practices of teachers. It will also include arguments for further investigation into the intersection of these influences to best understand how and why teachers shift to the use of student-centered technology.

In Chapter 2, pedagogical, attitudinal, and environmental influences on the student-centered technology practices of teachers will be addressed. In this chapter, I explain the search strategies used to retrieve peer-reviewed scholarly literature on the topic. I explain the conceptual framework for this study by synthesizing primary writings, describing how teacher technology use has been applied in previous studies, and how my study benefits from the conceptual framework. I explore the practice of student-centered technology use and explain studies that address the pedagogical, attitudinal, and environment factors that influence the technology practices of teachers and the influences these multidimensional factors have on teachers' use of student-centered technology. I conclude this chapter with a summary.

Literature Search Strategy

From November 2017 to May 2018, I used the Education Source database found in the Walden University Library to identify peer-reviewed scholarly literature regarding the influences on student-centered technology use behaviors of teachers. Beginning in May 2018, I extended this search to include ERIC, SAGE Premier, Academic Search Complete, Computers & Applied Sciences Complete, ProQuest, PsycINFO, SocINDEX, Teachers Reference Center, and Google Scholar. Search terms included various combinations of the following keywords: *social cognitive theory*, *first- and second-order barriers*, *teacher attitude*, *teacher belief*, *self-efficacy*, *pedagogical content knowledge*, *pedagogical belief*, *environment*, *context*, *administrator*, *colleagues*, *technology integration*, *technology use*, *technology adoption*, *educational technology*, *student-centered technology*, *constructivist uses of technology*, *constructivism*, *constructionism*, *elementary*, *K-12*, *qualitative*, *interpretive descriptive approach*, *basic qualitative approach*, *grounded theory*, *ethnography*, and *case study*. Terms were added to limit results to focus the literature review on K-12 education studies. Resources for the literature review were primarily limited to those published between 2016 and 2020, with the exception of seminal works and critical early research.

Conceptual Framework

The conceptual framework for this research study was comprised of the social cognitive theory (Bandura, 1986) and first and second-order barriers to technology integration (Ertmer, 1999). Social cognitive theory asserts that behavior is influenced by the interactions between personal factors and environmental influences (Bandura, 1986).

Ertmer (1999) explained that technology use is influenced by both external (first-order barriers) and internal (second-order barriers) factors. In this study, first and second-order barriers to technology integration provided support for the investigation of how reciprocal influences of pedagogy, attitude, and environment influenced the student-centered technology practices of third through fifth grade faith-based teachers.

Social Cognitive Theory

The social cognitive theory provides a framework that allows one to understand, predict, and change human behavior (Bandura, 1989). A key tenet of the theory is that behavior is influenced by the triadic interactions between personal, behavioral, and environmental influences. Bandura asserted that people are agentic operators who determine and change their behaviors and situations through personal efforts and that there is bidirectional influence between the environment and the person (Bandura, 2002.

While the social learning theory took thought processes into account and acknowledged the role they play in deciding if a behavior is to be imitated or not, it did not adequately account for how humans develop a whole range of behavior including thoughts and feelings. It is for this reason that Bandura modified his theory and in 1986 published *Social Foundations of Thought and Action: A Social Cognitive Theory.* Social cognitive theory evolved to better represent both the social origins of human behavior and cognitive influences on behavior.

Examinations of how teachers integrate technology into their classrooms are essentially explorations of human behavior. Social cognitive theory explains the causation of behavior as a reciprocal model that involves the interaction of personal,

behavioral, and environmental factors (Bandura, 1989). Other models have been used to describe human behavior over the years, often with a contrasting emphasis on whether dispositional or environmental determinants of behavior are more influential (Bandura, 1986). Linear models such as behaviorism where behavior is attributed to environmental influences, psychoanalytic theory that credits behavior to the personal subconscious, or cognitivism that attributes behavior to the intellect rely on a cause and effect paradigm that is unidirectional. Bandura (1986), in contrast, emphasized reciprocal determinism or the mutual action between the causal factors of behavior, cognitive, and other personal factors, and the environment to determine behavior. All points in the model act upon one another simultaneously, although with varying degrees of influence, in triadic reciprocal causation of behavior (Bandura, 1986).

Interrelationships between personal, behavioral, and environmental factors that work together to influence behavior is of primary interest in this study due to the complex factors that influence how and why teachers use technology. Teachers must navigate personal pedagogical beliefs about teaching and learning, attitudes about technology, and environmental influences on technology use before, during, and after their decision to use technology in their teaching (Burke et al., 2018; Petko et al., 2018; Sadaf & Johnson, 2017). Yang and Chun (2018) emphasized that the sociocultural influence on teacher development requires further study that concentrates on the interaction of the multiple factors that influence technology use, mimicking the emphasis Bandura placed on the triadic influences on behavior. The reciprocal causation of behavior provides a framework for navigating the varying factors that influence teacher technology use.

Within this triadic model, environmental and personal determinants are considered to be co-factors that cause a bidirectional effect on one another. Not only are people influenced by the forces around them, but they also affect these forces (Bandura, 1977). The influence of the social context and cultural landscape influences behavior while at the same time, the behavior influences the social context and cultural landscape. "People's efficacy and outcome expectations influence how they behave, and the environmental effects created by their actions, in turn, alter their expectations" (Bandura, 1978, p. 346). Tondeur et al. (2017) have concurred with this assessment of bidirectional influence on behavior in their findings in a meta-aggregation of 14 qualitative studies focused on the relationship between teachers' pedagogical beliefs and their uses of technology. In nine of fourteen studies, technology use enabled pedagogical belief change, while alternatively, five studies mentioned that teachers' pedagogical beliefs enabled technology integration to occur (Tondeur et al., 2017). This bidirectional relationship is situated in the triadic model and further elucidates how the interplay of factors powerfully influences behavior.

Central to the concept of bidirectional influence is the emphasis on human agency (Bandura, 1986). Social cognitive theory supports a model of inductive agency where persons are neither independent agents nor automated conveyers of environmental influence (Bandura, 1989; Bandura, 1999). Instead, people make causal contributions to their personal motivation and action. Bandura (1977) felt humans determine their own behavior and the measurement of how people perceive this ability he coined self-efficacy. Bandura (2002) extended efficacy beyond personal agency to proxy agency, which is the

reliance on others to act on one's behalf, and collective agency, which is carried out through group action. Successful functioning occurs when individuals utilize a blend of these modes of human agency.

The mechanisms through which personal agency operates include self-efficacy, goal representation, and anticipated outcomes, all of which influence behavior. Among the functions of personal agency, self-efficacy is the most powerful, (Bandura, 1989), which refers to one's personal beliefs about their capability to exert control over events that impact their life. The beliefs an individual has about their own abilities to integrate technology is a well-researched construct in educational technology studies around the world (Fenn, 2019; Hatlevik, 2017; Hatlevik & Hatlevik, 2018; Liu, Ritzhaupt, Dawson, & Barron, 2016; Ottenbreit-Leftwich et al., 2018; Siddiq, Scherer, & Tondeur, 2016).

In many educational settings, teachers lack control over the social conditions that influence their teaching practices. In these conditions, they seek their desired outcomes through the exercise of proxy and collective agency. In these socially negotiated modes of agency, teachers influence and are influenced by surrounding teachers and administrators (Ottenbreit-Leftwich et al., 2018; Petko & Prasse, 2018; Sadaf & Johnson, 2017) as well as school policies (Gonzalez-Sanmamed, Sangria, & Munoz-Carril, 2017; Yang & Chun, 2018).

In this interpretive descriptive qualitative study, the social cognitive theoretical framework provided a foundation that best supported the research questions due to its emphasis on the reciprocal and bidirectional relationship between personal and environmental factors that influence human behavior. Social cognitive theory is

elucidated in all three research questions as the investigation of pedagogy, attitude, and environment that allowed for a study of personal, behavioral, and environmental influences on the technology use behaviors of teachers.

First- and Second-Order Barriers to Technology Integration

First- and second-order barriers to technology use (Ertmer, 1999) provided structure, context, and language for the study of the reciprocal causal model of behavior for technology-using teachers (Bandura, 1986). Interpreted through the lens of social cognitive theory, barriers to technology integration should not be viewed in isolation, but instead studied simultaneously due to the premise that "psychological functioning is a continuous reciprocal interaction between personal, behavioral, and environmental determinants" (Bandura, 1977, p. 194). Ertmer (1999) also described a blend of influences, which result in first- and second-order barriers to technology integration.

Ertmer studied and clarified first- and second-order barriers to educational technology integration over the course of several decades (1999, 2005; Ertmer & Ottenbreit-Leftwich, 2010; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Ertmer & Ottenbreit-Leftwich, 2013). First-order barriers consist of missing resources (equipment, time, training, and support) that are absent or inadequately provided for teachers. Many schools focused early integration efforts on removing or improving these challenges. According to Ertmer (1999), barriers that interfere with fundamental change are second-order barriers. They are deeply rooted in internal connections to how teachers understand the process of teaching and learning. Second-order barriers include beliefs about teacher and student roles, attitudes about technology

in education, pedagogy, and assessment practices. These intrinsically engrained beliefs develop from personal learning experiences, undergraduate education program curriculum, and prior educational experiences in the K-12 setting. Initially, when administrators sought to remove first-order barriers to technology use, they learned that it was second-order barriers that caused stagnant growth and limited use of technology in the classroom. Ertmer (1999) concluded that in some schools first-order barriers to technology use had been eliminated, while Sadaf and Johnson (2017) stated that evolving technologies, new and sometimes conflicting policy mandates, and economic pressures made first-order barriers an ongoing struggle.

In a review of the literature, Ertmer and Ottenbreit-Leftwich (2010) examined technology integration through the perspective of the teacher as a change agent and reviewed four second-order variables including knowledge, self-efficacy, pedagogical beliefs, and school culture. The researchers concluded that teachers' mindsets, a second-order barrier construct, must change before significant change in practice could take place (Ertmer & Ottenbreit-Leftwich, 2010). Ongoing research on first and second-order barriers to technology implementation centers on teachers' attitudes about teaching and technology (Ottenbreit-Leftwich et al., 2018), teachers' pedagogical practices (Ertmer, & Ottenbreit-Leftwich, 2013; Liu et al., 2017; Taimalu & Luik, 2019), and the environmental influences present in the school context (Alenezi, 2017; Genlott et al., 2019; Gerick et al., 2017; Toh, 2016). These same issues will be investigated in this research study. First-order barriers elucidate the third research question and second-order barriers elucidate the first and second research questions.

The conceptual framework for this interpretive descriptive qualitative study utilized social cognitive theory, supported by first and second-order barriers to technology use. The triangular model for the causation of behavior corresponds to the first and second-order barriers to technology integration that were investigated in this study: teachers' pedagogical practices, teachers' attitudes about teaching and technology, and the environmental influences present in the school context. According to the studies of Ertmer (1999) and Bandura (1986), it is a blend of all of these influences that result in a teacher's decision to implement technology. In ongoing efforts, researchers have concluded that technology use by teachers is influenced by a complex sociocultural landscape, featuring the intersection of internal pedagogical beliefs and attitudes with the external social connections and cultural landscapes (Burke et al., 2018; Ertmer, 2005; Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010; Somekh, 2008; Tallvid, 2016).

Literature Review Related to Key Concepts

Student-Centered Technology Practices

Four key themes are addressed in this review of the literature. First, the term student-centered technology use will be defined and framed in the context of contemporary classrooms. Then, the sizeable body of primarily quantitative literature that defines the influences on the technology use behaviors of teachers will be explained. The stand-alone constructs of teacher pedagogy, teacher attitude, and the surrounding environment represent well-researched factors that have been proven to influence the technology practices of teachers and will be explicated in this literature review. Gaps in the literature were found in regard to how these factors intersect to influence the specific

type of technology use under investigation in this study, student-centered technology, instead of frequency of use or intention to use technology.

Over the last 15 years, there has been a persistent call for teachers' increased use of student-centered digital technologies to prepare students for the 21st-century (ISTE Standards for Students, 2016; National Education Technology Plan, 2017; Ottenbreit-Leftwich et al., 2018). When technology is used to address 21st-century skills such as collaboration, communication, creativity, and critical thinking, "students are more engaged in the learning process and graduate better prepared to thrive in today's digitally and globally interconnected world" (Framework for 21st- Century Learning, 2019, p. 1). Student-centered learning and technology practices provide a needed alternative to traditional, teacher-centered instruction that allows the flexible, adaptive skills essential in the 21st-century workforce to be developed (Admiraal et al., 2017; ISTE Standards for Students, 2016; Lee & Hannafin, 2016).

The student-centered technology practices of teachers represent a broad array of strategies that are founded on the historical and theoretical implications of constructivism and constructionism. According to Lee and Hannafin (2016) "Constructivism is not a single, unified theory; rather constructivism represents an epistemological perspective as to the nature and evolution of individual understanding" (p. 713). In his early work, Bruner (1961) determined that knowledge is actively constructed through an interactive process of learning as students use their creative mind to access knowledge and rearrange evidence to gain new insight. Papert (1980) extended the conceptualization of constructivism in his own early works when he introduced the theory of constructionism.

Constructionism emphasizes the hands-on construction of physical artifacts to communicate understanding for authentic contexts. In his seminal work on mindtools, Jonassen (1996) said that students use technology as an intellectual partner or tool instead of as something to learn about or from. Jonassen, Myers, and McKillop (1996) stated that "constructivist processes are more evident when students collaborate to produce and share representations of their understandings of the world" (p. 94) through the development of physical products. Jonassen envisioned technology integration that placed an emphasis on the use of technology as a tool to create, accomplish authentic tasks, and solve real-life problems (Howland, Jonassen, & Marra, 2012; Koh, 2019).

Ertmer and Ottenbreit-Leftwich (2013) further developed Jonassen's vision of the pedagogy-technology relationship in the conceptualization of the term 'technology-enabled learning' to represent students' meaningful learning with technologies. Their early work articulated that technology-enabled, student-centered learning includes the use of technology as a tool to accomplish authentic tasks or solve complex problems (Ertmer & Ottenbreit-Leftwich, 2013; Woloshyn, Bajovic, & Worden, 2017). This type of technology use necessitates that students actively participate with technological tools, create products to represent their learning, and/or use technology to develop real-life skills such as problem-solving, higher-order thinking, and collaboration (Dondlinge et al., 2016; Ertmer & Ottenbreit-Leftwich, 2013; Kang et al., 2015). Technology-enabled, student-centered learning represents the type of technology use represented in this study and will be referred to as student-centered technology use. Teachers use student-centered technology in integrated ways, allowing the technology to serve as a cognitive tool to

facilitate student learning (Smirnova, Lazarevic, & Mallow, 2018; Tondeur, Hermans, van Braak, & Valcke, 2008). Students, rather than teachers, use the technology to research, problem solve, and design (Ertmer, Ottenbreit-Leftwich, & Tondeur, 2014; Woloshyn et al., 2017).

Research on intentionally student-centered technology use reports increased student motivation, engagement in content, and enjoyment of learning (Fokides & Mastrokoukou, 2018; Moon, Wold, & Francom, 2016). Dondlinge et al. (2016) investigated how students developed 21st-century and technological skills through their creation of an online glossary of mathematical terms that was delivered in podcasts as word stories. These students demonstrated growth in both mathematical content knowledge and 21st-century skill development (Dondlinge et al., 2016; Moon et al., 2016). Similarly, researchers have determined that technology used as a constructionist medium to engage learners in real-world applications, problem solving, and peer collaboration also facilitates growth in learning content as well as 21st-century skills (Panorkou & Maloney, 2015). Student-centered technology use increases engaged learning and improves the development of both content and 21st-century skills (Dondlinge et al., 2016; Moon et al., 2016; Panorkou & Maloney, 2015), yet the literature did not address how or why a teacher might choose to use student-centered technology to elicit this kind of student growth.

The call for more student-centered technology use to better equip and prepare learners for the 21st-century suggests a need for further information on how and why teachers shift towards this type of technology use (Prestridge, 2017). Many studies have

investigated the frequency of teachers' technology use (Gerick et al., 2017; Gurfidan & Koc, 2016) or the intention to use technology (Liu, Lin, Zhang, & Sheng, 2018; Mare & Mihai, 2018; Scherer, Siddiq, & Teo, 2015; Shin, 2015), but the investigation of student-centered technology practices in particular is under-researched (Ottenbreit-Leftwich et al., 2018). The next three sections will focus on quantitative studies that offer evidence of the internal influences on technology use, namely pedagogy and attitude, and the external environmental influences. Ongoing explication on the interconnectedness of these constructs will be presented.

Pedagogical Influences on Technology Use

The decision to use student-centered technology is highly linked to an educator's overarching pedagogical orientation, which represents a key influence on technology use in educational settings. Pedagogical beliefs are "teachers' educational beliefs about teaching and learning" (Ertmer, 2005, p. 28), and are formed over many years of experiences in K-20 classrooms as students, in undergraduate teacher education programs (Levin, 2015), and extending into the many professional contexts teachers encounter (Prestridge, 2017). Pedagogical beliefs are internally rooted and often resistant to change, therefore representative of a second-order barrier to technology use that needs investigation (Ertmer, 2005). The enactment of pedagogical beliefs in teaching with technology is a complex phenomenon that will be explored in this section. I will describe studies that examined a constructivist pedagogy for effective technology implementation (Burke et al., 2018; Li et al., 2018; Liu et al., 2017), explicate the relationship between teacher beliefs and enacted practices (Heitink, Voogt, Fisser, Verplanken, & van Braak,

2017; Hsu, 2016; Liu et al., 2017; Mertala, 2017; Sheffield, 2015), and describe how technology and pedagogy influence one another in a bi-directional fashion (Ding et al., 2019; Prestridge, 2017; Tondeur et al., 2017).

Constructivist pedagogy for effective technology implementation. In general, education and in the field of educational technology, pedagogical practice is commonly classified as either teacher-centered or student-centered (Ertmer et al., 2014). Teacher-centered beliefs are often associated with behaviorism, often called traditional teaching in the literature (Deng, Chai, Tsai, & Lee, 2014), and place the teacher at the center of the classroom as the authority that utilizes direct instructional practices in a structured learning environment. As identified in early research on the relationship between pedagogy and technology use, teachers who espoused a traditional pedagogy often used technology in a supplementary role such as drill and practice, lecturing, or information presentations (Ertmer, 2005; Tondeur et al., 2008). In contrast, teachers with student-centered beliefs favored constructivist principles that emphasized individual student needs and used student-centered approaches that involved high student engagement and participation in authentic disciplinary problems (Deng et al., 2014). In constructivist classrooms, teachers are more likely to use technology in more integrated ways, allowing the technology to serve as a cognitive support to activate student learning (Ertmer, 2005; Tondeur et al., 2008). Teachers' use of technology in practice is highly connected to their general pedagogical beliefs; therefore researchers have spent a considerable amount of time exploring technology use from a student-centered perspective due to the implications for increased problem solving, real-world emphasis, and opportunity to

equip students for a digital world. Most investigations of this kind are quantitative, predictive, self-report studies.

Research in the field of pedagogical beliefs and technology practices has been ongoing for several decades. Early researchers hypothesized that simply adding technology and eliminating first-order barriers to technology would lead to changes in beliefs, and subsequently changes in practice, however, pedagogical beliefs have proven to be a second-order barrier to technology that is much more resistant to change than initially predicted (Ertmer, 2005). Historically and currently, pedagogical beliefs and technology integration have been studied from both quantitative and qualitative approaches and consistently yield results that concur that constructivist beliefs positively influence technology use (Burke et al., 2018; Ertmer & Ottenbreit-Leftwich, 2010; Ertmer et al., 2012; Li et al., 2018; Liu et al., 2017; Overbay, Patterson, Vasu, & Grable, 2010; Tondeur et al., 2008).

A constructivist pedagogy is influential in a teachers' choice to use technology and also predicts how the technology will be used. Burke et al. (2018) evaluated the technology adoption determinants of 200 K-12 educators and determined that teachers with constructivist pedagogy were significantly more likely to use technology for instruction than their traditional teaching peers. Li et al. (2018) also investigated determinants of technology use behavior and specifically evaluated whether the predictors differed when teachers were operating from a constructive or traditional approach. While self- efficacy was the highest significant predictor of teacher technology use for both types of pedagogical perspectives, only the teachers' pedagogy predicted

student-centered technology use. In contrast, pedagogy was not significant when predicting technology use in traditional teaching environments. The results of this study revealed that teachers who were more open to experimenting with technology, were also more likely to utilize technology to support student-centered teaching experiences (Li et al., 2018).

Pedagogical beliefs and enacted practices. The constructivist practices of teachers closely connect to their innovative uses of technology in instruction, yet teachers' constructivist beliefs for general teaching do not always transfer over to their enacted practice of using technology for instruction. While the traditional-constructivist pedagogical continuum is a very simplified construct; a substantial amount of current research has examined the pedagogical belief-practice relationship using this framework (Ertmer et al., 2014; Han, Shin, & Ko, 2017; Liu et al., 2017; Liu, Koehler, & Wang, 2018; Sheffield, 2015; Taimalu & Luik, 2019).

Researchers have demonstrated that the pedagogical beliefs teachers proclaim do not always match their technological instructional practices (Heitink et al., 2017; Hsu, 2016; Liu et al., 2017; Mertala, 2017; Sheffield, 2015). In a study of 17 primary educators, Mertala (2017) examined the relationship between general and technological pedagogical beliefs. The participants were found to value constructivist pedagogical beliefs, but when instruction included technology, their pedagogical orientation shifted to represent more traditional types of instruction, like whole class teaching, individual drill and practice games, and content reinforcement. Mertala (2017) concluded that "the educators' beliefs of what is good ICT-enhanced pedagogy was not based on their beliefs

about the pedagogical core" of primary education (p. 204). These findings demonstrate the mismatch between conceptualizing good teaching in belief vs. practice. This qualitative study of primary teachers uncovers more in-depth insight into the beliefs-practice challenge as it uncovers teachers' lack of awareness of the disconnect (Mertala, 2017). The mismatch between belief and practice "is worrisome for the intended effectiveness of using ICT in teaching and learning. For effective integration of technology in practice, it is important that teachers' practical actions and professional reasoning match" (Heitink et al., 2016, p. 82). Beliefs to practice research has yielded evidence that there is not a linear progression from general pedagogical beliefs to technological pedagogical practice (Heitink et al., 2017; Hsu, 2016; Mertala, 2017; Yu & Okojie, 2017). The literature shows that beliefs-practice relationship in educational technology use is complicated and influenced by many factors.

While most studies portray a one-dimensional relationship between pedagogical beliefs and technology practices, others suggest that this approach is oversimplified, because teachers often utilize both teacher-centered and student-centered pedagogies with technology depending on the purpose or task at hand (Ertmer et al., 2014; Tondeur et al., 2017; Ottenbreit-Leftwich et al., 2018). More recent research has addressed this paradox to better explicate a more accurate view of the pedagogical influence on technology use in practice (Crespo, 2016; Liu, Koehler, et al., 2018). In a quantitative study of 202 teachers, Liu et al. (2018) found that multidimensional beliefs (constructivist and traditional) significantly influenced technology use. The researchers concluded that

teachers who have dual high pedagogical beliefs are likely better suited to select and apply a variety of technology applications in different teaching contexts.

Teacher pedagogical beliefs cannot always be classified into one single category and using a multi-dimensional approach to understanding technology integration benefits a more holistic understanding of the phenomenon (Tondeur et al., 2008; Tondeur et al., 2017). While there is growing research about how multidimensional beliefs influence practice, a constructivist pedagogical approach still represents the most prevalent focus on effective technology use in the literature.

Bidirectional influence of pedagogy and technology. Technology and pedagogy allow for bidirectional influence on the technology teaching practices of teachers (Ding et al., 2019; Prestridge, 2017; Tondeur et al., 2017). In alignment with social cognitive theory, the instructional practices of teachers are influenced by the available technology while their pedagogical practices can also enable technology integration (Bandura, 1977). Tondeur et al. (2017) conducted a meta-aggregation of fourteen qualitative studies that focused on the relationship between teachers' pedagogical beliefs and their uses of technology. In nine of fourteen studies, findings concluded that technology experiences were seen as enablers for pedagogical belief change while contrastingly, five studies concluded that pedagogical beliefs could be seen as enablers for technology integration (Tondeur et al., 2017). This contrast in findings amongst current studies demonstrates the co-existing reality that technology influences pedagogy and pedagogy influences technology in a bi-directional way.

Prestridge (2017) came to a similar conclusion in an in-depth, two-year case study of the technology practices of three teachers in an effort to understand how pedagogical beliefs and practices are shaped and changed over time when teaching with game-based technology. In all three cases, the pedagogical beliefs of the teachers influenced their approach to using game-based technology and the use of technology during the implementation phase also activated their pedagogical reflection and use simultaneously (Prestridge, 2017). In a qualitative investigation of 12 English as foreign language teachers, Ding et al. (2019) found alignment between the pedagogical beliefs of the teachers and their content-specific technology practices. In coordination with social cognitive theory and the bi-directional influence of technology and pedagogy, a participant in this study surmised, "I think of my use of technology and my teaching approach as constantly influencing each other" (Ding et al., 2019, p 32). Technology-rich learning experiences can promote a teacher to change to more student-centered, constructivist beliefs, while simultaneously, teachers with constructivist beliefs are more likely to adopt student-centered technology (Tondeur et al., 2017).

Literature about pedagogical influences on technology use reveals the challenging beliefs-practice relationship, relevance of multidimensional pedagogical uses, and bi-directional influence of technology and pedagogy. Data from study results in the last five years confirm that pedagogy is a highly influential predictor of technology use, yet discrepancies remain between teachers' pedagogical beliefs and technological pedagogical practices. The relationship between teacher pedagogy and technology use is multifaceted and cannot be fully understood when studied in isolation. Further

investigation is needed about how pedagogy intersects with other influential factors, including attitudes and various environmental influences, to produce a change in the student-centered technology practices of elementary teachers. The next section will introduce attitudinal influences on technology use, another powerful internal construct.

Attitudinal Influences on Technology Use

Attitude represents a well-researched construct that is influential on teachers' decisions to use technology. In a review of the literature on teacher attitudes toward technology use, a critical issue that emerged was the lack of conceptual clarity about what constitutes attitude. While there is consistent representation in the literature that teacher attitudes influence technology use, the vast array of meanings of the construct attitude yields varied results with multiple areas of emphasis. While in general, an attitude represents a construct that links what people say, think, or do and it embodies a person's global evaluation of any object or circumstance (Petty et al., 2003), it can be further classified into categories relating to emotion, behavior, and cognition (Olson & Zanna, 1993). In a seminal study regarding teachers' attitudes towards technology, Whitley (1997) suggested that the operationalization of attitude towards technology use could be categorized into the areas of affect, belief, self-efficacy, mixed, and sex-role stereotype. Following this organizational structure, this section will focus on the first three categories and describe studies in K-12 settings that explain the attitudinal influences on technology integration from an affective (Joo, Lim, & Kim, 2016; Kim et al., 2015; Syvanen, Makiniemi, Syrja, Heikkila-Tammi, & Viteli, 2016; Teo, Zhou, & Noyes, 2016), belief (Cheng & Xie, 2018; Liu, Koehler, et al., 2018; Mare & Mihai,

2018; Pittman & Gaines, 2015; Scherer et al., 2015; Shin, 2015; Vongkulluksn et al., 2018), and self-efficacy (Hatlevik, 2017; Hatlevik & Hatlevik, 2018; Liu et al., 2016; Siddiq, et al., 2016) perspective. I will conclude with research that suggests that attitude and pedagogy should be investigated simultaneously to yield the most accurate understanding of internal influencers on teacher use of technology (Admiraal et al., 2017; Li et al., 2018; Liu et al., 2017).

Affect. Affect, as related to technology use, refers to the measurement of the emotional aspect of attitude including constructs such as anxiety, fear, liking, interest, and enjoyment (Cai et al., 2017; Whitley, 1997). While emotions can be viewed as situational, they can also be conceptualized as a stable trait that can be reflected upon via self-report instruments often used in research (Frenzel et al., 2016). Emotional traits studied within education technology research tend to be categorized by either negative emotion, most commonly anxiety (Joo et al., 2016; Kilic, 2015; Syvanen et al., 2016) or positive emotion such as enjoyment (Teo & Noyes, 2011; Teo et al., 2016), happiness (Kay, 2008), or personal satisfaction (Kim et al., 2015).

One of the most researched technology-related emotions is anxiety. Computer anxiety, sometimes also known as technostress, is generally defined as any negative impact on state of mind, attitude, or behavior caused directly or indirectly by technology (Joo et al., 2016). Computer anxiety is predicted by information and communication technologies (ICT) competence, school support, compatibility of ICT with teaching style, and pressure to use ICT (Syvanen et al., 2016). Technostress is an essential predictor of technology acceptance and integration. Joo et al. (2016) found that technostress had a

significant effect on teachers' intention to use technology. Researchers also determined that technostress acted as a significant mediator between technological pedagogical content knowledge (TPACK) and intention to use technology as well as school support and intention to use technology. While technostress is found to significantly influence intention to use technology, Chi and Churchill (2016) determined that after implementation occurs, significantly lower levels of anxiety can be expected. Practical experience can reduce anxiety as teachers gain familiarity with technology, yet teachers with higher levels of initial computer anxiety take longer to make this adjustment (Chi & Churchill, 2016).

Other demographic factors have been considered in technostress research. It has been determined that subject-specific teachers tend to experience more technostress than classroom teachers (Syvanen et al., 2016), females tend to experience more technostress than males (Hismanogulu, 2011; Kilic, 2015; Syvanen et al., 2016), and more experienced teachers feel more technostress than teachers with 0-15 years of experience (Kilic ,2015; Syvanen et al., 2016). Demographic variation regarding technostress highlights the importance of understanding individual differences so that individuals can best be supported to integrate technology according to their needs.

Positive emotions are far less researched yet provide important insights into affective attitudinal influences on technology use. In a study of 592 K-12 teachers, Teo et al. (2016) determined that attitude towards computer use had the most significant positive influence on teachers' behavioral intention to use technology. In this study, attitude was measured by items such as "I look forward to those aspects of my job that require the use

of technology," "I have fun using technology," and "I find using technology enjoyable," which demonstrate the affective intent of the attitude construct under investigation. In this study, perceived usefulness, perceived ease of use, and technical support predicted attitudes toward using technology, which in turn strengthened teachers' intention to use technology (Teo et al., 2016). Farjon, Smits, and Voogt (2019) found similar results while using the Will, Skill, Tool (WST) model. In contrast to previous research utilizing the WST model, the *Will* construct (defined as a positive attitude towards technology use) had the strongest effect on technology integration, and the *Tool* construct (defined as the quantity and quality of technology use) had the smallest effect (Farjon et al., 2019). Researchers conclude that a positive attitude, and particularly a lack of a negative attitude, impact whether and how a teacher would use technology for instruction (Farjon et al., 2019; Hismanogulu, 2011; Kay, 2008; Teo & Noyes, 2011.

Personal satisfaction, interest, and engagement are also emotions that have been investigated in technology attitude research. While investigating pre-service teachers' science, technology, engineering, and mathematics (STEM) engagement, learning, and teaching, Kim et al. (2015) determined that enjoyment and personal interest were the most powerful indicators of emotional engagement. In turn, emotional engagement significantly influenced teachers' ability to produce technology-enhanced lessons, in this case, STEM-based. Researchers agree that the regulation of negative emotion is critical to success, and enjoyment often increases after participation (Chi & Churchill, 2016; Kim et al., 2015). Internal motivation and perceived enjoyment significantly influence a

teacher's desire to implement technology in the classroom (Moreira- Fontan, Garcia-Senoran, Conde-Rodriguez, & Gonzalez, 2019).

Affective attitudinal studies are less frequent than belief and self-efficacy studies in the field of educational technology integration. Due to a shortage of K-12 classroom literature in this category, studies on pre-service teachers were also included in this review. The methodological approach to nearly all the affective attitudinal studies found in the literature was quantitative. Attitudinal beliefs will be considered next.

Belief. Belief systems represent a complicated network of values and attitudes that influence behavior. Belief, as related to technology use, refers to the value a teacher places on technology use and its societal function (Cai et al., 2017; Whitley, 1997). Attitudinal studies that use belief as the construct of emphasis are seeking to understand to what extent, how, or why teachers find technology to be useful or important for teaching and learning. This factor has been defined using many terms in the literature with value beliefs (Cheng & Xie, 2018; Ottenbreit-Leftwich et al., 2010) and perceived usefulness (Liu, Koehler, et al., 2018; Scherer et al., 2015) the most prominent.

Value beliefs regarding technology address the extent to which teachers believe that technology can help them achieve the instructional goals they identify as most important for student learning. Technology value beliefs have been cited as the most influential determinant of technology integration (Admiraal et al., 2017; Cheng & Xie, 2018; Pittman & Gaines, 2015; Vongkulluksn et al., 2018). Value beliefs predict the quality of technology integration, including using technology for student-centered instruction and higher-order tasks (Mare & Mihai, 2018; Pittman & Gaines, 2015; Sadaf

& Johnson, 2017; Vongkulluksn et al., 2018) and TPACK enactment (Cheng & Xie, 2018).

Teachers who believe technology is valuable are much more likely to amplify access, downplay constraints, and find ways to integrate technology despite barriers in the school context. Early qualitative research regarding value beliefs (Ottenbreit-Leftwich et al., 2010) and teacher beliefs (Ertmer et al., 2012) of award-winning technology using teachers demonstrated that teachers who believe in the value of technology for student learning will actively work around barriers to achieve the kinds of technology integration they believe is most beneficial for students. Teachers who are motivated by choosing technology that has discernible value, tend to persist even when external influences or generic educational value statements dissuade technology use (Kimmons & Hall, 2016; Vongkulluksn et al., 2018).

Perceived usefulness is similar to value beliefs and another common construct found in the literature used to measure beliefs. The technology acceptance model (TAM) defines perceived usefulness as "the degree to which an individual believes that using a particular system would enhance his or her job performance" (Davis, 1986, p. 82). Research studies consistently report that perceived usefulness, much like value beliefs, significantly influences the technology integration practices of teachers (Liu, Koehler, et al., 2018; Mare & Mihai, 2018; Scherer et al., 2015; Shin, 2015). In a 2019 meta-analytic analysis, Scherer, Siddiq, and Tondeur found that perceived usefulness significantly predicts behavioral intentions via attitudes towards technology and with more profound effect than perceived ease of use. Along with perceived usefulness, perceived ease of use

is one of the most important factors in the TAM and represents the extent to which technology integration is free from difficulty or great effort. Researchers concur that a teacher who is influenced more strongly by their attitude towards a perception of usefulness than ease of use results in higher user intention (Liu, Koehler, et al., 2018; Scherer et al., 2015; Scherer et al., 2019). When teachers believe that technology will enhance teaching and learning in their classroom, they will overcome implementation challenges to make it happen (Kimmons & Hall, 2016; Liu, Koehler, et al., 2018; Vongkulluksn et al., 2018).

Perceptions of the usefulness of technology urge implementation; however, surrounding environmental factors also influence attitudes and can be a strong factor in changing behavior. In contrast to the findings of many studies utilizing the TAM, Wong (2016) surveyed 185 elementary school teachers in Hong Kong and concluded that perceived usefulness and perceived ease of use had little influence on the behavioral intentions of the teachers. Instead, environmental factors (facilitating conditions) most strongly impacted teachers' behavioral intentions to use technology. Contextual influences on teacher attitudes towards technology use demonstrate the complexity of a teachers' intention to use technology (Mare & Mihai, 2018; Wong, 2016) and will be explored more fully in the section on environmental influences on technology use later in this literature review.

Research on teacher beliefs regarding technology enrich our understanding of attitudinal influences on technology use in practice. Researchers primarily report consensus that attitudinal beliefs powerfully influence teachers' use of technology in

practice. While mostly quantitatively studied, both qualitative and quantitative studies are represented in the literature on this topic. Attitudinal studies with an emphasis on self-efficacy will be shared next.

Self-efficacy. Embedded within the social cognitive theory, Bandura (1986) described self-efficacy as a person's judgment about their capability to bring about desired outcomes. Beliefs about self can be more influential than actual ability and can influence individuals' thought processes, ability to persist in the face of a challenge, and degree of motivation (Bandura, 1997). Bandura (1997) also asserted that self-efficacy is not a global trait but is rather represented in domain and context specific ways. In this review of the literature, self-efficacy will be represented in the domain of technology use and will refer to the beliefs a teacher has about his/her abilities to take on technology-related tasks successfully (Cai et al., 2017; Scherer & Siddiq, 2015; Whitley, 1997). Research regarding technology self-efficacy supports Bandura's assumptions and illustrates the connection between technology self-efficacy and technology use (Hatlevik, 2017; Hatlevik & Hatlevik, 2018; Liu et al., 2016; Siddiq et al., 2016).

Current studies report a significant relationship between technology self- efficacy and technology use in practice. In a quantitative study of 1,235 K-12 teachers in Florida, researchers found a positive and significant relationship between classroom technology integration and teachers' confidence and comfort using technology (Liu et al., 2016). Hatlevik and Hatlevik (2018) extended this finding by concluding that teachers' general ICT self-efficacy is strongly associated with their ICT self-efficacy for instructional purposes, calling specific attention to technology use in practice. Furthermore, it was

determined that collegial collaboration around the topic of technology use fostered ICT self-efficacy growth and built capacity for authentic technology implementation (Hatlevik & Hatlevik, 2018). Other current quantitative studies have corroborated the finding that technology self-efficacy positively and significantly impacts technology use (Drossel, Eickelmann, & Gerick, 2017; Hatlevik, 2017; Lopez-Vargus, Duarte-Suarez, & Ibanez-Ibanez, 2017; Siddiq et al., 2016).

The technological pedagogical content knowledge (TPACK) framework has also been used to assess teacher self-reported technology self-efficacy (Durak, 2019; Lopez-Vargus et al., 2017; Minshew & Anderson, 2015; Saudelli & Ciampa, 2016; Scherer et al., 2019). The predictive variables of technology integration, self-efficacy, and attitudes towards technology, have been determined to be significantly effective on TPACK and its subfactors (Durak, 2019). In a study of 401 K-12 teachers, technology integration self-efficacy had the highest correlation with TPACK and results suggested that teachers' self-competence beliefs highly influenced their decisions to use technology in content-specific and pedagogically sound ways (Durak, 2019). Contrarily, when teachers demonstrated low technology self-efficacy, TPACK enactment was limited in practice (Lopez-Vargus et al., 2017; Minshew & Anderson, 2015).

Teachers who demonstrate positive technology self-efficacy are more likely to take risks in their uses of technology for instruction. In a qualitative study of the self-efficacy beliefs and practices of elementary teachers, researchers determined that teachers' attitudes and confidence, namely their ability to give up control and work through unanticipated outcomes, greatly influenced their pedagogical implementation of

iPad technology in their classrooms (Saudelli & Ciampa, 2016). Teachers who were able to let go of control and embrace technology in support of TPACK demonstrated higher comfort levels and self-efficacy (Saudelli & Ciampa, 2016). Alenezi (2017), Li et al. (2018), and Rich, Jones, Belikov, Yoshikawa, and Perkins (2017) concurred that the ability to embrace the use of technology, take risks, and let go of control is grounded in self-efficacy beliefs and comfort level, which influences the use of technology in the classroom.

Not all technology self-efficacy research finds a strong positive connection between self-efficacy and technology use, thus illustrating the complexity of the attitudinal construct. In a mixed-methods study, researchers concluded that perceived self-efficacy did not directly influence technology use in practice, but instead affected technology use indirectly through perceived benefit (Hur, Shannon, & Wolf, 2016). These researchers projected that perhaps the results differed since 70% of the 223 Alabama teacher participants identified as advanced users of technology before the study began, therefore shifting attitudes to emphasize value beliefs over perceived competence. Other studies that demonstrated similar yet unusual contrary results have utilized the TAM framework. The variable perceived ease of use examines how easy a teacher perceives a technology tool to be, thus correlating to their confidence or comfort in its use (Ottenbreit-Leftwich et al., 2018). Li et al. (2018) and Wong (2016) determined that teachers' perceptions that technology is easy to use had no significant impact on their reported use of technology.

Affect, belief, and self-efficacy all represent attitudinal influences on the technology practices of teachers. While these unique facets of attitude can stand alone, they often are intertwined and influence one another. Moreira-Fontan et al. (2019) conducted a study that investigated teachers' job resources, ICT-related self-efficacy, and positive emotions concerning internal motivation and engagement at work. They concluded that teachers with higher digital self-efficacy felt strong positive feelings when utilizing technology and concluded that further research is needed to make connections with personal values (beliefs) that might further enhance our understanding of ICT positive emotions that influence technology use (Moreira- Fontan et al., 2019). Perceived digital self-efficacy has also been shown to influence value beliefs (Heath, 2017), while value beliefs influence positive attitudes about technology (Teo & Noyes, 2011; Vongkulluksn et al., 2018). Together, affect, belief, and self-efficacy depict the attitudinal influences that should be considered critical for promoting technology use for instruction (Joo et al., 2016; Moreira- Fontan et al., 2019).

Intersection of internal influences on technology use. Teacher emotions, value beliefs, and self-efficacy beliefs strongly influence the technology practices of teachers, yet these attitudes do not act alone. Technology attitudes are reciprocally influenced by other internal factors, namely pedagogical beliefs. As teachers shift to student-centered pedagogical beliefs, more positive attitudes about technology often increase, and with it, more innovative uses of technology follow (Liu et al., 2017; Shin, Han, & Kim, 2014). Self-efficacy is also known to influence the beliefs of teachers and is especially powerful as teachers try to translate new pedagogical beliefs into practice (Li et al., 2018).

Technology self-efficacy can influence both pedagogical decision-making and the choice to use technology-related instructional activities, as the teacher must cope in the face of obstacles along the way (Bandura, 1989; Li et al., 2018).

Teacher attitudes about technology and pedagogical beliefs should be investigated concurrently. In a quantitative study of 1602 teachers, Admiraal et al. (2017) determined that the complex relationship between pedagogical beliefs and technology attitudes should be addressed simultaneously for effective change to occur. Teachers navigate these bi-directional and reciprocal internal influences, and an investigation into both constructs is necessary to fully represent the internal state of mind (Shin et al., 2014). Liu et al. (2017) and Shin et al. (2014), along with the theoretical implications of the social cognitive theory (Bandura, 1977), support the finding that a simultaneous investigation of attitude and pedagogy will yield the most accurate picture of internal influences on teacher behavior.

Literature on the attitudinal influences on teacher technology use range from an emphasis on emotion to belief to self-efficacy. Data from study results in the last five years have led researchers to conclude that attitude is a complex construct comprised of many parts, yet a powerful influencer on teachers' ability and willingness to use technology in practice. Additionally, the relationship between attitude and technology use is multifaceted and cannot be fully understood when studied in isolation. Teacher attitudes about technology are influenced by multiple internal factors, including self-efficacy and pedagogy, as well as external environmental factors. Research suggests that the environment in which attitudes and pedagogical beliefs are applied influences the way

teacher practices manifest. Further investigation is needed about how these internal influencers intersect with external factors to produce a change in the student-centered technology practices of elementary teachers. The next section will explore these external environmental influences on technology use.

Environmental Influences on Technology Use

The investigation of environmental influences on technology use expands this literature review to address factors beyond the context of the teacher. While pedagogy and attitude are considered internal constructs that represent second-order barriers or enablers to technology use, environmental influences address constructs that are external to the teacher and often reflect first-order barriers that influence a teachers' use of technology for instruction. First-order barriers to technology use are located beyond the teacher's person and can include constructs such as technology policy or interaction from influential peers such as administrators or teacher leaders. While some researchers have claimed that first-order barriers have largely been overcome in the US due to schools' ability to adjust resources to address various barriers (Ertmer, 2005), others have reported that evolving technologies, new and sometimes conflicting policy mandates, and economic pressures make first-order barriers an ongoing struggle (Sadaf & Johnson, 2017).

While research in the last five years has concluded that pedagogy and attitude most strongly influence the technology practices of teachers (Cheng & Xie, 2018; Li et al., 2018; Liu, Koehler, et al., 2018), the environmental influences that surround them most definitely persuade, challenge, or encourage technology use as well (Genlott et al.,

2019; Toh, 2016; Vanderlinde & van Braak, 2010). With a social cognitive theory framework in mind, Somekh (2008) stated that "Teachers are not 'free agents' and their use of ICT for teaching and learning depends on the inter-locking cultural, social and organizational contexts in which they live and work" (p. 450). This highly cited quotation in environmental/contextual educational studies summarizes the complex arena in which teachers carry out their daily tasks and elicits further investigation into environmental influences on teacher technology use. In this section, I will describe studies that explain the complex school environment (Genlott et al., 2019; Kimmons & Hall, 2016; Toh, 2016) and then provide studies that explicate specific environmental influences on technology use including school policy (Roumell & Salajan, 2016; Sauers & Richardson, 2019), the role of the administrator (Gurfidan & Koc, 2016; Sun & Gao, 2019), and peer collaboration (Drossel et al., 2017; Hatlevik & Hatlevik, 2018; Saudelli & Ciampa, 2016). I will conclude with research that suggests that internal influences, specifically pedagogical beliefs and attitudes about technology use, should be investigated alongside external influences because it is the intersection of these constructs that produces teacher behavior that engages in technology use for instruction

Complex school environment. The educational setting is a complex system that contains many levels, including the classroom, school, school system, and the broader educational context in the nation and world. Pressing and often contrary policies, beliefs, and expectations from each level shape conditions that encourage or discourage the use of technology for instruction (Kimmons & Hall, 2016; Vanderlinde & Braak, 2010). This interplay of environmental influences is difficult to research empirically, yet is often cited

as influential in technology-mediated reform efforts (Petko & Prasse, 2018; Swallow & Olofson, 2017).

To address this complex system, some researchers have used a biological ecological model, adapted from Brofenbrenner's ecological model for human development (1976; Brofenbrenner & Morris, 2006), to investigate macro, meso, and micro-levels of domain in the educational setting (Pierce & Cleary, 2016; Swallow & Olofson, 2017; Toh, 2016; van den Beemt & Diepstraten, 2016). The macro-level consists of broad influences such as global development, national and state policies, or societal norms. Meso-level influences pertain to institutional culture, school infrastructure and policy, and a school's mission and vision. The micro-level describes the classroom context and influencers include a teacher's beliefs and practices, already addressed in previous sections of this literature review. Systemic ICT change in schools requires consideration of each level of the ecosystem such as a change in vision, the expansion of technological options, pedagogical and technical support, professional development, and peer-to-peer collaboration (Petko et al., 2015). Understanding the school system from an ecological framework provides a structure for the investigation of a system confounded by multiple influencers on technology use.

A connected educational system, engaged at the macro, meso, and micro-levels, is known to most readily produce systemic and sustained change in technology practices (Genlott et al., 2019; Toh, 2016). Using an ecological model to investigate the prolonged success of technology innovation, Toh (2016) determined that open communication filtering to and from each level, the use of a decentralized and distributed decision-

making model, and feedback sought out and initiated from multiple levels enriched the opportunity for innovation and sustained technology integration. Genlott et al. (2019) built on these results in their study on the dissemination of digital innovation. Results emphasized that engagement with the extended social system (at macro, meso, and micro-levels) and collaboration with various influencers was essential to the development of a community that had shared thinking and collective purpose for the success of the innovation. The school ecosystem represents complex nested subsystems that reciprocally influence one another. This environment powerfully influences the attitudes, beliefs, and behaviors of teachers who use technology (Genlott et al., 2019; Toh, 2016).

The complexity of the ecological model peaks at the classroom (micro) level. Teachers are confounded with expectations and systems from varying levels of the ecosystem pertaining to policy, standards, curriculum and instructional strategies, assessment, and technology use, to name a few. The classroom represents a nested subsystem that can remain isolated from change if other levels do not effectively engage and activate it. Research demonstrates that teachers are often most influenced by the realities at the micro-level, despite meso or macro-level expectations. In an investigation of specific contextual factors that influence teachers' instructional practices, Swallow and Olofson (2017) concluded that teachers were most strongly influenced by their personal backgrounds, attitudes towards technology, and pedagogy. These constructs moderated teachers' enactment of TPACK more strongly than institutional (meso) or societal forces (macro). Similarly, Kimmons and Hall (2016) determined that teachers placed the highest emphasis on the discernible impact and ease of implementation that technology will

provide at the classroom (micro) level. While teachers are confounded by external requirements and expectations at various levels, they are still most influenced by student learning in their intimate classroom context. The school ecosystem must carefully engage teachers in their own nested environment to initiate effective change.

Researchers have agreed that the educational context is complex and multifaceted (Genlott et al., 2019; Toh, 2016). Multiple environmental factors surround individual teachers, although potentially different in each school setting, and concurrently influence their personal decision-making regarding technology use. While the variables under investigation in contextual studies are wide, varied, and interconnected; school policy and the roles of administrators and colleagues are typically represented and denote important research in this area.

School policy. School policy on technology integration orchestrates priorities, systems, and approaches to diffusion that influence the technology practices of individual teachers and the school culture at large. Policy issues regarding technology use reflect the tension and complexities of a multi-leveled education system (Roumell & Salajan, 2016). While knowingly complex, national, state, and local policies must work together to comprehensively guide technology goals and usage for effective classroom implementation (Pettersson, 2018; Toh, 2016). The orchestration of these policies influences a teacher's decision to use technology.

Technology policy at the national level equips schools with resources, network infrastructure and supporting equipment, and professional development for teachers, thus addressing first- order barriers that influence teacher technology use (Roumell & Salajan,

2016; Vanderlinde & Braak, 2010). Beyond resourcing schools, national technology policy sets expectations for how technology should be used and integrated within the complex American school system, which is concurrently nested within other powerful subsystems such as the economy and government. National plans and initiatives address global competitiveness and the desire to produce students ready for a digital world (Sauers & Richardson, 2019). In a review of the most recent National Education Technology Plans (NETP), researchers surmised that the documents both romanticize technology use as the optimistic fix for education while also elucidating tensions and contradictions that make implementation a challenge (Roumell & Salajan, 2016). Notably, tension exists as national policy seeks to both liberate students to embrace the freedom that technology can offer, while simultaneously control their access and freedom to use it (Roumell & Salajan, pg. 394). Contrasting, yet simultaneous priorities demonstrate the complexity of national educational technology policy that influences both school and classroom level implementation.

National technology policies filter down to K-12 schools and influence school-level (meso) policy development and actual technology implementation. Local school districts must navigate policy coercion due to state and federal guidelines that dictate expectations as they attempt to develop their own technology policies that will be effective in their unique settings (Sauers & Richardson, 2019). The tension and dichotomous nature of freedom versus control issues at the national level are best evidenced at the school-level through acceptable use policies (AUPs). After a review of 61 AUPs from US school districts utilizing a 1:1 technology model, Sauers and

Richardson (2019) concluded that the overwhelming policy emphasis regarded consequences, restriction, and disempowerment rather than empowerment and democracy as purported as the goal of technology use. This contradiction and emphasis on the negative influences all stakeholders in the school culture and can strongly influence their reaction to technology use (Batch, 2015).

School-wide technology policies should set the agenda for educational change related to technology use and therefore influence a teacher's decision to use technology. To do so, school districts must navigate national ICT policy and AUP development so that comprehensive and sustainable change can occur at the school-level. Effective technology policy should strategically pair pedagogy and technology together and not produce a generic technology use expectation (Genlott & Gronlund, 2016; Genlott et al., 2019). Simultaneously, school-level policies should be firmly anchored at multiple levels in the school ecosystem so that teachers, schools, and school districts can be influenced holistically (Petko et al., 2015; Pettersson, 2018; Toh, 2016; Vanderlinde & Braak, 2010). Care must be taken as national, and school policy initiatives trickle into individual classrooms as contradiction and simultaneous realities can result in an implementation dilemma that must be navigated by teachers (Pettersson, 2018). There is a need to close the gap between broad policy and classroom implementation so that policies can effectively and strategically influence teacher technology use. One way to close that gap is explained through the role of the administrator.

Administrators. Administrators play a crucial role in influencing the use of technology at the meso-level (Gurfidan & Koc, 2016; Sun & Gao, 2019). Along with

other roles, administrators oversee technology policy, infrastructure, and the development of an innovative culture. These overarching constructs impact how a school runs, dictate its priorities, budget, and atmosphere, and are distinctly flavored by how an administrator carries out his/her work (Lindqvist, 2019). Effective leadership in the role of the administrator provides a powerful influence on a teacher's decision to use technology (Petko & Prasse, 2018).

At the meso-level, the administrator must orchestrate many socio-environmental influences to activate a school culture that embraces the use of technology for instruction. Studies have shown that effective leadership factors critical for the support and development of technology integration include the establishment and enactment of a clear vision that includes both technological and pedagogical influences on technology use (Gurfidan & Koc, 2016; Islam & Gronlund, 2016; ISTE Standards for Students, 2016), development of a supportive learning environment (Lindqvist, 2019; Sun & Gao, 2019), involvement of staff in ICT decision-making (Islam & Gronlund, 2016), and the development of a culture that embraces risk-taking (Lindqvist, 2019). Effective administrators lead the direction of technology innovation with a systems thinking mindset (Petersen, 2014) by involving stakeholders at all levels in the process (Sun & Gao, 2019). Administrators should develop a supportive learning culture that provides multiple opportunities for collaboration and growth (Lindqvist, 2019; Sun & Gao, 2019). Each of these attributes represents an opportunity for influence, but it is the co-existence and simultaneity of these influences that impacts the most change. Overarching school-

level constructs initiated by administrators influence the technology practices of teachers, yet an administrator's role at the classroom level is also highly influential.

Studies indicate that administrators impact the attitudes teachers have about technology use, thus demonstrating influence at the micro-level of the ecosystem. It has been determined that teacher attitudes toward technology are highly predictive of their level of technology use in practice (Cheng & Xie, 2018; Liu et al., 2016), so the administrator's role in cultivating positive attitudes is essential. In a study of 223 Alabama teachers, Hur et al. (2016) investigated the relationship between internal and external factors that affect technology integration. Regarding administrators' influence on the technology use practices of teachers, researchers concluded that principal support directly influenced the perceived self-efficacy of teachers. Encouragement from the principal helped teachers use technology more confidently, but in this study, other environmental factors (infrastructure and access) hindered actual integration (Hur et al., 2016; Kafyulilo, Fisser, & Voogt, 2016). Authors concluded that internal and external factors are inextricably linked together, and the complexity of the school environment makes it difficult to address variables separately. School environments are complex, and technology use in practice is influenced by multiple mediating factors (Hur et al., 2016; Petko & Prasse, 2018).

In technology initiative environments that are not successful, administrator influence or lack of influence is evident at multiple levels in the school ecosystem. In a study measuring teachers' attitudes towards technology integration after a one-year experience teaching with Chromebooks, results revealed that teachers developed negative

attitudes towards technology after experiencing meso-level infrastructure problems, insufficient implementation of rules and policies, and a lack of technical support (Sahin, Top, & Delen, 2016). At the micro-level, administrators and other influential stakeholders' lack of vision, problem-solving, and proper training opportunities produced the development of negative attitudes that decreased technology use and the desire to learn. This study affirmed the need for a systemic and multileveled approach to implementing technology school-wide (Sahin et al., 2016;). Another key actor that influences the technology practices of teachers at the meso and micro-levels is fellow teachers.

Peer collaboration. Peer collaboration offers an opportunity for teachers to share ideas and support each other's efforts to use technology for instruction. This practice occurs at the micro-level in informal ways, while meso-level peer collaboration is part of the organizational structure, expectations, and culture of the school. Research studies have confirmed that collegial collaboration used to enhance the use of technology for instruction can increase self-efficacy, intention to use technology, and actual use of technology (Drossel et al., 2017; Hatlevik & Hatlevik, 2018; Saudelli & Ciampa, 2016).

At the meso-level, organizational structures and visionary emphasis on the development of an innovative school culture often produce regular, on-going collaboration opportunities for teachers embedded within the school day. Petersen (2014), Sun and Gao (2019), and Lindqvist (2019) found that team-based, collaborative systems allowed teachers to grow in their technology skills and pedagogical implementations, as well as take risks more comfortably. Systemic implementation of collaborative structures

provided opportunities for teachers to change their attitudes and beliefs about technology at their own pace and with the support of peers experiencing similar conditions (Almerich, Orellana, Suarez-Rodriguez, & Diaz-Garcia, 2016; Sun & Gao, 2019).

Formal, school-level collaborative structures impact teacher technology use, yet informal collaboration that occurs at the micro-level also influences the technology practices of teachers. Research has indicated that teachers prefer an informal approach to learning about technology and that teachers want to learn with their teaching peers (Saudelli & Ciampa, 2016; Toh, 2016). Saudelli and Ciampa (2016) found peer collaboration to be the most influential aspect to developing more positive self-efficacy and influencing a change in instructional practices with technology. Participants reported that informal exchanges with peers at varying levels of readiness for technology use allowed them to authentically plan technology integration in their own classroom, consider potential successes and failures, and also reflect on alternative instructional practices concerning the role of technology and pedagogy. Hatlevik and Hatlevik (2018) determined that the social aspect of building self-efficacy and the understanding that the use of ICT in teaching can be a collective project, actually legitimatized the teachers use of ICT and beliefs about ICT for instruction.

Without meso-level structural support for ICT collaboration, teachers at the micro-level struggle to find time to engage informally to improve their instructional uses of technology. Teachers also are challenged by other priorities such as standards and assessment, and often feel dichotomous influences on the most influential ways to improve student learning in their classrooms. While both formal and informal

collaboration is proven to be influential to teacher use of technology, a systemic multi-leveled plan for collaboration and the development of a culture of continuous and collaborative learning is most influential (Sun & Gao, 2019; Tondeur et al., 2017).

Intersection of Internal and External Influences on Technology Use

Inter-locking constructs of the complex school environment work together to influence the technology practices of teachers. Simultaneously, the internal influences of pedagogy and attitude reciprocally influence actual technology use. Researchers conclude that the barrier between studying internal and external factors that influence teacher technology use be removed so that a more comprehensive investigation of this complex phenomenon can be studied more accurately (Gurfidan & Koc, 2016; Petko et al., 2018; Yang & Chun, 2018). Petko et al. (2018) investigated the complex environment of school by considering how teacher readiness (internal) and school readiness (external) influenced educational technology integration. Researchers concluded that technology use is dependent on teacher readiness (including pedagogical beliefs about teaching and learning and attitude) that, in turn, is strongly influenced by school readiness (including quality of educational technology, formal and informal peer communication, perceived importance of ICT in the school, administrative support, and goal clarity) (Petko et al., 2018). Teachers who are in schools with an institutional culture that emphasizes technology use tend to be more likely to share this emphasis in their own teaching (Yang & Chun, 2018). Results demonstrate that multiple influences promote a change in teaching behavior.

Examining isolated influences on technology integration limits understanding of the phenomenon due to the complicated system in which teachers live and work (Yang & Chun, 2018). Researchers have encouraged a decrease in the boundary between second-order (internal) and first -order (external) barriers affecting technology integration and instead suggested that future research should highlight the interaction between these factors (Yang & Chun, 2018). Other researchers have attempted to investigate this complex interplay of environmental influences through structural equation modeling (Gerick et al., 2017; Liu et al., 2016; Petko et al., 2018). While the results of these studies do not yield a coherent picture due to contrasting variables or proposed paths of influence, there is a consistent call to further study contextual influences on technology use (Liu et al., 2016). Other researchers suggest that further research be conducted in other educational contexts, understanding that environmental influences will be different based on specific school dynamics (Durff, 2017; Swallow, 2017; Swallow & Olofson, 2017).

Data from study results in the last five years have led researchers to conclude that the inter-locking cultural and social constructs of the complex school environment work together to influence teachers at the classroom level. Once in individual classrooms, the internal influences of pedagogy and attitude reciprocally and simultaneously influence actual technology use. While much is known about the individual constructs that influence technology use, further investigation is needed about how internal factors intersect with external factors to produce a change in the student-centered technology practices of teachers.

Summary and Conclusions

This review of the literature has framed student-centered technology use in the context of contemporary classrooms and explicated the primarily quantitative literature that defines the known influences on the technology use behaviors of teachers. Teachers are influenced by both the internal factors of teacher pedagogy and attitude, as well as external environmental factors. Pedagogical orientation influences the way teachers approach learning and think about technology use. A student-centered pedagogy is known to most highly influence student-centered technology practices, yet the belief-practice relationship is complicated and not linear. Attitude is a complex construct comprised of emotion, value beliefs, and self-efficacy, all of which have proven to demonstrate a powerful influence on teachers' ability and willingness to use technology in practice. Environmental factors represent a complex set of social and cultural factors that influence how teacher technology use practices are manifested. Each of these influencers has been studied heavily in isolation, but in reality, all three constructs work together to simultaneously influence teachers' use of technology. Further investigation of the intersection of these triadic influences may yield new insight into how and why a teacher shifts their instruction to embrace student-centered technology.

Gaps in the literature were found in several areas. Research studies on the influences on technology use behavior are predominately quantitative, and in-depth qualitative approaches are rare. Several quantitative studies addressed the intersection of the factors explained in this literature review in schools outside the United States and analyze the frequency of use or intention to use technology rather than the type of

technology use. Furthermore, few studies have examined internal or external influences on specifically student-centered technology practices, and no qualitative studies were found that investigate the intersection of these influences. Research is needed in new and different educational contexts, understanding that environmental influences will be different based on specific school dynamics.

This interpretive descriptive study addressed these gaps in the literature by using a qualitative approach to uncover the pedagogical, attitudinal, and environmental influences on student-centered technology use. Interviews with elementary teachers that actively use student-centered technology allowed in-depth insight into the influences that instigated their practice. All teachers interviewed in this study teach in faith-based schools, which provided new insight into an under-researched context. In Chapter 3, I present the methods used to conduct this study. Issues of trustworthiness, including credibility, transferability, dependability, and confirmability will be discussed. Ethical procedures will also be shared.

Chapter 3: Research Method

Introduction

The purpose of this qualitative study was to examine how pedagogical, attitudinal, and environmental factors intersect to influence the student-centered technology practices of teachers in grades 3-5 in faith-based schools. Although there is a large amount of primarily quantitative research on the individual constructs of pedagogy, attitude, and environment and their influence on teacher technology use, there are few qualitative studies that investigate how these constructs work together to influence teachers' use of student-centered technology (Durff, 2017; Ottenbreit-Leftwich et al., 2018). Even fewer studies analyze technology integration in nonpublic settings, and further investigation of sociocultural influences in these contexts is needed (Swallow, 2017; Swallow & Olofson, 2017). Teachers use of student-centered technology was examined in this study as this type of technology is believed to enhance students' readiness for a globally-connected and technology-infused world, and represents the kind of technology that elicits the development of 21st century skills (Gerick et al., 2017; Sias et al., 2017). This study has the potential to expand and deepen the scholarly understanding of factors that influence teachers' behavioral decisions to use technology in student-centered ways.

In Chapter 3, I provide a detailed description of this research study. First, I describe the research design and rationale, followed by an explanation of my role as the researcher. The following section will focus on methodology specifics and include participant selection, instrumentation, data collection procedures, and data analysis. Next,

issues of trustworthiness and ethical considerations related to this study will be shared. A summary of the research methodology will conclude the chapter.

Research Design and Rationale

The following three research questions guided this interpretive descriptive qualitative study:

RQ1: How do grades 3-5 teachers in faith-based schools explain the pedagogical influences on their student-centered technology use?

RQ2: How do grades 3-5 teachers in faith-based schools explain the attitudinal influences on their student-centered technology use?

RQ3: How do grades 3-5 teachers in faith-based schools explain the environmental influences on their student-centered technology?

The questions are grounded in components of the conceptual framework: social cognitive theory and first- and second-order barriers to technology integration (see Table 1). The first and second questions align with social cognitive theory and second-order barriers to technology integration, and the third question aligns with social cognitive theory and first-order barriers to technology integration.

Table 1

Alignment of Research Questions within Conceptual Framework

Research Question	Relevant Concepts
RQ1: How do grades 3-5 teachers in faith-based schools explain the pedagogical influences on their student-centered technology use?	Social cognitive theory Second-order barrier to technology integration
RQ2: How do grades 3-5 teachers in faith-based schools explain the attitudinal influences on their student-centered technology use?	Social cognitive theory Second-order barrier to technology integration
RQ3: How do grades 3-5 teachers in faith-based schools explain the environmental influences on their student-centered technology use?	Social cognitive theory First-order barrier to technology integration

An interpretive descriptive qualitative approach was the best methodological design to examine how pedagogical, attitudinal, and environmental factors intersect to influence the student-centered technology practices of teachers in grades 3-5. Interpretive description is a form of basic qualitative research that provides the opportunity to explore the meaning of real-world experiences by eliciting participant perspectives (Creswell, 2013; Patton, 2015; Thorne, 2016). This approach is geared toward use in clinical practice settings and is common in education research (Kahlke, 2014; Thorne, 2016). It is intended for smaller qualitative studies that seek to capture themes within subjective experiences (Thorne, 2016). Interpretive description encourages the researcher to draw

from models and concepts to frame the research (Merriam & Tisdell, 2015). In this study, social cognitive theory (Bandura, 1986) and first- and second-order barriers to technology use (Ertmer, 1999) were used to frame the study. Interpretive description elicited descriptive accounts from participants about the various factors that influenced their student-centered technology use. Results were interpreted and analyzed to discover relationships, associations, and patterns to better understand influences on teachers' use of student-centered technology (Thorne, 2016). According to interpretive descriptive design, the analysis of individual and collective expressions of the inherently complex phenomenon were then translated back into the practice setting, which in this study was grades 3-5 elementary teachers in faith-based schools (Kahlke, 2014; Thorne, 2016).

Other research designs were considered but ultimately rejected in favor of the qualitative interpretive descriptive approach. The case study design was rejected because the participants in this study were not bounded by place, and data collection consisted only of interviews (Yin, 2016). Ethnography was considered due to the study of influences on technology use in the culture of faith-based schools, but rejected because the intended participants were spread throughout the country, and in-depth and in-person field study was ineffective due to time and cost (Schwandt, 2015). The decision to use interpretive description over each of these cornerstone qualitative approaches rested on methodological flexibility and the desire to bridge the theory-practice divide, which is a goal and focus on the interpretive descriptive approach (Thorne, 2016).

Role of the Researcher

I served as the primary researcher in this study and was responsible for participant selection, design, instrumentation, and collection of data, and analysis of data. I was responsible for considering the influences of bias, judgment, and personal beliefs concerning the use of student-centered technology for instruction. While these personal elements were acknowledged, the interpretive descriptive approach encouraged me to consider my disciplinary orientation as a fundamental component in the study (Thorne, 2016). Interpretive description is designed as an approach for the study of problems within applied settings, and the disciplinary orientation helps the researcher understand the motivation for the study and what the potential audience for any new knowledge could be (Thorne, 2016). I balanced this orientation with the desire to attain new knowledge as I strove to capture the essence of the subject matter presented by my participants.

Participants in this study taught in faith-based schools. The faith-based schools used in this study share a common faith denomination and are a part of a system of schools referred to as the Faith System. A substantial number of educators in Faith System elementary schools were educated at one of the Faith System universities where they were trained in both general teaching pedagogy and faith-based instruction. As a graduate, current professor of education, and active participant in Faith System education conferences, it was possible that I would know several participants. The only individuals who were intentionally avoided for this study were former students I taught at my Faith System university. While relationships would now be power-neutral, former students

were removed due to the possibility that they may be tempted to sway accurate reports to please or impress a former professor. The management of researcher bias is paramount to credible qualitative research (Patton, 2015; Rubin & Rubin, 2012). Through all aspects of my research, I strove to maintain a high ethical standard and used a journal to record, observe, and address any biases that emerged during the study (Rubin & Rubin, 2012). Another way I planned to minimize bias was through consultation with my dissertation committee during all phases of research design, data collection, and data analysis.

Methodology

In this section, the methodology for this interpretive descriptive qualitative study will be described. Participant selection logic will be described first, followed by a thorough description of instrumentation, procedures for recruitment, participation, and data collection, and the data analysis plan.

Participant Selection Logic

Interpretive descriptive qualitative studies that utilize interviews as the sole source of data must find participants with extensive experience with the phenomenon under investigation so that accurate and credible results can be attained (Thorne, 2016). In this section, I clarify the target population, explain sampling strategies, define inclusion and exclusion criteria, justify the target sample number, and articulate the approach used to obtain a strategic sample fitting for this study.

The target population for this interpretive descriptive study was teachers of grades 3-5 who use student-centered technology in faith-based schools. To date, there has been substantial research into the influences on teachers' decision to use technology in general

and in public schools; however, there is less currently known about teachers in grades 3-5 (Pittman & Gaines, 2015; Howley et al., 2011), student-centered technology use (Ottenbreit-Leftwich et al., 2018) and the nonpublic school setting (Swallow, 2017; Swallow & Olofson, 2017). The research questions of this study were best answered through purposive sampling strategies that allowed me to access strategic participants in alignment to these parameters (Patton, 2015). To maximize homogeneity of the sample, all participants were required to teach in a Faith System school. Then, the specific purposive sampling approach of identifying key knowledgeables was followed to choose specific participants. Key knowledgeables sampling allows for the purposive selection of people with a certain body of knowledge desirable for a study (Patton, 2015). In this study, I purposively selected key knowledgables who utilize student-centered technology practices and teach in grades 3-5.

There were three inclusion criteria and one exclusion criteria for participants in this study. The three inclusion criteria aligned with the research questions. First, participants were required to teach in a Faith System school. Second, participants were required to teach in grades 3, 4, 5, or a 3-5 combination classroom. Third, participants were required to use student-centered technology. The exclusion criteria limits bias in the study and excludes participants who were former students of mine at their Faith System higher education institution. Upon expressing interest in taking part in this study, all participants completed a Google Form survey to establish that they met the stated participant criterion.

While there are no specific guidelines for appropriate sample size in qualitative studies, the researcher must confirm that samples are large enough to assure that all important perceptions or insights are uncovered, while also being cognizant of time and monetary demands that limit extensive qualitative data collection (Mason, 2012). The goal is to reach data saturation, which Guest, Bunce, and Johnson (2006) defined as the "point in data collection and analysis when new information produces little to no change in the codebook" (p.65). Data saturation is most likely to be reached when the researcher obtains rich and thick reports that include detail, specific description, and layered responses, no matter the sample size (Dibley, 2011). Guest et al. (2006) concluded that a sample size of four can even produce data saturation if participant responses demonstrate this rich and thick kind of data. While there is no unanimous number of interviews required, for purposively sampled qualitative studies, Guest et al. (2006) stated that six-twelve interviews should be adequate to attain saturation. The purpose of my study examined how common factors intersect to influence the student-centered technology use of teachers. To gather this information, semi-structured interviews were my primary data source. Since my aim was to understand common perceptions and influences among a relatively homogenous sample of teachers, I planned to conduct interviews with 12-15 individual teachers in an effort to reach data saturation as recommended by Guest et al., (2006).

Participants were recruited with the support of the Faith System Office of Rosters, Statistics, and Research Services and Faith System elementary principals. The Faith System Office of Rosters, Statistics, and Research Services provided me with email

addresses for all Faith System elementary principals in the United States. To assure ethical use of the email addresses for the stated purpose of this study, a data release and cooperation statement was signed by the Office of Rosters and Statistics and myself. This list of principals was emailed and a request was made that they identify teachers in grades 3-5 who use technology in student-centered ways, based on a brief research-based description of student-centered technology. Of the teacher names I received from principals, I removed the known names of former students from my Faith System institution. The remaining teachers were emailed an invitation to take part in my research study. If they expressed willingness to participate, I emailed them a brief message containing a link to a Google Form survey (see Appendix A) where they could indicate their agreement to participate by selecting "Yes, I consent," as well as complete participant criteria questions and biographical information. Data from the Google Form survey was vetted to remove participants who did not qualify for the study. Of those who volunteered and met the criteria for the study, the sample of teachers who demonstrated the highest level of student-centered technology use were chosen to take part in the study, which increased credibility and reduced selection bias as explained by Patton, (2015).

Instrumentation

The primary data collection instrument for this interpretive descriptive study was an interview guide (see Appendix B), consisting of an interview protocol and semi-structured interview questions (Patton, 2015). Interviews served as the only data source for this study and provided the necessary evidence to answer the research questions (Rubin & Rubin, 2012; Thorne, 2016). Interviews were most fitting for this study because

I was seeking knowledge about teachers' perceptions, feelings, and interpretations of their experiences in using student-centered technology, and interview questions provided a platform in which their experiences and perceptions could be shared

The interview guide was designed with semi-structured interview questions that were carried out in a responsive interview format (Rubin & Rubin, 2012). The responsive interview format allowed the interview questions to be conducted in a supportive and comfortable environment where the participant was viewed as a research partner, rather than research subject (Rubin & Rubin, 2012). While interview questions guided the conversation, the responsive interview format allowed me to flexibly add or modify questions in response to what was heard from the participant. The order of the responsive interview began with introductions and simple questions, built to more in-depth and targeted questions, and ended with an invitation for further contact (Rubin & Rubin, 2012).

The interview guide was used in each interview. It included an opening statement, two introductory questions, eight focused questions, and a closing statement (see Appendix B). The interview questions in the interview guide were developed based on a thorough review of the literature on pedagogical (Burke et al., 2018; Li et al., 2018; Mertala, 2017; Ottenbreit-Leftwich et al., 2018), attitudinal (Liu et al., 2016; Saudelli & Ciampa, 2016; Vongkulluksn et al., 2018), and environmental influences (Genlott et al., 2019; Sadaf & Johnson, 2017; Toh, 2016; Vanderlinde & van Braak, 2010) and sought to extract descriptive accounts from participants regarding the various factors that

influenced their student-centered technology use. Each interview question in the interview guide was aligned with a research question (see Appendix B, Table A1).

Other data sources that were used in the study included researcher notes during the interviews and a reflective journal throughout the data collection process. These sources were used as I engaged in concurrent data collection and analysis, as is expected in the interpretive descriptive approach (Thorne, 2016).

Procedures for Recruitment, Participation, and Data Collection

Once Walden IRB approval was granted, I contacted the Faith System Office of Rosters, Statistics, and Research Studies to generate a list of Faith System administrators that would be pertinent to my study. According to the 2018-2019 school year Faith System Statistics, there are 511 accredited Faith System elementary schools in the US (Schmidt, 2019), so I anticipated a similar number of principals. I emailed this list of principals, and other fitting Faith System administrators, the purpose of my study and requested that they reply to my email with the names of teachers in grades 3-5 who use technology in student-centered ways, based on a brief research-based description of student-centered technology. Of the teacher names I received from principals, I removed the known names of former students from my Faith System higher education institution, per exclusion criteria for the study. The remaining teachers were emailed an invitation to take part in my research study. This email stated the purpose of the study, the time required to participate, that participation would be voluntary, and that no compensation would be received. If they expressed interest in the study, I sent them a link to a Google Form survey (see Appendix A) where they found the official study consent form where

participants indicated their agreement to participate by selecting “Yes, I consent.” The form also included participant criteria questions and biographical information. Data from the Google Form survey was vetted to remove participants who did not meet the study criteria. Of those who volunteered, consented, and met the criteria on the survey, a sample of teachers who demonstrated the highest level of student-centered technology use were chosen to take part in the study, which increased credibility and reduced selection bias (Patton, 2015). Once participants were confirmed, I emailed each participant to confirm the date and time for each interview.

Interviews were conducted virtually via Zoom, where all interviews were recorded in a video file. Virtual synchronous meetings, facilitated by Zoom, were used because my sample population was from across the US, therefore reducing the opportunity to conduct face-to-face interviews. While Zoom was preferred due to geographic constraints, it is important to note that special attention was given to noticing subtle non-verbal communication cues that can be easy to miss when viewed through a screen versus face-to-face (Rubin & Rubin, 2012). Interviews were conducted using the interview guide (see Appendix B). Each interview was individual and took between 45-60 minutes.

The audio of each Zoom interview was also backed up with the recording application software called Audacity. The Audacity recordings was then uploaded to an online transcription service called TranscribeMe to produce verbatim transcribed documents. All video files, audio files, and transcriptions were kept on a password-protected computer, external hard drive, and online accounts.

After all interviews were transcribed, I sent each participant an invitation to proofread the transcript of their interview. Participants had the opportunity to correct any transcription errors that they found as well as add meaning to areas of the interview they did not feel captured what they intended (Rubin & Rubin, 2012). This practice increased the credibility of my study and also demonstrated respect and consideration for study participants (Rubin & Rubin, 2012).

Due to the large volume of Faith System elementary principals that were contacted to provide names of qualifying teachers for this study, I did not have a problem finding my 12-15 participants. It was not necessary to reach out to Faith System school ministry district executives to request their support in communicating with principals in their district. I found success in soliciting my full participant population through my initial method of contact directly through emails to Faith System elementary principals.

Data Analysis Plan

A data analysis plan that is in accordance with the interpretative descriptive approach was used to discern insight from the data collected in this study. Thorne (2016) suggested that data collection and analysis occur simultaneously in this approach. This concurrent and responsive relationship between data collection and analysis was necessary to confirm, test, explore, and expand on the conceptualizations that occurred during the data collection process (Thorne, 2016). This analysis was enhanced by principles of the constant comparative approach, which enabled a back and forth evaluation of concepts, properties, and relationships from one participant to another (Thorne, 2016).

Based on this recommendation, the first step in the analytic process occurred while data was collected. The data that was gathered during each interview was immediately reflected upon, transcribed through the TranscribeMe transcription service, and read so that the insights I gained from one interview could be used in the ongoing data collection process. Once data collection was complete, analysis continued through careful reading of each transcript multiple times, with notes taken on initial reactions, questions, themes, and hunches, with confirmatory and contrasting cases noted. The initial phase of data analysis emphasized a broad interaction with and understanding of the data rather than a deep dive into coding too soon (Thorne, 2016).

After reading the interview transcripts for overarching content, structural coding was used to highlight data related to pedagogy, attitude, environment, and first- and second-order barriers to technology integration, which aligned with the conceptual framework of the study. Structural coding connects a conceptual phrase that represents the topic of inquiry to a part of the data that relates to a specific research question or part of the conceptual framework and is suitable for use with interview transcripts (Saldana, 2016). Transcripts were hand coded with a color-coding system which indicated each theoretical connection, and first-round coding memos were noted on the transcripts. Coding for each interview was compared in order to better understand how they were the same and different. First cycle structural codes and corresponding interview data were transferred to a Microsoft Excel table which helped facilitate further analysis in second cycle coding. Table columns organized the structurally coded content and provided a place for further delineation of emerging codes during the second cycle (LaPelle, 2004).

The second cycle of coding built on the structural coding conducted during the first round yet was more inductive and addressed divergent themes that emerged beyond the conceptual framework. Pattern codes were developed to identify an emergent theme that pulled together a lot of material from first cycle coding into more meaningful units of analysis (Saldana, 2016). After second cycle coding was complete, the analysis of discrepant data was reviewed for further understanding.

Issues of Trustworthiness

Credibility

Credibility refers to the internal validity of the research, which determines if the study measures what it was designed to measure, and if the results are honest (Ravitch & Carl, 2016). In this study, credibility was enhanced through audio-recorded interviews, verbatim transcription, and aligned research design. Participants were asked to review their transcribed interview to be sure that it accurately captured not only what they said but also what was meant (Rubin & Rubin, 2012). I strove to present a thick description of confirming and negative cases, as well as worked with my dissertation committee to assess the efficacy of the codes and themes established during data analysis.

Transferability

Transferability addresses external validity and the extent to which research findings can be applied to other situations. The goal of qualitative research is not to produce true statements that can be generalized to other settings, but to develop descriptive, context-relevant statements (Ravitch & Carl, 2016). Transferability in this

study was enhanced through detailed explanation of my sampling strategy and participant size as well as thick description of the data and context.

Dependability

Dependability refers to the stability or reliability of the study (Ravitch & Carl, 2016). To enhance the dependability of this study, a solid research design was implemented. A reasoned argument for the qualitative approach, data collection, and data analysis was provided and is consistent with my argument. All notes, records, and transcripts relating to the study have consistently been stored in a secure location. To further enhance the dependability of my research findings, I used practices of data triangulation, researcher reflexivity, and audit trails (Merriam & Tisdell, 2015).

Confirmability

Confirmability is ensured through the researcher's ability to demonstrate neutrality as it applies to the study design and analysis. To achieve confirmability, I used a reflective journal to capture my positionality and potential biases (Ravitch & Carl, 2016), as well as constructed an ongoing audit trail that spanned from data collection through data interpretation. Triangulation in analysis was also used as a means to lessen bias and ensure confirmability (Patton, 2015).

Ethical Procedures

It is paramount that researchers uphold high ethical standards when conducting research. Ethical procedures are put into place to hold researchers accountable and also to protect the rights of study participants (Ravitch & Carl, 2016). I followed the standardized processes of Walden University's Institutional Review Board (IRB), which

held me accountable to the demonstration of high ethical standards throughout this study. I did not have contact with study participants or collect data until IRB approval was received. Upon approval, participants were asked to voluntarily consent to take part in the study. They were emailed an informed consent statement and were asked to respond with "I consent," which served as an electronic signature. Participants were informed of their right to withdraw from the study at any time with no consequences. All interviews were recorded, transcribed verbatim, and stored on a password-protected computer. Participant names and any identifiable information was removed from written documentation to protect each participant's privacy. The data collected during this study will be stored for five years and then will be destroyed.

Summary

In Chapter 3, I provided a detailed description of the qualitative interpretive descriptive methodology chosen to examine how pedagogical, attitudinal, and environmental factors intersect to influence the student-centered technology practices of teachers in grades 3-5 in faith-based schools. This included a summation of the research design and rationale; an explanation of my role as the researcher; methodology, including criteria and procedures for participant selection and recruitment, instrumentation and data collection procedures, and a data analysis plan. I concluded the chapter with strategies for ensuring trustworthiness of the study. In Chapter 4, I present study findings that emerged after data collection and analysis.

Chapter 4: Results

Introduction

The purpose of this interpretive descriptive qualitative study was to examine how pedagogical, attitudinal, and environmental factors intersect to influence the student-centered technology practices of teachers in grades 3-5 in faith-based schools. Research Question 1 asked how grades 3-5 teachers in faith-based schools explain the pedagogical influences on their student-centered technology use. Research Question 2 asked how grades 3-5 teachers in faith-based schools explain the attitudinal influences on their student-centered technology use. Research Question 3 asked how grades 3-5 teachers in faith-based schools explain the environmental influences on their student-centered technology.

In this chapter, I report the results of this research study. First, I describe the setting and share the demographics for the study followed by a through description of the data collection and data analysis procedures. Then, I share evidence of trustworthiness and the results of the study organized by research question. I conclude the chapter with a summary.

Setting

The setting for this study included teachers that were a part of Faith System schools. Faith System schools share a common faith denomination, yet are varied in terms of geographic location, size, school resources, and overarching school culture. According to the 2018-2019 school year Faith System statistics, there were 511 accredited Faith System elementary schools in the US (Schmidt, 2019). These schools are

overarchingly governed by a common faith denomination and are nested within seven geographical districts within the United States. The schools in this study demonstrated a representative range of school sizes found within the Faith System. The smallest school had 70 students and the largest school had 790 students. Two pairs of teachers in this study taught at the same Faith System school. The pairs were Participant 3 (P3) and Participant 9 (P9) in one school and Participant 2 (P2) and Participant 4 (P4) at another school. While P2 and P4 taught at the same school, P2 led instruction in a stand-alone K-5 combination classroom embedded within the Faith System school, thus resulting in differing resources illustrated in the table below. Each participant in the study had access to technological resources for student-centered technology use, yet the resources varied from several iPads to shared technology carts to 1:1 iPads or Chromebooks and robotics. Faith System schools are privately funded primarily through tuition, fees, donations, and congregational giving. The specific nature of each participant's school setting, as participants self-reported in the background survey, are shown in Table 2.

Table 2

Professional Settings of Study Participants

Participant	**Faith System Region**	**# of Students**	**Classroom Technology**
Participant 1	West-Southwest	205	Shared Chromebook cart
Participant 2	Great Plains	260	1:1 BYOD
Participant 3	West-Southwest	790	1:1 iPads Apple TV
Participant 4	Great Plains	260	2 iPads Shared iPad and Chromebook cart

Participant 5	Great Plains	75	Shared Chromebook cart
Participant 6	Central	70	1:1 Chromebooks Shared iPad cart
Participant 7	West-Southwest	120	1:1 Chromebooks Shared iPad set Robotics
Participant 8	East-Southeast	254	5 iPads SMART board
Participant 9	West-Southwest	790	1:1 iPads Apple TV
Participant 10	Great Lakes	223	1:1 Chromebooks SMART board STEM equipment
Participant 11	Great Lakes	167	Shared iPad and Chromebook cart Robotics
Participant 12	Great Plains	75	SMART board 1:1 tablets
Participant 13	Great Lakes	500	SMART board 1:1 Chromebooks
Participant 14	West-Southwest	256	1:1 Chromebooks

Demographics

Participants were recruited throughout all Faith System elementary schools. All participants taught in grades 3, 4, 5, or a combination grade setting. Four teachers taught third grade, three teachers taught fourth grade, three teachers taught fifth grade, and four teachers taught in combination classrooms. Thirteen participants were female and one participant was male. Number of years teaching and years teaching with technology are shown in Table 3.

Table 3

Participant Demographics

Participant	**Grade**	**Range of Years Teaching**	**Range of Years Using Student-Centered Technology**
Participant 1	4	8	6
Participant 2	Combo 1-5	6	6
Participant 3	4	3	3
Participant 4	4	20	15
Participant 5	Combo 3-5	6	6
Participant 6	Combo 3-4	5	4
Participant 7	3	11	11
Participant 8	3	10	1
Participant 9	3	15	15
Participant 10	5	19	8
Participant 11	3	8	2
Participant 12	Combo 3-4	25	10
Participant 13	5	21	15
Participant 14	5	24	14

Data Collection

Upon receiving IRB approval to conduct this interpretive descriptive qualitative study on January 29, 2020, I contacted the Faith System Office of Rosters, Statistics, and

Research Studies to request an Excel file that contained all accredited elementary Faith System schools, principal names, and email addresses. On January 31, 2020, I received a file with a total of 503 elementary schools. In the file, only 272 included principal names and email addresses. Emails were sent to 272 named principals, 194 schools with no principal name, and 28 emails were returned as undeliverable. Within one week, 62 principals replied to my email with 106 teacher nominations. Two former students from my Faith System university were removed from the list per exclusion criteria. I sent an email to the remaining 104 teachers with an invitation to take part in my study and a request to reply to my email if they were interested in participation. Twenty-six teachers expressed interest in participating in the study and were sent a Google Form survey that included the official study consent form, biographical questions, and an opportunity to self-report current use of student-centered technology. Twenty-two teachers completed the Google Form survey. Of these 22 teachers, the Google Form self-reported technology use responses were scaled and scored to select the teachers who demonstrated the highest level of student-centered technology use and five teachers were removed from the list of participants and sent a thank you email. Over the course of two weeks, 17 teachers were invited through email to sign up for an interview time using Calendly scheduling software. I chose to email 17 teachers, exceeding the planned 12-15 participant range, due to the slow response of several teachers, which led me to believe they had chosen to opt out of the study. In the end, all 17 teachers signed up for interviews.

Seventeen interviews took place from February 8 to March 3, 2020. All interviews were conducted and recorded virtually via Zoom and backed up on an audio

file with the recording application software called Audacity. All 17 interviews were conducted individually using the interview guide (see Appendix B) and took between 45-60 minutes.

Upon completion of the interviews, it became clear that 3 participants needed to be removed from the study due to their inability to meet all study inclusion criteria. Although their Google Form survey responses indicated their use of student-centered technology, the interview questions more fully identified that while technology was used in their classrooms, it was actually conducted in more teacher-directed and low-level ways. In order to stay aligned with the problem, purpose, and research questions of this study, it was paramount that all participants use technology clearly in student-centered ways. For this reason, their interviews were omitted from data analysis and the participant pool for this study was changed to 14 participants.

The Zoom recordings of the 14 interviews that fully met the inclusion criteria for this study were uploaded to an online transcription service called TranscribeMe and verbatim transcribed documents were produced. After I edited each transcript and changed participant names to pseudonyms, I emailed the transcribed interviews to each participant with an invitation to correct any transcription errors as well as add meaning to areas of the interview they did not feel captured what they intended. No transcript corrections or follow-up questions were necessary.

Data Analysis

The data analysis plan for this study began during the data collection process. In alignment with the interpretive descriptive approach, the concurrent and responsive

relationship between data collection and analysis was used to confirm, test, explore, and expand on the conceptualizations that occurred during the data collection process (Thorne, 2016). After each interview, initial insights and reflections were recorded, including potential biases I needed to be aware of. Ongoing perspectives were recorded in the reflective journal and were consulted regularly throughout the interview process.

Once the interviews were completed and the TranscribeMe transcripts were received, I listened to the recordings and reread the transcripts to check for accuracy and ponder the content of each interview. While I listened and read, I highlighted key information and took anecdotal memos of initial impressions and thoughts connected to the research questions. Then, the large data set was structurally coded according to the conceptual framework and research questions used to frame the study (MacQueen et al., 1998). Transcripts were hand coded with a color-coding system which indicated each connection to the conceptual framework, and first-round coding memos were noted in my ongoing reflective journal. First cycle structural codes and corresponding interview data were then transferred to three different Microsoft Excel sheets named pedagogy, attitude, and environment, which correspond to the conceptual framework and the 3 research questions in the study. Each Microsoft Excel sheet contained 5 named columns including interview question, participant pseudonym, page number of utterances, spoken words, and a blank cell for coding purposes and multiple unnamed columns set aside for further second cycle coding purposes. The Excel sheet columns organized the structurally coded content and provided a place for further delineation of emerging codes during the second cycle (LaPelle, 2004).

The second cycle of coding built on the structural coding conducted during the first round yet allowed for more inductive and divergent themes to emerge beyond the conceptual framework. Each structurally coded Microsoft Excel sheet was analyzed individually to address pattern codes that connected to the corresponding research question. Each structurally coded Microsoft Excel sheet was read from start to finish and open coding was conducted to explore ideas and meanings contained in the raw data (DeCuir-Gunby, Marshall, & Mcculloch, 2011). Through an iterative process, open codes evolved into pattern codes that combined data from first cycle coding into more meaningful units of analysis (Saldana, 2016). A codebook table was developed with clearly articulated definitions for each code and then that was used to recode each structurally coded data set. The data was then compiled, sorted, and resorted by pattern code to explore further meaning and develop themes. This process was repeated for all 3 structurally coded components.

Themes emerged for each of the research questions. Four major themes emerged in response to RQ1 regarding how grade 3-5 teachers in faith-based schools explain the pedagogical influences on their student-centered technology use. The four major themes were student-focused, purposeful learning, pedagogical beliefs, and time. Three major themes emerged in response to RQ2 regarding how grade 3-5 teachers in faith-based schools explain the attitudinal influences on their student-centered technology use. The three major themes were value beliefs, reevaluation of tech use, and professional mindset. Four major themes emerged in response to RQ3 regarding how grade 3-5 teachers in faith-based schools explain the environmental influences on their student-centered

technology use. The four major themes were availability and usability of tech, administrative leadership, collegial engagement, and students as technology natives.

Evidence of Trustworthiness

In this study, credibility was addressed in several ways. I conducted accuracy checks of the verbatim interview transcripts with each of my participants, I used thick description of confirming and negative cases, and I used an aligned research design throughout the study (Merriam & Tisdell, 2015). I worked with my dissertation committee on an ongoing basis to assess the efficacy of the codes and themes established during data analysis. To further strengthen credibility, I collected data until I achieved data saturation as described by Merriam and Tisdell (2015).

Transferability, or external validity, was enhanced through thick description of the study context and study participants (Shenton, 2004). This included a description of the Faith System culture and delineation of varying features of the schools within the system. The professional setting and participant demographics were clearly articulated.

I addressed dependability by executing a carefully planned research design. I provided a reasoned argument for the qualitative approach, data collection, and data analysis processes (Shenton, 2004). I used practices of peer review through ongoing and detailed feedback from my dissertation committee. Throughout the data collection and data analysis period, I kept an ongoing reflective journal that served as both an audit trail and a record of researcher reflexivity (Merriam & Tisdell, 2015).

To achieve confirmability, I used a reflective journal to capture my positionality and biases throughout the data collection and data analysis process. My audit trail

documented each step within the data collection and data analysis process. Triangulation of data from multiple participants was also used as a means to lessen bias and ensure confirmability (Shenton, 2004).

Results

In this section, I report study results organized by research question. The data came from in-depth interviews with 14 grade 3-5 teachers in faith-based schools. Participant responses were originally organized in transcripts according to interview question and then through two rounds of coding and further data analysis I was able to interpret the patterns that emerged into the themes reported below.

Research Question 1

The first research question explored how grade 3-5 teachers in faith-based schools explain the pedagogical influences on their student-centered technology use. There were four major themes that emerged in analysis of participants' experiences: student-focused, purposeful learning, pedagogical beliefs, and time. Support for each of these themes are described below.

Student-focused. The study participants indicated that the students strongly influenced teacher use of student-centered technology. This student influence empowered teachers to let their technology use be driven by the students.

Student-focused: Student response. Teachers reported that their students liked using technology. P4, P5, P6, and P7 provided ongoing insight regarding students' liking of technology and others shared students "love making videos" (P3), "seem to enjoy it"

(P10), and “kids really like it, they take to it” (P1). More specifically, P1 shared how students’ liking technology influenced quality:

> It's not always going to be fun, and I'm not saying if-- none of you are having fun then we're not going to do this, but you're just finding that that right amount of engagement and learning. It affects also the outcome of the product that they produce too. If they don't like doing it, then it's not going to be a good quality.

Teachers also reported that their use of technology is influenced by the students’ response to experiences with technology. When asked what influences her technology use, P14 responded, “A lot of it is how the students respond to it. I like to find what’s relevant.” P5 had a similar response, “Probably my biggest influence is the students. And just trying things in the classroom and finding out what works and what doesn't with them.” P1 expanded this idea by including student interest:

> I would say definitely the kids. There have been years where I've used it less or I've used it more. Some kids they really like it. They take to it. And so, yeah, I mean, the kids’ kind of drive it, depending on their interests. Some kids don't feel comfortable sharing their work, or they don't like speaking into the video and having it played, so I kind of have to be kind of aware of things like that, and adjust as necessary.

New to the use of student-centered technology, P8 felt encouraged to loosen her more traditional top down approach to project work as she watched students thrive when using technology without so many parameters in place. While P10 has been using student-centered technology for many years, she is still influenced by student investment in

student-centered technology projects. After students conducted research and designed technological solutions to a science problem, P10 reported:

> The kids, they loved it, and it was theirs. They took more ownership of it and they weren't happy with just being mediocre on that one. They pushed themselves to get it exactly the way they wanted it, whereas if I just had given them a worksheet or something to do, they would have turned it in, done, and not have been proud of the work. So definitely, student-driven gives them more ownership and results.

Participants were influenced by their students liking of technology and their reported use of student-centered technology was powerfully influenced by the students themselves.

Student-focused: Student driven. Study participants also extended the idea that students' response to technology influenced their use, when they reported that students actually drive the development of projects or use of technological tools. P5 shared that the coding program at her school began through student-driven interests. After she overheard students discussing their video game coding dreams for the future, she exposed them to coding options in the classroom. The students responded with passion and excitement, and she therefore followed up with implementing coding into the schoolwide curriculum. P1's fourth graders proposed involvement in a grant to clean up the beaches and nearby communities that involved student-led planning and the development of a 7-15-minute video montage of their work. Their desire to take part in this grant led P1 to teach them how to use iMovie for an authentic purpose. P1 further discussed how student interests and passions influenced the development of parody Christian music videos and bible-based skits with a greenscreen:

> I had this one class that was very much like they always wanted to dance and perform. And that was their thing…and when you form a committee and the students are leading it, you kind of go with what they're passionate about. So, it's like, "If you guys are up for it, then I'm up for supporting you." If the kids are not driven, then it's like, "Okay. Then, I'm not going to be the one doing all the work."

Participants in this study were willing to take on student-initiated projects and programs, demonstrating their connection to student ideas, needs, and desires.

Purposeful learning. The grades 3-5 teachers interviewed also explained that their pedagogical use of student-centered technology was influenced by the desire to produce purposeful learning experiences. They were influenced by purposeful learning that was differentiated, authentic, and provided evidence of learning.

Purposeful learning: Differentiated. Having already acknowledged the participants beliefs about student-focused technology use, further support for this idea emerged when considering the production of purposeful learning opportunities. 9 of the 14 participants acknowledged differentiation as a component of their influence on using student-centered technology. P2 articulated that technology allows students to learn individually, which becomes the driving force behind "how we can meet every students' needs." P12 described technology as an "invaluable tool that I would never want to be without" when describing his use of technology to "gear instruction to the learner one-on-one." His philosophical emphasis on the use of differentiation to support learner success was paramount throughout his interview and was the primary motivator for technology

use in his classroom. P6 included ease of use as she articulated the role of differentiation in producing purposeful learning in her classroom:

> I use technology for differentiation just because each student works at their own level, and it's just an easier way through technology than making copies or realizing that I can't work with every student at the same to help them. I had put some students on technology to work on this while I work with this small group and, then, vice versa. It just kind of gives me more flexibility to kind of work with students where needed and help them improve the skills that they need.

Other teachers provided more specific implementation examples of purposeful learning opportunities that include differentiation. P8 described embedding MAP testing scores into Khan Academy to produce on-target learning experiences for her students. P8 stated:

> And that is quickly becoming a favorite of mine because it's so catered to exactly what they need at whatever level they're on. Because there's no way to reach grades one through five in a third-grade classroom if that's the range in their geometric reasoning.

P5 also provided a specific example of differentiation to support student pacing needs:

> Coding is all self-paced. Because I find it's really hard with-- especially with the coding stuff, to work kids through step by step-by-step altogether because you have those, like my two older boys, who are going to zip through 30 lessons in 10 minutes and have it. And then I've got other girls who've been coding for two years and are still on the beginner level.

P4, P6, P12, and P14 referenced specific software programs that allowed them to meet the specific learning needs of students. P4 explained:

> Right now, my students have really been enjoying Prodigy Math. And it's one of, I know, many, many programs that has kind of an adaptive feature, and so the students can be working on problems that are appropriate. Either I can set it for topics we're currently studying, or it can be kind of self-leveled, so they are working on different types of problems.

Study participants explained that differentiated experiences produced purposeful learning opportunities for the wide variety of needs in grades 3-5 classrooms.

The teachers in this study also reported that differentiated technology use provided opportunities for student interaction in decision making and assessment. P2 teaches in a multi-grade 1-5 classroom where differentiation and student decision making are paramount to purposeful learning opportunities. P2 stated:

> So they do a lot of math and a lot of ELA skills on their own using technology. Sometimes they're picking skills. Sometimes skills are assigned to them. And so in this environment, if you come across a topic that you're just like what, you can actually try it and then step away from it and work on something else. And it's not that you get to skip it. But you get to come back to it at a time when you are prepared mentally and you're making the choice.

P4 and P12 mentioned that while software programs allow for teacher-directed practice on needed skills, there are also often opportunities for choice. P12 stated:

> There are some scores they're working for. And once you move beyond that, then they can kind of direct the direction they're going, as long as they're working with that IXL math.

Other participants were highly influenced by the feedback and self-assessment that differentiated technological experiences provided. P2 described that students are empowered by feedback and personal application. She reflected that technology provides "instant feedback" which allows students to "catch their errors quicker and to investigate on their own…[Students] feel like the ones that are comprehending why the mistakes are made." P3's students have created a vault of videos to support their own learning. She finds value in the ongoing availability of these technological artifacts to support ongoing learning efforts:

> And then if my students are ever in a position where they forgot how to do it, they can go back to their own digital videos. And the parents see those too. So then when they're at home and they're like, "Oh. I forgot how to do long division or I forgot how to do 2 by 2 multiplication." There's this whole database, this whole resource, now, that they've created that is by them.

Similar to P3, P9 spoke of the iterative process of returning to work that is posted in a technological way and values student self-assessment. P9 reported:

> The kids have had the chance [to post work] through the program Seesaw. And it is in ways not fully edited by the teachers, so it's the kids put it out there and they after a while might come back and go, "I saw that mistake. Can I go back now and correct it?"

The participants in this study were influenced by opportunities for student interaction in decision making and assessment.

While 9 of 14 participants spoke in favor of differentiation as a tool to provide purposeful and individualized learning opportunities, P4 also did bring up some reservations about taking the practice of differentiation and individualized technological tools too far. P4 stated:

> I just have these reservations. And I know there's good things. I see the good things but some of the-- maybe going to that as more of a core piece where the students are all working individually. There are just pieces of that that just don't sit right or don't-- that would be the pedagogy piece I'm like-- I think about all those good interactions. I think about the students who are able to achieve at a higher level. That it's still valuable for them to hear material again, to at times be able to support their peers. As well as the students who might be struggling, they can still gain from whole-class learning or hands-on manipulatives or even just writing it out paper, pencil versus using your keyboard.

Purposeful learning, supported by differentiated learning experiences, influenced the grades 3-5 teachers in this study to use student-centered technology.

Purposeful learning: Authentic. Study participants explained that another attribute of purposeful learning that is valued is authentic sharing. Many participants articulated the importance of sharing what students have learned with parents, with other classrooms, and even with the community. P4 explained that authentic learning, “making sure that [students’] working effort can be noticed beyond just the teacher,” is often

showcased well with technological tools. She said, “I think technology lends itself to a lot of sharing what you've learned, and so I think that's another valuable piece.”

P1, P3, P4, P7, P8, P9, and P11 all reported practices of sharing student work with parents, utilizing apps such as Class Dojo or Seesaw. They reported that these technological platforms got kids excited and made the sharing of learning more intentional and purposeful. Parents and students alike reported enjoying the ability to comment back and forth. P8 mentioned, “the parents love that they can comment on their child’s work, and their child can see it immediately.” P11 reported that she primarily used Seesaw for the “positive parent interaction” and the opportunity to showcase authentic learning.

Teachers in this study also valued the authentic opportunity to share learning with other classrooms. After producing stop motion movies about the water cycle, P7’s 3rd graders presented their learning to other classrooms. P7 reported:

> I let them go show second grade and one of my teaching buddies that I taught with when I was in the middle school, we took them down there to our seventh and eighth graders. And they were really great with it. And so, yeah, the kids got to share. It was fun.

P8’s class has an ongoing partnership with a 3rd grade class at a different school. She explained:

> We have another private school here in [Redacted] County, another Christian school… And the kids can share the things that they're doing with the third-grade classroom at this other Christian school. It's nice they're able to share with another

> third-grade classroom things that they've created. And they send things to us (The name of the county is redacted to protect the identity of the school).

Other study participants were able to expand their authentic sharing opportunities beyond the school. During a unit on composting, P2's class experienced purposeful learning through exposure to authentic audiences in several ways. P2 explained:

> The fifth graders were in charge of having a meeting with the principal and with the head of facilities at our campus. And then so these fifth-graders were sitting down in this meeting with those people, and they used technology to prepare what they were using. We also put together a commercial for a compost club, joining the compost club, so we made a video with that and the chart apart and we showed that to the school and to our community. So we weren't just using technology in the classrooms to present to the classroom but we were using technology for the community.

P1's fourth grade class also found opportunities to share their learning with a wider audience. P1 described:

> Well, I do have a YouTube channel…we've actually used a greenscreen to make videos like Bible-based like skits online. And we've made like parody music videos but that are like Christian. Christian-based all shared on my channel.

Study participants communicated that they valued purposeful learning opportunities through the opportunity to share with authentic audiences.

Purposeful learning: Evidence of learning. The grades 3-5 teachers in this study explained that their pedagogical use of student-centered technology was influenced by

purposeful learning experiences that showcased evidence of student learning. P8, P9, P10, P11, and P14 expressed interest in activities that allowed students an opportunity to apply what they learned. P10 described that her favorite way to implement student-centered technology was "where the students have to prove, give me evidence of a topic." After creating online trading cards about the early American explorers, her students "share out and prove that they can do it and it's engaged; it's hitting numerous different learning strategies and how kids learn themselves." Similarly, P14 emphasized opportunities that allowed students to demonstrate conceptual understanding. She explained:

> I will teach them stop-motion just so they have that tool. But then what I want them to do is I want them to take a science lesson, and I want them to create their storyboard, which of course, requires greater thought because they really have to plan. And then I would like them to bring a concept to life using something like stop-motion. Stop-motion is only a tool that they like to go much deeper with their conceptual understanding.

P9 expressed a similar emphasis, yet tied evidence of student learning to specific standards. She reported:

> It went along with our science unit, and so what the kids did was they created an augmented reality. I think it was through an app called AR Makr, and they went through and created that. And then we took those pictures and dropped them into the app Clips, and then the kids labelled it and created a video about it. So we went through, and they had certain standards. They had to define what their

> ecosystem was, where they would find their ecosystem. They had to have at least 10 things, living and nonliving, in their ecosystem.

P8 stated that technology allowed students to demonstrate evidence of learning in novel ways. She explained how her students made inanimate objects come to life with the app Chatterpix, which allowed them to demonstrate mastery of content in unexpected ways. P8 said:

> [Students] were putting mouths on our place-value structures and saying how much they are worth. The amount of learning that went on with that added level of technology, that was really neat because I knew that their parents were going to see it. So they were kind of showing off. And suddenly, they wanted to make even bigger structures so that they can have the highest number, you know what I mean? So, it's an element that we couldn't add on our own.

Participants in this study also reflected about how their use of technology has shifted from an emphasis on engagement to a focus on purposeful learning that provided opportunities for student creation or use of higher-level skills. One way study participants explained this shift was by reflecting on how their use of technology has changed over time. P2 stated that she was previously using technology to “give better lectures” or as a “glorified whiteboard for the kids to work on.” Now, P2 stated, “if I'm going to use technology, it has to do something more than just change the look of what's been done.” P11 expressed a similar transformation as she reflected on how her use of technology has changed over time. P11 stated:

> My definition of student-centered technology came from more of a review game of some kind online to actually creating projects and have them be creative. So in the past-- and I still use the Kahoot app to review for social studies class, but I did a lot more of that in the past, whereas now I'm trying to switch a little bit to giving them a little bit more creative projects like the social studies Google drive that they did recently.

P6 reflected on her students' engagement with technology. She reported:

> I would also say the first year it was more things that were just, I don't want to say just to entertain students, but it was like, "Okay. You've got to type or you have to do your spelling words." Or it wasn't necessarily always research-based. The kids weren't researching for themselves. It was more just here's some websites to help practice games or to help learn things but not them taking charge, I guess. It was me telling them, "Hey, practice your multiplication facts. Here's a website." Versus now, "Let's do some research and find it out on our own.

P3 and P14 reported that their students learn new technologies by actually using the technologies. P14 said, "I could spend a lot of time teaching them how to use something or let them learn by doing. And they seem to do a little better learning by doing." She also said:

> I used to have to show a lot more and now it's more exposing them, getting them started, and letting them take off… I have helped [my students] grow to understand that, "We don't teach you how to use everything anymore because

> what we're teaching you today, be it even coding, that program is not going to exist in five years. So, you just have to learn by doing."

P3 added:

> I have just become more comfortable with saying even if they don't understand this absolutely the right way the first time doing something through technology, we can learn through the process of it.

In addition to making changes in their instructional use of technology overtime, study participants spoke about their critical choice to use student-centered technology to specifically enhance student learning. P14 expressed that she thinks critically about the technology experiences she provides because some offer more value than others. She stated:

> There are things on technology that I feel are more engaging and fun, and that's its purpose, but I don't know that it truly makes a huge difference. And that may be things like Padlet, where it's kind of like, "Okay, let's today instead of writing it on little post-it notes. Let's all post our post-it notes online." It's fun. It's a great deviation, but I don't need to do that every day. And even things where you do quick little formative assessments, I think they're great, but you know what? I don't always want the kids to know that they were the one that got it wrong, and everybody else beaned on B and theirs is on C. You know what I'm talking about. So, there's nothing wrong with that, but I don't know that I see it as something I need to invest a lot of time in, because I don't know that it's better than what I'm doing.

As a new user of student-centered technology, P8 provided a fresh perspective on this shift to enhance student learning. P8 stated:

> This is all still really new to me but I will tell you like I just said my entire approach to it is completely different now...I see how [technology] can support what we're teaching in the classroom, how it teaches them to not just be consumers of what we're teaching but they're producing something which is a really big shift. And that I think as educators what we want. We don't want them just sitting there taking stuff in. We want them doing that higher-level learning and producing something.

P8 also reflected that she saw how creating with technological tools helped shift children's desire to create and produce in other authentic settings. She said:

> If we can get them realizing that they're capable of producing something really valuable and not just sitting and staring at a screen that they can-- and this has prompted, honestly-- they get together on the playground, and we have to staple-- I can't even tell you how many rings of paper we've gone through this year because now they want to create-- they sit out on the playground, especially my little girls-- they'll sit, and they'll put books together. They'll write books, and then they'll want to come up to the classroom and do the ChatterPix to add a mouth to one of the pages in the book so that the page can talk. I mean, they're producing, and that's a good thing.

P11 also reflected on the role she can play in enhancing student learning with technology:

> I noticed that [students] all have technology at their house, and they're using technology, but I feel like it might not be-- they might not be using it in a more critical thinking type of way, and I know that when they're with me, I have that opportunity to help them create and be creative, and use critical thinking skill either individually or as a collaborative piece.

Study participants expressed that they were pedagogically influenced to produce purposeful learning opportunities that offered opportunities for high-level technology use and creativity.

Pedagogical beliefs. Participants agreed that their pedagogical beliefs about best fitting instruction and the perceived role of the teacher influenced their pedagogy when using student-centered technology. While the participants represented some variation in their level of constructivist pedagogical thinking, many discussed a pattern of direct instruction and modeling followed by student-centered uses of technology and a hands-off faciliatory teaching role as influences that are a part of their decision to use student-centered technology.

Pedagogical beliefs. Direct instruction then student-centered technology use. The grades 3-5 teachers in this study explained that their pedagogical use of student-centered technology was influenced by their beliefs about teaching and learning and often followed a pattern of direct instruction and then student-centered technology use. P4, P7, and P9 explained this by discussing the importance of pre-teaching technology skills before allowing student-centered exploration with the tools.

P4 stated:

> I think that student-centered technology should be something that the students can use and be successful with, ideally with less interference from me. And maybe that means that there's training prior to that, but then the actual projects or the times when they're getting to set the goals or to make a lot of the decisions that they are equipped to do that. Otherwise, I think it just goes back to being kind of teacher-directed anyway.

Similarly, P9 explained a similar pattern:

> And so we had done a lot of pre-teaching and had given them kind of an outline to fill out and brainstorm and come up with ways and then they got to kind of have more free reign and struggle a little bit with getting the font size right, getting the titles, and going through that. But they had that chance to apply the lessons we had initially-- they got to apply it to their learning and then that was something we eventually posted on Seesaw.

P7 added:

> I basically just gave them the iPad, taught them what stop motion meant, meaning, taking out the pictures, and they put them all together and so forth. Once they had a little bit of background, they just ran with it. And I just kept the mess under control. Because they had to create all their stuff.

P14 demonstrated similar thinking when she said, “we will have periods of direct instruction, but I want them to then take what they've learned and I want to see what they can do with it.” Once students have the technological tools, they have choices afforded to them. P14 reflected:

> And because they learned [the tools], then I could easily say, "Well, we're learning this concept. What tool do you want to use to demonstrate learning?" And then they can choose Minecraft, and they can use stop-motion. They could use Scratch. So, I really like to expose them to different methods that they learn actually very easily and then apply it to some deeper thinking.

Other participants describe pedagogical beliefs that are in contrast to student-centered constructivist principles or are in a state of evolution. When asked if there was anything in her approach to teaching that is a hindrance when using student-centered technology, P11 reflected:

> It might be the transition from a teacher-centered lesson to more of a student-centered lesson. I know that when I went through college, and as well as now with some of our mentor teachers, I feel like that-- the influence of them is just be the teacher. You're the one teaching instead of giving it to the students or opening up for questions, open other things. I do see a transition though. And so I would like to try to be better at that. And making sure that we kind of open it up to more student conversation and less me talking.

P7 described an evolution in her pedagogical approach:

> As far as the way I started as a teacher, it was very much me in front of the room, doing all the teaching, all the talking, leading all the discussions to where I am now. There's still direct instruction, but the kids do a lot of stuff…They have their parameters, but they're the ones that are just kind of doing it. And so, I've changed, as a teacher, from when I first started to now, and then in that change,

> I've been more open to using not just student-led technology stuff, just student-led everything.

As previously described, P8 is new to using technology in student-centered ways and she expressed an ongoing struggle in its use. P8 described herself as being "very old-school," and shared the following reflection that demonstrates an ongoing struggle in her pedagogical beliefs:

> Like I was saying, I think, there needs to be a balance of what, traditionally, we know has worked. We know that reading good quality novels to them is going to help with their fluency and their vocabulary. But obviously, you're going to have to partner that with the ability for them to be able to do something…And I think I had to see it to actually believe it…I just think, at the elementary level, it needs to be a little bit more limited.

The pedagogy of study participants, and particularly their pedagogical beliefs, influenced their use of student-centered technology.

Pedagogical beliefs: Facilitator. Many participants reflected on their hands-off faciliatory teaching role as influential to their approach to using student-centered technology. P2 summarized her perception when she said, "I see my role more as helping students learn how to learn and learning with them. And if we don't know the answer, let's see how we can find it." P7 described her role as a "monitor of their activity versus direct instruction" and "it's me more so just kind of walking around and making sure you're staying on-task." P1 reflected on the faciliatory role as a shift in practice:

> And so, I think as teachers we're moving into this new phase of us being not just teachers but moderators and mentors and just helping the kids come up with their own conclusions and their own findings and their own evidence for things. It's a very interesting time. So you have to create that safe environment for them to be able to share and think outside the box and not be afraid to make mistakes and say the wrong things, so.

P8 provided an example of her shifting thinking regarding the use of teacher-directed guidelines and the more open-ended role of the teacher when she said:

> So I think my [thinking] is completely different now than it would have been a year ago where I would have said oh, my gosh, no. There has to be rules and there has to be structure. And what if they go on YouTube and they look up something inappropriate? You kind of have to just know these are the apps that are available in our classroom and just kind of sit back and get out of the way sometimes and just let them-- without any of those parameters just kind of let them be. Because that's honestly when I get the most out of them. It's pretty amazing. And I wouldn't have believed that a year ago.

Time. For the teachers in this study, the pedagogical use of time was influential to their decision to use student-centered technology. The teachers reflected on strategic decisions regarding how to use time for technology integration. Even after thorough descriptions of how technology was used in their classrooms, P3, P8, P9, and P12 all specifically mentioned a self-imposed one-hour time limit to technology use per day, with some days set aside as “no-tech days.” P9 explained:

> I usually don't pull iPads out on Mondays and Fridays just because those are kind of content-heavy days in some ways. And when we do have them out, I personally try to limit it to an hour a day throughout the different subjects… I think my particular teaching has definitely evolved to incorporate more and more [technology]. And even sometimes I look at it and I'm like, "Well, am I doing too much technology-wise? Am I not doing enough of the old school anymore"?

Further, P3 explained how the influence of time influenced her pedagogical approach to teaching:

> I would say that I really struggle-- I struggle with the amount of time that they spend on the screen. And so if I look at my daily lesson plan, I try to make different types of learning environments for each of my lessons which if I'm doing a reading lesson where we're simply reading the textbook and answering a sequencing page or something, I try to keep that one solely just textbook and a paper and pencil. And then later on in the day in science, I'll say like, "Oh. We didn't get a chance to use our iPad for anything." We're working on our keynote project, so I'm going to have them work on that aspect of the research… sometimes I just feel like without a clear balance, it's just going to-- is your whole day on an iPad?

P8 discussed her use of specific technologies and the system she uses to organize the time. P8 explained:

> We only have a few days a week that we're able to [use the iPads]. And the days that we're able to do it-- we do about three, 20-minute rotations-- is all we really

have time for. They are free to use iPads during their fun Friday, which is about 45 minutes on Friday mornings. So if they choose to use the iPad then, they can.

Participants also discussed that curriculum resources are more and more online and require the use technology. P1 discussed balancing the math and language arts curriculum digital components for her use at home and at school. P13 reflected on how the ongoing addition of digital curriculum adds to the amount of time she must consider when utilizing technology. P13 reflected:

> Now, our new reading curriculum is very online-driven. We have our textbook and we have audio clips, and our workbook, it's all visual and online, so we're really using that a lot. And there are days when I would rather have them just open their book and read the book themselves.

The last time connection relates specifically to the combination room setting in which P2, P5, P6, and P12 teach. They all spoke of how the use of technology intersected with time and their ability to interact with individuals and grade level differences. For some, technology served as a differentiated time filler. P6 said:

> There's just a huge difference in academic ability, and there should be from an 8-year-old to a 10-year-old. So, using [technology], have a math resources where if they have free time, they can go on and it goes to their specific ability level. I use Prodigy, which is a game-based math site and it puts them at their own level… Sometimes if I'm working with third grade independently, fourth grade needs something to do. I'll tell them, "Oh, get on your Chromebook. Go on Prodigy.

> Practice your math." And then we switch, and I'll teach the other grade. And the other one can do that as well. Same for reading.

P6 and P12 also discussed how student-centered technology saved time for instruction and preparation. P6 said, “it just saves time as well. What used to take me half an hour to give two different spelling tests, the kids can get it done in five minutes then, on their own.” P12 reflected that his approach to using technology to support the varied learning levels in his third and fourth combination classroom has shifted over time and has influenced his personal prep time:

> So technology has just made [differentiation] easier for me. I don't think it changed my philosophy. It's just allowed me to walk out of the building at 4:30 and not 6:00. It may be a matter of practicality.

Time issues presented a powerful pedagogical influence on the student-centered technology behaviors of the teachers in this study.

Research Question 2

The second research questionRQ2 explored how grade 3-5 teachers in faith-based schools explain the attitudinal influences on their student-centered technology use. There were three major themes that emerged in analysis of participants’ experiences: value beliefs, reevaluation of tech use, and professional mindset.

Value beliefs. The grades 3-5 teachers interviewed in this study expressed an attitudinal influence on their student-centered technology use based upon their value beliefs. Value beliefs regarding technology address the extent to which teachers believe that technology can help them achieve the instructional goals they identify as most

important for student learning. Participants in this study expressed attitudes that the value of student-centered technology overrides the struggle it presents, they discussed divergent values ranging from basic skills to 21st-century skills, and also shared their desire to equip students for life.

Value beliefs: Value overrides struggle. Participants in this study explained that their belief in the value of student-centered technological experiences outweighs the struggle involved. This sentiment was expressed overarchingly, however, P3, P6, and P8 articulated it most clearly. P6 said:

> A lot of times my first year there it would just be a hindrance because the internet wouldn't work or this wouldn't hook up right. And then just realizing all the things that it can do and how beneficial it is. And it's kind of like, "Okay. I can work through the hurdles of technical issues because of the benefits that I can see with the students."

P3 explained:

> My attitude towards [technology] is even though I probably face weekly struggles with it, I'm not going to give up using technology because of the benefits that I see. And that's probably the biggest thing.

P8 reflected that “once you see the benefit of using [technology], as intimidated as you are by it, once you see the benefit of what they're able to create, you're hooked. It just takes one time.” For participants in this study, the value of the student-centered technological experiences far outweighed the struggles and they chose to persist through it.

Value beliefs: Divergent values. The participants in this study expressed divergent value beliefs that exposed an interest and desire for both basic computer skills as well as the development of 21st century skills. These contrasting values influenced how teachers integrated technology.

Study participants regularly connected their perception of a lack of student skill and their value beliefs in regards to basic computing skills. P13 expressed frustration regarding her students' shortage of basic technological skills that caused her to shift her instructional approach prior to using technology for writing essays or using Google Suite programs. P2 explained similar frustrations in her first year working with fifth graders in a multi-grade setting. P2 reflected:

> I was a little bit taken back just with how unfamiliar with the computer they really were as fifth graders. So, I mean, they were able to do-- if you give them a link they could do something. But teaching them how to save things on a computer. Having their own drive or their own place where things are stored. None of them came in with that which-- that's kind of how our world works. And so I think that's important.

P6 and P5 connected their value for teaching basic skills to their perception of a universal skill set all students should have. P5 said:

> I think they need just the basic computer skills. Being able to type is just a universal skill. Everybody assumes you can type now and if we're not teaching our kids to type properly then we're doing them a disservice.

While P1 and P10 also expressed interest in the development of student typing skills, they also shared that they were influenced by contrasting perspectives on this topic. P10 said:

> I personally think they need to learn how to type. And I've had people challenge me at county-wide meetings I've attended that, "They don't need to learn how to type because there's self-correct and there's this and there's that."

P1 added:

> When I first started, the school really valued typing, basic typing skills. And then now we're kind of talking about, "Well, is typing important? Do they need to know home row keys?" Because we're very pointy now.

P9 and P10 added the ability to find accurate information to the basic computer skills inventory that study participants valued. P9 said:

> I think that one thing that I've noticed with something that they need is more of a general idea of how to find accurate information. They think, "Okay, if I just Google it, I type it in. Whatever comes up first that's exactly it… I think what the kids need a lot more now is some of that discernment and that's got to come at a much younger age than it used to.

In contrast to the value beliefs regarding basic computing skills, study participants also expressed a desire for student-centered technological experiences that cultivated 21st century skill development. At times, participants referenced particular 21st century skills such as collaboration or creativity, but sometimes these skills were referenced in more general terms. P3 said:

> So, I just see technology hitting many educational standards, not necessarily the ones that are written down, but that you try to teach them as an educator like how to progress in building research and how to present. So, I just see it as a huge tool in their own confidence.

P3, P4, P6, and P14, specifically mentioned collaboration as a value belief in student-centered technology use. P14 reflected:

> When it comes to collaboration, that's pretty big with me. So, we spend a lot of time at the beginning of the year helping them understand what that is, and why we do it. And so, I value the time that they get to do when they can see the one document, or they can see each other's documents. That has become kind of a natural place, even though, right now they're all doing research papers, and they have a different state, yet they're in-tune with what other screens are doing, and they're like, "How'd you get those pictures to look like that?" Little things like that. They're constantly learning from each other in the right way. So that was a skill that needed to be taught to them, but now they understand the difference between learning with each other and still doing your own work.

The 21st century skill of creativity was also valued. P11 expressed a connection to creativity while considering students' growth in independence. P11 said:

> Being the third-grade teacher, they're at that transition of being independent learners, and I also feel like that would fill in with technology. Be willing to try and figure something out and not just rely on a friend or the teacher. And I do feel like the technology-based creative process helps that as well especially when

> we've entered into things like the little bits or the coding or be that. They have to critically think their way through a problem independently or at least with partners. That's been a big one for me, that I want to see them be able to think through those kinds of problems without might help.

Similarly, P8 stated:

> I see how [technology] can support what we're teaching in the classroom, how it teaches them to not just be consumers of what we're teaching but they're producing something which is a really big shift. And that I think as educators is what we want. We don't want them just sitting there taking stuff in. We want them doing that higher-level learning and producing something…They surprise me with what they are able to produce, so I think my entire viewpoint has changed I think drastically just in this last year to be honest with you.

The divergent value beliefs of basic skills and development of 21st century skills represent attitudinal influences on the student-centered technology practices of teachers in this study.

Value beliefs: Equip for life. The grade 3-5 participants expressed that they valued the opportunity and need to equip their students for a life lived with technology. Participants regularly expressed concern about the safety of the internet and the risks involved in exposing students to technology. P6 referenced "the dangers of the internet" and P5 mused "there's so much danger out there in misusing technology with predators and with cyberbullying." P7 described safety concerns as a deterrent to her decision to use technology:

> And so, my biggest reservation would be safety on the internet because you can only protect them so much. And some of the resources that we use, we don't pay for, so they're full of ads. And they'll click them, and then they'll go places that you don't want them to go. And so that would be my biggest reservation…and probably the thing that requires me to spend the most time finding, like making sure that I find things that are okay for them to see and do.

Others connected safety concerns to the digital citizenship curriculum used to equip students with good technological practices. P5 shared her attitude about digital citizenship as she reflected:

> I just really feel that [digital citizenship] is just so important, and it's something that not all schools are covering. And I think as we go forward in this new age of technology, in this new of era of the technological revolution, I just can't stress enough how important it is to find a good digital citizenship curriculum that teaches your kids how to use technology from a young age.

Participants also shared attitudes about helping students navigate technology safely, in spite of their perceived dangers of the online world. P4, P5, P7, P11, and P14, all viewed their position as influential to equipping students for the future societal roles they may play in regards to using technology. P11 recognized, “Our world is changing. Their world is changing. We have to be willing to help them get ready for a world that's different than what we were raised in.” P7 reflected that educators can’t hide from this change. She said:

> You can't not do it because this is a part of their life now. This is not going away, and so you have to teach them how to use it safely and correctly. And so, you can't run from it. That's what also makes it hard. You can't just ignore it.

P4 agreed that educators need to take an active role in equipping students in this area. She said:

> So, hopefully giving them a lot of opportunities to experience using technology in positive ways, and what to do when things don't go well. Or they're doing something and something inappropriate comes up. Or just trying to really equip them to be safe with technology. I think that's extremely important. And they can't do that by me teaching them and answering questions on a worksheet, or something like that. I mean, they have to practice those [skills].

Study participants also expressed concern about students' use of and perception towards technology and the need to shift that perspective. Consistently, participants described students' home technology experiences as being focused on gaming or using social media, rather than seeing technology as a tool for learning. This dichotomous perception of technology challenged students' use of technology for learning in the classroom. P5 recalled:

> At home most of these kids just use technology as toys. And so, they come into the classroom with this understanding that technology is fun, it's a toy, it's a place where I can play games. And so, it's hard for me to trust them to use the technology appropriately…So, we talk about responsible internet use and being able to practice that in the classroom.

P14 provided an example that illustrated her intention to shift student thinking about technology and equip students with a new perspective. She reflected:

> But my fifth graders, they are addicted to TicTok and I am not, and I explained to them why I'm not. I said that you're trying-- so when we get to some of those social platforms, the way they're currently being used is very much, "How can I entertain you, and get noticed". And I talked to them about, there's nothing wrong with social media. There's nothing wrong with Instagram, but how can we use that in a different way to be more of a positive influencer with the world? So, like, I had a group that just recently created an Instagram account in our marine-mammal-- it was a project-based learning unit. They each had an ocean threat that they had to find a solution for, and their solution was to set up an Instagram page. And I liked that because it was a very healthy use of Instagram.

Study participants expressed the desire to equip students for a successful life with technology. P5 shared:

> I'm very, very passionate that you cannot separate education and technology anymore. I mean, it's integrated in their lives and if we're going to have a full-circle education, I think technology has to be part of that and digital citizenship has to be part of that. When you've got kids whose lives are so interwoven with technology, you can't ask them to just drop that at the school door.

Reevaluation of tech use. For the grades 3-5 teachers interviewed, an attitude of reevaluation of current technology use emerged. The teachers were influenced by

attitudes regarding their students' exposure to screen time in and outside of school and the necessity of technology use to be used for enhanced learning opportunities.

Reevaluation of tech use: Screen time. The grades 3-5 teachers in this study explained that their attitudes about student-centered technology use were influenced by the potential long-term health concerns for students based on their exposure to prolonged screen time. Study participants explained that these concerns stem from a range of sources including their interpretation of research studies, hunches, or personal beliefs about screen time. P12's concern about the over-use of technology permeated the content of his interview. In his opening comments during the interview P12 stated:

> At this point in time, I've stepped back, to some degree, from how much I utilize the devices. Just because I've done a little bit of research and I'm not convinced-- I've just read some sobering facts about overuse or over-interaction of devices with students.

Later, P12 continued:

> With some of the behavioral stuff I've been dealing with and some of the stuff that I've read about student engagement and brain development, particularly since I have young nieces and nephews and I visit a little bit with their parents, I think that that probably has influenced a little bit more skepticism on my part, that I don't want to put all of my eggs in one basket, utilizing [technology] to this degree. And then as an educator, you've got to be able to prove your effectiveness. And so I utilize the tools I need to be effective as an educator, and technology-- so I think some of it has just been out of necessity and some of it has been out of

> genuine concern that, I don't know if we know, exactly, what the influence or the effects are of using this with a greater frequency than I already am.

P2 referenced a lack of research on total screen time as a starting point for her wariness about overuse of technology. She said:

> There are studies out there about gaming, and there's studies out about social media, and things like that. There's not necessarily-- they usually take out school time. This is the time spent on it outside of school. So, we don't just necessarily have a ton of information-- we're pretty new at this, so are we going to have a bunch of people with eye problems? I don't know. That makes me a little bit nervous.

P13 also expressed concern about future vision problems for students and an internal hunch that she needed to reevaluate her use. She said:

> We recently retired one of our outstanding learning resource specialists who was really big into vision therapy, and she was having a real upswing in kids with vision issues because of all the screen time. And so, it really resonated with me knowing that that's a link to vision issues. I think it's just too much for kids… I feel like I just want to give their brain and their vision a break, and I don't know if that's very scientific, but it's just a feeling that I get as a teacher to just cut back a little bit.

P8 shared:

> As far as putting iPads in their hands, honestly, that's been my biggest internal struggle is deficit wise what could that possibly be causing later on down the

> road? Because obviously, we know and, in every classroom, it certainly isn't just here, but there's so much ADD and ADHD that you know you're just reinforcing those behaviors. You're making it so much harder for the little brains to focus when they're staring at an iPad any more than they have to. So that's probably my biggest internal struggle is just my own stubbornness to let go of that fear of screen time, too much screen time.

Many participants in this study explained that their attitudes about student-centered technology use at school were influenced by the amount of screen time their students were exposed to at home. P8 reflected:

> I really struggle, I feel kids get too much screen time. I feel like when they go home, a lot of them spend their after-school hours and at night, either looking at an iPad or playing on their Xbox, and that's probably my biggest struggle is I wrestle with the drawbacks of having so much screen time all the time. That's probably why I put the limit on and don't do iPads every day.

P3, P5, and P13 all mentioned examples of their students being overtired at school due to their overuse of technology at home. P3 stated:

> I just also struggle with the way that it's used at home and I know I have many students that use it a lot at home and talk about that a lot. And that's not my job to monitor what they do at home. But I had a student, last year, who was coming into school with bags under his eyes. And I asked the family, "Is his technology close to where he is when he is sleeping?" Because I had heard him tell his friends, "I stayed up till 3:00 AM playing blah blah blah." And that was just hard

> for me because he had been staying up so late and he was so tired during the day. And I hear that a lot with my students.

P13 demonstrated sensitivity to the screen time concern when she said:

> I know some of them are staying up well after hours. Again, I've got a student who falls asleep in class because I know that's what he's doing at home. And so, I just really want to watch that and be sensitive to that, and I ask them questions about it quite a bit.

Teachers' awareness of this overuse of screens at home caused them to reconsider when, how often, and in what manner technology is used in their classroom. P8 summarized this sentiment well when she said, "they get enough screen time at home. So, I'm not interested in them being on too much during the day." P3 agreed, "The amount of time that we spend on the screen, really, also, is something I struggle with because I just know that my kids go home and do that as well." P13 expressed an internal struggle with the amount of technology she uses as she shares several perspectives on the issue:

> I don't integrate [technology] now. I'm entrenched. I need it, and it makes me only a little nervous just because there are days when I think, "Okay. Now, we don't need any screen time." We don't need any screen time today… So I'm reversing my thoughts a little bit on it and stepping back a little bit more, but I do drive the use of it with our Chromebooks and what we're going to create, and they're all about it and they're great with it, and I just feel like sometimes it's too much.

P2 used several technological supports for differentiated instruction and students are involved in authentic uses of technology during project-based learning, yet P2 surmised:

> I truly am always trying to look for ways to not just rely on the technology, even for my own kids. I don't want them in front of the screen 24/7. So, I'm always constantly looking for ways that we don't need to be on technology 24-- all day, every day.

While participants struggled with overuse, they also expressed an understanding that technology was pervasive in the home lives of their students. P8 said:

> I'm blown away that I have eight-year-olds, third graders, and the majority of the kids in my class have cell phones, which I can't wrap my head around. But that's kind of the environment that they're growing up in. That expectation, I think, is kind of there. You kind of have to embrace it.

P3 expressed an interest in addressing the contrasting values she sees in technology use at home and in school and expressed:

> Expectations for technology should not just be a school thing, it should be an everywhere thing. I think everybody, even adults, need to monitor how much we use it because you just need to see what it's doing to yourself socially, emotionally, mentally, all those things.

P8 reflected on how technology was used differently in the home and at school and found a positive opportunity for schools. She said:

> But I think if you can shift that into something a little bit more positive, at least in the classroom, and show it to be more of a-- because I do think when they leave here, when they're at home, I do think that they're more consumers. From what I hear them talking about, they have all these people that they follow on YouTube. I

> think they're watching. So they're taking in-- they're just consuming. They're not producing a whole lot. So if we can kind of shift that and turn the production of anything educational into something a lot of fun, then that kind of-- it causes that shift that I think even if we just make a tiny, little dent in-- I think that could be a really good thing.

P12 shared another perspective on the connection between home screen time and school use of technology. He shared:

> I find that I'm not completely aware of how much they're able to use the technology at home. And I think they step into our building and there are firewalls in place. They're somewhat restricted in directions they can go. They have not told me this, but I almost get the impression that some of them find it a little boring, what they're able to do with the technology at school. "Oh, really. We've got to use this for math." Things are not wide open for them. So, I can't speak to what necessarily the direction they're going at home, but I have not sensed that, "I got to have my tablet. I got to have my technology," because they know that when they got it, there are certain expectations as to what they're going to need to do with it in the classroom.

Participants reaction to their students' screen time exposure and fear of future health concerns represented a strong attitudinal influence on their decision to use student-centered technology in their grade 3-5 classrooms.

Reevaluation of tech use: Enhanced learning. The grades 3-5 teachers in this study explained that their attitudes about student-centered technology use represented a

reevaluation of technology's ability to enhance student learning. Participants attitudes included a range of perspectives including a desire to embed technology, reduce technology, and increase technology. For P3 and P14, this attitude was demonstrated in their seamless and on purpose use of technology during instruction. P14 reflected on how her use of technology has changed over time:

> I think [my approach] has evolved over time where I am much more application nowadays. But I think our tools have changed. I feel it's just an extension of who we are in the classroom, and I think the kids catch on to that. So, they feel comfortable using it. It's not a threat to them. And if they don't know how to do something - and that happens all the time - I just tell them, it's no big deal.

P3's desire for technology to enhance learning was captured with a focus on purposeful technology use. She reflected that she does not want her lesson plans "to just be this eye-catching technology thing," but that she wants it "seamlessly put in there for the students." These participants expressed an attitude of critical analysis of technology tools so that they can be effective in using tools to enhance instruction.

For other study participants, their reevaluation of technology use to enhance student learning caused them to pull back, or reduce, their technology use and choose tools more strategically. P1 talked about using "the right kind of technology" and "using technology to enhance student learning and not just using technology to use technology." Further, P1 reflected on her evolving attitudes and behaviors:

> I definitely think I'm more conservative now and careful about how I use technology in the classroom…. I think, maybe in my third or fourth year of

> teaching, I was always trying to be this progressive teacher and doing new things. But then, as I over the years as I've gotten more, I guess wiser, not that I'm wise, but as I've gotten more wise and experienced, I've had to cut a lot of technology out because I really have to use what I feel like, "Am I just using technology to use it? Because I want to use all these things? Or am I using technology because it really changes the way-- it produces work, or it allows the kids to do something that otherwise couldn't be done with paper or pencil." It would have to really enhance the learning and the lesson.

P11 reflected on the students' interaction with various uses of technology, emphasizing her desire to use technology for enhanced learning and not rote or game-like learning. She said:

> A lot of groups are pushing for that critical thinking and if we just use technology as a way to get answers out of them, it's not going to help reach those standards or help them develop, either. And that's the reason I know this does well, is they like using the technology but when it was just playing the games, I didn't see change in their behavior or their thinking. It was just we're going to use it like a quiz or a test or something.

P12's use of technology has also changed overtime, partly due to a shift from teaching middle school to 3 and 4th grade, but his attitude of reevaluation of technology was also evident. P12 said:

> I have just found that the technology has become less of a focus in how I need to be able to reach these students. Yeah. I think that's part of it. When you're

> assessing them and what they know, I just don't feel like the technology has the influence on them that it did initially, maybe 5 or 10, 15 years ago. It's still a very valid tool.

An attitude of reevaluating technology for enhanced learning encouraged others to increase purposeful technology use. Initially, P8's attitude about using technology to enhance student learning was strongly influenced by her observation of her own daughter's reaction to student-centered technology in 6th grade. She witnessed firsthand how technology increased her daughter's excitement and engagement in learning, which motivated P8 to reconsider her negative preconceived notions about technology and instead embrace the opportunities it could afford. Over time, P8 considered her own students' engagement, and more importantly enhanced learning, as she reflected on her use of student-centered technology in her own classroom. P8 said, "I am blown away every week at what they come up with. Whether it's a skit tied into whatever chapters we just did in the BFG…they recreate scenes from the book that they like" or they complete a book report with Chatterpix and upload it to Seesaw. "It's nice that they have that opportunity to be a little bit more creative, and it's not just answering things even using technology, but they are creating with it." P8 shared, "I think I had to see it to actually believe it…I think, obviously, the benefits of that are there." P2 also developed an attitude of reevaluation of technological experiences that led to an increased use of student-centered technology. She said:

> If I'm going to use technology, it has to do something more than just change the look of what's been done…I'm not this super high tech, I always want the newest

> and the greatest. Just not that person. But when [technology] allows kids to work at their own pace and to feel competent and to have some voice and choice, I'm not ready for that today and come back and revisit at a time when they're ready. That's mind-blowing, and that's so exciting for those kids.

The grade 3-5 teachers in this study demonstrated that enhanced learning was central to their attitude about student-centered technology use.

Professional mindset. For the grades 3-5 teachers interviewed, attitudes relating to a professional mindset emerged. The professional mindset of teachers in this study addressed their affect, or emotional connection to technology, their willingness to take risks, and a mindset that expected ongoing growth.

Professional mindset: Affect. Affect, as related to technology use, refers to the measurement of the emotional aspect of attitude including constructs such as anxiety, fear, liking, interest, and enjoyment. Many study participants expressed positive emotions about technology use. P14 said, **"**I'm excited about [technology]. And I think that that helps the students to be excited about it." P3 added, "I'm a very tech-savvy person. I love technology." P1 reflected, "I'm comfortable with technology and I value technology, I'm automatically open to it." P4 expanded upon her emotional connection to technology:

> I think if I get excited about it or I'm passionate about it then it's much easier to work through the challenges and problems or I definitely think students see that whether it's technology or anything else. If they see you're excited then that's just contagious. Just like it is when they're excited about something and kind of spark that with their classmates or their teachers.

Most participants did not feel anxiety as they began to use technology in the classroom. P14 said, “I was a computer science major so I've always loved technology” and P1 shared, “I don't want to say that I didn't have anxiety teaching, but I feel like I come from a different place where I was very comfortable with technology.” P7 also explained that anxiety was not a problem she struggled with even though it was normal for technology not to work. She reflected:

> If I had any anxiety, really because I don’t feel like I ever did, but it not working because that happens all the time. I'm pretty patient with those kinds of things because I know it's going to happen. And I'm a pretty go with the flow kind of person. And so, if it just doesn't work that day, we're just not going to do it.

Other participants reflected upon an evolving affective response to technology. P8 confessed, “I'm scared of it. I mean, I'm certainly not techy so it's uncomfortable.” Further, P8 explained:

> I think I've gone begrudgingly into it to a little bit more optimistic and excited about it. So, I'm a little bit more eager… I think I'm more excited now about finding what's out there to get help for [my students] that I didn't realize it was even available, to be honest with you. I had no idea. There's a lot of benefits to it.

P13 reflected:

> It's been a whole gamut from fear to anger to acceptance. It's like this whole process. I'm just feeling really isolated because I'm older. And now, just feeling really good about it and having people ask me [for help], that's a huge switch, and

> that's been in the last two, three years where I have a couple of younger teachers asking me. That's incredible. How did that happen?

The affective response to technology was influential to the attitudes the participants had about using technology. Their general liking for and enjoyment of technology also helped them feel comfortable taking risks.

Professional mindset: Risktaker. Many study participants discussed a mindset that encouraged exploration and letting go of control. Participants explained that they consistently try new things, even when they are uncertain of the outcome. P5 explained:

> I've noticed not everyone is really comfortable with just clicking on something and seeing what happens, and so people tell me like, "Oh, you're so techy. You're so techy." I'm like, "No. I clicked, and something happened, and I figured it out." And that's just kind of my attitude with technology, is just play around with it. Just figure it out. And that really seeps into my teaching a lot too.

P10 added:

> So that has been a big difference in trying to encourage other teachers and it's not really that hard. Just play around with it. [Computers] are not going to explode. They're not going to do anything. Just play around so you can create. And if it doesn't work, try something else.

P4 considered her early use of technology and shared:

> I guess if I could change anything, just being less concerned with getting it right the first time, even though I don't know if I could change that, but just seeing how

> things have come out knowing that whether it was perfect or went exactly the way I thought wasn't always maybe the main part of the learning.

P3 reflected upon how the risk-taking mindset helped her compared to her more hesitant peers:

> I'm comfortable with all of these things because I've tried them and some of them have failed epically and some of them have gone really well. But I think I may be a little bit more resilient in my use of technology just because of being comfortable with then jumping back, whereas another teacher who they're just trying to figure it out for the first time, not as much.

Study participants' willingness to try new things also connected to the attitude that they don't have to have all the answers to be effective with technology. P2 said "you can learn as you go" and "you don't have to have it completely figured out. You don't have to be the expert." P8 added, "I think that some of that personal struggle too is giving up a little bit of control as well as, not perfection, but giving up some of those expectations so that [the students] can have the opportunity to step outside the box and be creative." P3 agreed with these sentiments when she added:

> So, probably, the biggest thing though is relinquishing my control in knowing exactly how it's going to pan out. And knowing that there will be issues along the way that I can't solve all the time. And even with technology, now, things will happen all the time that I'm daily trying to put out fires with technology. But just knowing that's part of the territory you can't have everything work seamlessly... So, understanding that it's okay to feel uncomfortable, you're not making your

> students feel uncomfortable because you are just trying to solve the situation or help them.

P1 connected this attitude to teachable moments for her students. P1 said:

> I think that goes with anything that you do in the classroom and it is definitely a life lesson for the kids to-- even I make mistakes. We're going to have to keep on trying and we're going to learn together, because I am by no means an expert in technological devices. And I definitely learned over the years along with them. And I'm still learning.

P4 and P13 also connected the idea of letting go of control to utilizing their students for technological support. P13 shared, “Once I realized I've got to ask the kids and I got over that prideful attitude, oh, they were tremendous. They were so great… I'm glad that they're my best IT support and they're always available.”

Professional mindset: Growth-minded. Study participants also demonstrated that they had a professional mentality that exhibited a high expectation for perseverance and ongoing professional growth. Participants regularly discussed technological difficulties yet persisted through them to continue to provide student-centered technological learning experiences. After expressing how technology connectivity issues can be “very, very frustrating,” P10 explained that those emotions never stopped her from using technology. P10 said, “Power through and deal with it. Figure out a better way, a different way to do it. But yeah. No. It hasn't stopped me yet.” P9 similarly shared an attitude of persistence when she said:

> I'm one who's going to sit there and try to work and figure it out. Because if you click enough normally you can-- you tap enough things, normally you can figure it out on your own. So, I'm a problem solver.

Throughout P13's interview, she discussed her ongoing battle to learn and become proficient with technology. Her persistence was evidenced when she described:

> So, my colleague and I, she's 64, we'd sit down till 7:00, 8:00 at night at school battling through the software to try to click around and navigate and feel like we knew how to show it to the kids. That was really hard.

Later, as P13 reflected on ongoing technological changes at her school, she expressed her awareness of how she must continually train herself. P13 said:

> I know what I have to do. I have to do it myself and find out myself and learn a lot on my own, but I feel like I'm kind of over a hump now unless something new comes along, but I'll embrace that too.

Other study participants demonstrated evidence of being growth-minded as they consistently pursued learning opportunities. P6, P7, P8, and P9 reflected upon learning opportunities that influenced their attitudes about how they use technology. P9's open-mindedness and willingness to be stretched was evidenced as she reflected upon how her use of technology evolved:

> So, I think a lot of it actually stemmed from where our classrooms were in fifth grade. We were at the time right next to the school technology director. So, he would constantly come over into our rooms and go, "Hey will you guys try this?" And he knew that three of us in fifth grade, at the time, were willing to kind of do

> anything and be guinea pigs and-- so we kind of would jump in and try things, and we would be the pilot program… So a lot of it, in some ways, was kind of forced into and work with it. Some of it is curiosity, and how can I go through and stay relevant in my teaching, in my adaptations with things? So some of that's just kind of adjusting as teaching is going along. And some of it is just being willing to be uncomfortable for the purpose of trying to continue to improve and provide opportunities for students.

P6 and P9 valued continued growth, and also exhibited a sense of internal responsibility to use the technology that was provided. P6 said, “I know so many schools don't have this. I kind of felt almost-- not that I felt obligated to use it. But I didn't want it to go to waste because we had it.” And P9 shared:

> I think a lot of it-- and me personally, if it's a professional development day and we've been told to incorporate it… you go through and you do it and it might be a struggle.

P8 and P10 demonstrated growth-mindedness as they recognized a need for constant renewal in their teaching craft. In response to who or what influences her use of student-centered technology, P10 said, “So I personally don't get bored, I try to just change things up as much as I can.” P8, who reported feeling anxious about using student-centered technology, cited a professional need for change as an attitudinal influence. She said, “I think seeing the benefits of what's actually capable, what's out there makes me not want to bury my head in the sand. I know I've got to keep changing.” P6, P7, and P8 reported that professional development opportunities combined with personal application

influenced their attitudes about how they use technology. For example, P7 started a robotics program at her school after learning about robotics at a conference. P8 specifically connected a professional development experience to her attitude about using technology. She said:

> It was really the training this summer when I saw how much was actually out there to really support what we're doing in the classroom to make it more fun for them. It really, really changed my attitude to all of it.

The professional mindset of participants in this study influenced their attitudes about student-centered technology use.

Research Question 3

The third research question explored how grade 3-5 teachers in faith-based schools explain the environmental influences on their student-centered technology use. There were four major themes that emerged in analysis of participants' experiences: availability and usability, multi-leveled administrative leadership, collegial engagement, and students as technology natives.

Availability and usability. The grades 3-5 teachers in this study expressed that the availability and usability of the technology resources provided by the school strongly influenced their student-centered technology use. The availability and usability issues were different for each participant, especially due to the wide variance in school size, the amount and type of technological tools per classroom, school budget issues, and also how the technology was embedded within the school schedule, yet the theme was consistently recorded as an important environmental influence.

Availability and usability: Tech tools. The technology tools available to study participants influenced their self-reported student-centered technology behaviors. Participants discussed the availability and usability of these tools and how that influenced their use. P3 reflected, "I feel like if I was not at a school that provided it so easily, I would not be as enthusiastic about it." P9, who taught at the same school as P3, agreed that the school's technological resources were influential to her use. After reflecting on the continual evolution of technological tools available at her school, P9 shared that "because of our resources, we've been able to be on the cutting edge of technology and so we're always pushed to learn more and bring more in." P11 explained:

> Five years ago we really didn't have all of these technological tools at our disposal. So, I really didn't feel the need to reach out and try to find my own within the classroom…Having the tools that we have really has opened up doors to me that I didn't think I was ever going to be able to have."

Most participants had access to 1:1 devices: 9 participants had a classroom set, 4 participants shared the set with other classrooms or the entire school, and 1 participant did not have 1:1 access. The transition to classroom sets of 1:1 technology devices proved to be influential for multiple participants. P3 explained:

> The first year we just had an iPad cart that was shared amongst all fourth-grade classes, and so we would take turns using it. And then the last two years, we've been 1:1 in iPads. And I really noticed a huge shift in what that looks like for my students…. So, it's just that the freedom that I have… It's not like I'm saying like,

> "Oh. I have this idea that we're going to put into practice maybe next week." It's right at that moment, we're able to do it.

When asked about circumstances in her environment that helped or hindered her use of student-centered technology, P6 reflected on the shift from shared devices to classroom sets of Chromebooks. She said:

> Right now, it's not an issue because we're at 1:1, but before we were just making sure that technology was available to you, so you didn't plan a lesson involving technology and then, "Oh wait, seventh grade was supposed to use that." So that was a hindrance. Now, it's not a hindrance so much anymore.

P11's school is equipped with shared iPad and Chromebook carts, yet she reflected on how the lack of availability at her school influenced her use of student-centered technology. P11 said:

> Even though we have a lot of technology tools at our school – more so than some of the other schools that are around us - one of the big things that I feel is a hinderance is actually having a third grade Chromebook cart or laptop cart or iPad cart. We have to share the tools with all the other grades… I would love to be able to just have a Chromebook cart or an iPad cart right here for the kids. It makes it a lot easier. It saves time.

Along with access to physical devices, participants reflected on the importance of good connectivity, supportive infrastructure, and keeping technology up to date and working properly as influential determinants to their use. P13 and P7 shared frustrations with infrastructure challenges in older school buildings and P6 and P10 explained how

connectivity issues caused regular disruptions and irritation. Aging devices were also a struggle that participants pointed out as being an environmental hindrance to their student-centered technology use. P13 expressed frustration about aging devices. P13 shared:

> Those Chromebooks are getting old, and it was so great when we had them, and now, it's like wow, how did that happen? They're really crummy now. They're dated now. My computer is horrible. I can hardly lock it anymore… It's a lot that we have to keep up, and it's expensive.

P10 also shared:

> When I came to [Redacted], we had very old-school Acer laptops that all the kids shared. And every day was a frustration because they wouldn't connect to the internet. Or the kids say they're on the wrong computer. And it was a mess. So now that they're on Chromebooks, it's much easier. We have had some issues with our connection, but thankfully that's been fixed. So that's been helpful. But yeah. It is super frustrating (The name of the school is redacted to protect the identity of the school).

Connecting to this idea in a positive way, P4 said:

> I would say that right now our school is in a place where there's a lot of helpful things in our environment. Like I said, I assume that my projector is going to be working all the time. As opposed to there have been times when I'm like, "Oh. I hope the computer works." And, so I feel that is very, very helpful.

Several participants also discussed that the schools' motivation for making technological devices available and useable stemmed from a need to stay relevant, to recruit new students, and to keep up with perceived expectations. P10 reflected on the progression to 1:1 access and shared, "Our public schools here in [Redacted] High School, they are Chromebooks 1:1 and the local Catholic school, they're iPads 1:1. So, in order for us to have our students ready for high school, we had to do something" (The name of the town is redacted to protect the identity of the school). P7 described the parent population as being influential to gaining technological access. P7 said:

> Our parents are very supportive of all the stuff that we use. And they want us to use it. Because we didn't have Chromebooks three years ago, and they were like, "Why not? The public school has it. We need to get it too." Because in our small little town it's us as the Lutheran school and then the one public school in town, and that's it. And so, we're constantly competing with the public school as far as, "Well, they have that. How come we don't have it?" Or, "Look. We have this, and they don't."

P12 sensed the same kind of parental expectation, dating back to 15 years ago, "there was a constant push and there was always the sense that we need to be doing more. And that came from leadership, that came from parents, that came from community members. 'This school did this.' And so, there was a real push." P12 reflected that for Faith System schools "there was always this sense of keeping up with the Joneses" in terms of acquiring technological devices. In recent years, however, P12 explained that he sees a perceived change in the environmental emphasis given to technology use and acquisition

and senses “a bit of a pendulum swing on the parental side of it or in an administrative side of it as well.” While participants had varying experiences and perceptions, they shared a common connection to how the availability and usability of technology tools influenced their student-centered technology use.

Availability and usability: Budget. The monetary connection to availability and usability issues are also evident in participant responses. Participants expressed a variety of issues relating to the budget, yet demonstrated differing perspectives based on individual school situations. The school size and demographic make-up of the student population dictated, to some extent, the availability of funding for school operations, including a budget for technological materials. P8 reflected on budget issues as an influence to her use of technology. P8 said:

> I would love to have a classroom full of Chromebooks, to be honest with you. if we had additional funds to be able to do something like that-- I mean, that's probably our biggest hindrance; it's just the financial part of it. So I think the financial part is the biggest hindrance. We just, obviously, there's never enough money to go around.

P1 reflected:

> I do think compared to other private schools that are bigger or just even other private schools with more money we are limited to what we can offer the kids technological wise…I know that there are parents who feel like we're not up to par, we're not getting the kids ready for I guess this technological world that

> they're going into. And so, and I know the school is working on ways to change that. But I would say, overall, yeah, our resources are limited.

P12 offered an alternative perspective on budget issues based on his school experience. He described improved technological availability compared to previous circumstances. P12 shared:

> The negative influence 10 or 15 years ago would have been the money. I mean, gaining the resources to be able to do this. That was always kind of the overarching - I don't know - wall that was there. Can we do this? Can we do this? And you'd get these bids and then it was going to be a $30,000 price. The financial side of things has really kind of dissipated because things are much more affordable.

Faith System schools are private, parochial entities that have their own fiscal systems often connected to a church budget. Full funding for the operation of Faith System schools relies on funding from a variety of sources. P10 and P11 shared how school funding issues related to technology were connected to overarching church budget and strategic ministry plans. P7, P9 and P12 discussed fundraising and donor contributions as being essential to making technology available and usable in their schools. P9 described her school's "very generous donors" as being a key part of equipping her school with 1:1 devices for over 650 students. P7 described multiple circumstances that the parent organization at her school was responsible for fundraising to attain new technology including 1:1 Chromebooks and a 3D printer. P12 described fundraising in his setting as almost magical. "When we do our annual fundraiser, it seems

like if we want to buy 25 tablets, poof the money is there. On the positive side, financially, it always seems very feasible now. The resources are available, so that's a positive." Each Faith System school works in its own unique fiscal reality and the technological availability and usability in each setting influenced the teachers' use of technology.

Availability and usability: Schedule. Availability and usability issues were also evidenced through participant discussion about when and how technology time was scheduled and carried out. Again, participant experiences were different, but the regular discussion of how and when technology was implemented supported the development of this theme. The *schedule* sub-theme addressed whether schools had set aside computer class time and also addressed the availability for time to teach technological skills within the regular classroom.

Of the 14 study participants interviewed, 9 reported some type of weekly computer class time embedded into their teaching schedule. This time ranged from 30 minutes 1 time per week to several sessions per week. The curriculum and focus for these sessions were widely varied including typing, coding, basic computer skills, or a combination of these things. P11 was especially influenced by a newly added technology time supported by a technology teacher. P11 reflected:

> Being able to have a technology time has really opened up doors where I feel like I've been more willing to play around with technology...If I have half of them doing technology time with our tech teacher, I could do something technology-based with them that pertains to our lesson as well. So, once I feel comfortable

> with kind of the way things are working, I feel more encouraged to try something new.

Participants that reported no scheduled computer time had different experiences. P14 expressed certainty that technology needed to be embedded into the day. She reflected, “So I have found technology can't just be an extra. It has to be part of what we're doing or we would never get everything done.” P4 also discussed the importance of embedded technological learning. P4 reflected:

> And we used to have a separate computer class, but then when we transition to having STEM as an additional, like a class period, then the computer piece was transitioned into the regular classroom. And so, things like keyboarding or learning to use Word Documents, or Google, research, all those kinds of things. Those are definitely more classroom integrated than they were a number of years ago. And I think that's-- I mean, I think that makes a lot of sense.

P13 expressed concern about the removal of a set aside computer class due to a decline in student skills. She expressed concern about student typing skills and basic computer functioning that she doesn’t have time to teach in the regular classroom. This scheduling change influenced her approach to using technology with her students. Availability and usability, including tech tools, budget, and schedule, was a theme represented with varying perspectives due to the wide range of participant school environments, yet representative of powerful environmental influences on teachers’ student-centered technology use behaviors.

Multi-leveled administrative leadership. For the grades 3-5 teachers interviewed, multi-leveled administrative leadership emerged as an environmental influence on their student-centered technology use behaviors. Participants reported that their administrators were influential in several capacities and at various levels in the school environment. In this study, multi-leveled administrative leadership was described with the three subthemes of resource, equip, and engage.

Multi-leveled administrative leadership: Resource. Many participants described their administrator's role in seeking out and providing technological resources for the school. P12 reflected that "leadership from the middle as a teacher pushing for technology to move forward, it doesn't necessarily happen…It takes administration to a board of education or a lead administrator to encourage that, to provide the funding." The administrator's role in resourcing classrooms with technology influenced the participants perceptions of using technology because the technology became more readily available and functional. P13 said:

> Our principal has always been a real visionary when it comes to technology. So, he pulled us along through that, and he got push-back initially… because of the expense…And I'm really proud that we have one-to-one technology. Everyone has a computer cart because of my principal and my assistant principal.

P4, P6, and P8 referenced an upswing in technological resourcing when new administration came to their school. P8 reflected on her principal's role:

> The new principal especially, I think realized we were a little behind. And when he came on, I think that was a driving force was him was to really try to get more

> technology in the hands of students here because he came on, and the first year we had iPads in the classroom.

P6 shared:

> Our principal has really put a big push on technology since he's been here. This is his third year there. It's my fifth year. So, I had two years without him, three years with him now. And he, more than anyone else, has really pushed us to try and integrate technology with what we're doing or provide the help that we need to be able to do that. So, before he-- well, not necessarily before he came, but he really pushed to get more Chromebooks. Because before we only had, I think, a set of 10. So now we have a set for each classroom, K-8.

P4 expanded the idea of resourcing to include functionality. Resourcing schools with updated tools is only beneficial when the tools are working and supported, requiring administrative attention. P4 shared:

> If we want to implement technology, then having an up-to-date iPad cart with the iPads working and a system put in place to check them out and share them, I mean, those were all really, really important for it to be doable. Because certainly, up until a couple of years ago, we had a computer lab more set up. This year, certainly, there are those days or times when things don't go in your way, but I think that's important for administrators to be able to-- whether they know it themselves or have personnel that have the time and the ability to make those resources really usable for teachers and students.

The administrator's role in resourcing the school with technology was appreciated and noted as influential to teachers in this study.

Multi-leveled administrative leadership: Equip. Multi-leveled administrative leadership was also described as participants shared how their administrators equipped them with professional development experiences or planned peer collaboration time to grow their technological skills. P11 shared that her administrator "has really been pushing for more technological use in the classroom" and demonstrated that emphasis by providing on campus training and the opportunity for her peers to attend conferences paid by the school. Other participants also described how their administrators planned professional development experiences on campus, where training was brought to them. P3, P4, P8, and P11 discussed how this training was very influential to their student-centered use of technology. P8 said that the professional development "really, really changed my attitude" and helped her focus on intentional standards-focused uses for the new technology she gained access to. P4 explained a yearlong professional development opportunity that was planned by her administrator, which helped the teachers at her school get a jump start on their technology use. P4 reflected:

> And that was really valuable because they shared a lot of tools. And then we would have practiced implementing them or trying them and then talking about what worked and what didn't. So that was a-- to me, that was a good-- when I say starting point, not that teachers weren't using things before, but it definitely kind of gave everyone a place to start from, to feel kind of like on an equal level.

P3 and P9 teach at the same school and both described a professional development experience that represented how their administrator influenced and equipped their perspectives on technology use. P9 said:

> I don't know if you've heard of Westin Kieschnick with his 'Bold School?' He came and spoke for some of our professional development days. And so, our principal's very big on being that 'Bold School,' that kind of old version still but working towards balancing it with the technology.

P3 also talked about how this professional development equipped her and made her think differently about her student-centered technology use. She said, "We recently had a speaker come and say that tech shouldn't drive your lesson plans, it should just be incorporated seamlessly. And so, I've really been trying to focus on that." The administrative leadership at their school equipped and strongly influenced their perception of what effective technological implementation looks like.

Other participants expressed that their administrator provided time for equipping through intentional staff sharing or peer collaboration opportunities. P6, P9, P10, and P14 all mentioned that their administrators embedded peer technology collaboration into their faculty meeting time. P10 reflected:

> We have every month we have a faculty meeting, and that the last half hour of every faculty meeting is a technology time where we can share with other teachers what we've learned or what we've found. We've done troubleshooting times. We've kind of gone through and compared to try to scaffold, "Well, here's

> what second grade's doing. Here's how third grade's going to--" We kind of work in vertical alignment as well with some of our activities.

P14 shared a similar mode for peer equipping, yet emphasized that the technology support was handled best by sharing student work products rather than technology tools. P14 explained "those of us that were using technology, we would have a time to share student work. And then just by sharing student work, it opened up eyes for the different teachers, for all of us." P9 explained that "at the end of our faculty meetings for the first two months of school, it was like stay and get your tech questions answered. Stay and get your tech things answered. And so, he is encouraging that kind of community." For P4, personal goal setting and peer accountability discussions were equipping for the teachers in her setting. She reflected:

> And then our professional development the last couple of years that we've done is we actually developed our own goals. We meet with [the principal], but then we kind of share our progress through the year of what we're doing. And so, a lot of times, there is a technology component in what a lot of people are using. So, then they'll show it to us, or demonstrate, or just in the conversations, someone will share other tools that they're using.

A few participants discussed a lack of or decline in opportunities administration provided to equip teachers in the area of technology. P13 shared appreciation for the in-services her principal offered in the past, but has seen a shift in professional development content towards lockdown drills and safety rather than technology support. P13 reflected, "It seems like it is not as big a priority anymore because maybe administration feels

we’re pretty adept at that.” P12 discussed a steady decline in the amount of pressure he senses to implement technology, and also a decline in equipping opportunities by his new administrator. While P5 and P10 discussed some equipping opportunities available at their school, they also mentioned a hindrance of access to professional development at their Faith System school. P5 shared:

> One thing that's tough being at a small parochial school is that we don't have the access to as much professional development as other teachers might. Like at the public schools, we don't have a technology specialist on campus. So, there's just not the time or the meetings or the carved-out trainings.

Participants found administrative equipping to be influential to their student-centered technology use.

Multi-leveled administrative leadership: Engage. Study participants described that multi-leveled administrative leaders also engaged them in technology through support, personal skill, and expectation. P3, P4, P10, P13, and P14 emphasized the overarching sense of support they felt from administrators as being influential and important for their personal perceptions about student-centered technology use. Participants described administrators as willing to problem solve, share ideas, and support trouble shooting efforts. P13 appreciated an open invitation of support from her assistant principal who offered "’Anytime you need help, come and see me,’ and she's always available.” In reflection about her administrator, P10 reflected:

> She's a very good leader in that she respects and listens to our needs and stuff, but then she also lets us know what she sees happening. And she thinks would be a

> good idea. And so, again, it's just that collaboration of whatever she sees that she thinks is a good idea she'll share with us, and we'll try it. And if it works it's awesome and if it doesn't, we go back to the drawing board and figure out a new solution.

P3 expressed appreciation for the support her administrator offered after struggling with an ongoing technology challenge in her classroom. This support influenced her willingness to persist and work through the challenges she was facing. P3 reflected:

> But I was also really grateful that my principal cared very much to come in and see what that looked like for me. I think it's really important that administration, if they want technology to be a huge component, that technology has to work.

P4 summed up how a collective sense of support is influential for her. P4 described:

> Having an administrator that is not just giving us directives or standards but that is doing what he can to support us with the materials and tools and training. I think those are all really positive things and those haven't always been the case. And that certainly was more challenging.

Study participants were also engaged by administrators who demonstrated skills in their personal use of technology. P4, P6, P7, and P9 articulated that the technology skills of their administrators were helpful and influential. P7 described that her administrator “uses all of the stuff himself. He very much uses Google Classroom and anything else he can get his hands on. He wants to integrate it and use it.” P6, who described her principal as “the most tech-savvy of all of us,” said:

> Any time if we have a problem with the technology, he's able to assist with that so the students can keep going, and just seeing how he uses technology in his classroom too at the middle school level kind of influences me.

Similarly, P4 reflected, "[My principal] has a much higher just personal skill level with technology. And that has made him a really valuable resource in addition to the administrative piece."

Participants also described how administrators engaged them through setting expectations. P5, P7, P8 and P13 described unspoken expectations or a general understanding about how technology would be used. P8 shared:

> I think the assumption is just that we are using it to hit our state standards. I think he just wants to make sure that whatever they're doing is tied into a learning objective that could be linked back to a standard. And I think he just assumes we're not letting them get on and watch YouTube videos. I think that understanding is there, but as far as, having anything specific in place. We don't have any policies or guidelines yet.

Other participants shared specific approaches their administrators used to establish expectations. P4 explained:

> He sets high standards. And so, I think that forces you to do some things that maybe either you wouldn't have chosen, or tried, but-- or would have put off, or not been able to develop. For example, when we first had the TechEdge group come in, we all developed our own classroom blogs as kind of a place for parents to-- and students, but especially parents at the elementary level to find

> information. We could post pictures. We did a lot. And that was definitely a big jump for a lot of people.

P14 reflected:

> At the school I was at was the first time we rolled out 1:1… the administration said, "If the parents are going to invest in this, and if we're going to invest in it, we need to see it happening." So, it was mandated but in a very good way.

P1 shared another approach to setting expectations:

> We have professional goals that we have to present to [the principal] at the beginning of the year, the middle of the year, and at the end of the year. And within those professional goals, one of them is technology development or how the teacher is going to incorporate technology in their classroom.

Even with administrator expectations, participants also discussed teacher autonomy and the realization that teachers in their buildings used technology at a wide variety of levels. P1 reflected that her principal "kind of believes in everyone to kind of do their own thing, everyone has their own preferences for how they integrate technology." P8 and P14 concurred that even with expectations, the implementation of technology is wide and varied. P14 shared:

> I think if we didn't use [technology] at all that would raise red flags because they all do have Chromebooks. So, I would say in that regard, we are expected to use them. Some teachers might use them to teach typing and that's okay. Typing is a skill but personally, I just like to go much beyond that.

P4 summed up her perceptions of an administrators influence when she said:

> Administrator support and the initiative, I think, are really important. And certainly, can be stressful at times for the teachers, but hopefully, there's a balance between being challenged to incorporate new things or try new things or use different methods with students.

Participants reported that their administrators' ability to resource, equip, and engage them influenced their decision to use student-centered technology.

Collegial engagement. The student-centered technology practices of the grades 3-5 teachers in this study were influenced by their collegial interactions. Teachers in this study primarily saw themselves as influencers and peer camaraderie surrounding the use of technology influenced their use of student-centered technology.

Collegial engagement: Influencer. The study participants regularly described themselves as being an influence on their peers rather than being influenced by their peers. Participants saw themselves as technology leaders and equippers. P7 and P10 described themselves as an "influencer." P10 shared, "I like the fact that I'm at [Redacted] now because what I do in my classroom, I feel like influences other teachers to try different things, especially since we've had our Chromebooks now" (The name of the school is redacted to protect the identity of the school). P7 saw herself as an influencer, but also viewed roadblocks to this role. P7 said:

> I would say I'm more of an influencer. I'm kind of in the middle as far as age-wise. And, so I have a handful of younger staff members, and they're very willing to integrate technology, and try new things and just ready to learn. And they're excited to just be in the classroom. And, so I may look to impart my knowledge

> on them with something, and so it's nice because they're ready to receive it. And so, it kind of depends. It depends who you hit on. And I'm not saying that all of our older teachers aren't open to it, but you know that old saying, it's hard to teach an old dog new tricks. They have their system and the way they want to do it and it works. And, so it's just kind of what it is.

P14 shared her approach to peers as leading by example. “I do what I know will enhance student learning, and I like it when they get excited about it too because they see it happening. It's more show by example. And then them jumping on board.” P3 also reflected on her practice of influencing her peers. She said:

> I would say because I am a new teacher and I am very comfortable with all of these things, I am probably the one promoting it a lot more, and not negatively, just, "Hey. I'm comfortable with it." And so, there are things that I will do in my classroom, because I am comfortable with the technology, that I know aren't being done in the other classes. And I'll share it with them and explain it but I also don't want to force anything on another class.

P13’s leadership and ability to influence has changed over time. P13 started out feeling “pretty inept being an older staff member but surrounded by other older staff members. We really sought support with each other as opposed to the younger teachers who were really savvy. That was very intimidating.” After seeking training, P13 experienced a shift in her collegial role. She said:

> I actually feel pretty good about where I'm at with technology because it felt so much, for years, like I was chasing them to try to keep up, but then something

> changed when I took a number of SMART board classes, and I was teaching them. It was just a switch….it might be more of an even playing field. However, my colleague, she retired two years ago, she has come back to teach. She's older than I am, and I'm teaching her all day long, and it's okay. I feel really good about it because I wish I would have had someone other than my own students teach me.

Even P8, new to student-centered technology use, reflected on her growing ability to lead others. She said:

> We don't have a team of teachers at a grade level…We're teaching all of it, all day. So, any opportunity you can have to maybe provide a little bit more support to one is nice. And I see the benefits of that, and that makes me excited about how next year how I could do a little bit more in terms of that because I know a little bit more this year. I've gotten a little bit of a foundation from the training that we had this last summer, and then just hands-on doing stuff this year, that next year I'll be a little bit more confident going in and trying maybe something else.

Study participants viewed their role as influential to their peers use of technology.

Collegial engagement: Peer camaraderie. Study participants expressed that peer camaraderie influenced their use of student-centered technology. Peer collaboration varied from participant to participant depending upon the school size and level of technology use by other teachers at the school, but the value of collaboration and team building emerged as a theme in participant responses. Peer camaraderie involved the collaborative exchange of ideas, development of vertical alignment, and support for

varying levels of peer technology readiness. P14 described peer interaction as a reciprocal influence where peers "feed off of each other." P5 explained "we're a very collaborative group. So, we're borrowing ideas from each other all the time." Peer collaboration and expectation for technology use was described by P3 as a "cultural" phenomenon that the school encourages. At the same school, P9 described the peer collaboration as having "healthy competition," implying that the teachers work together to push each other to do their best. When asked how the beliefs and practices of her peers influenced her student-centered technology practices, P9 replied:

> I think it greatly influences it, and not only with that healthy kind of competition, but it creates a learning time for us as teachers even to be able to work with teachers who may not have as much technology experience. We get to collaborate with them to help bring them along…it's forced us to have more camaraderie and more vertical alignment.

Just like P9, peer collaboration produced vertical alignment conversations for other participants as well. In P4's smaller school setting, awareness and ongoing conversation about tools and programs used at each grade level provided "times where we can coordinate and then times when we can choose different platforms or different tools just to keep things fresh." P14 experienced alignment conversations too. She said:

> At my current school, those teachers are hungry for scope and sequence…Because things like Tinkercad, that's a pretty useful tool right now, especially with your 3D printers. But it's really helpful if you decide, "Hey in kindergarten, you're going to expose them to this." And then in 1st-grade, and

> then in 2nd, it doesn't become an overwhelming tool when they're suddenly in middle school. And the students then will grow and you can do that for Google Docs and you can do that for programming, coding. The teachers have been very hungry for it and it is growing. The teachers are noticing that this is something they would really like and I think administration definitely wants the school to rise to that level.

Not all participants taught in settings with an overarching collaborative peer atmosphere regarding technology use. Some taught in settings with limited peer interest and a lack of collective pressure to use technology. P8 described her school setting as single-graded classrooms with a wide range of teacher readiness and willingness to embrace the new technology available at the school. She seemed to relish the colleagues in this setting who were ready to work together for growth. P8 said:

> It’s really a few of us that are kind of willing to jump on and try the different things. So, for the rest of us, I think anybody that you can get that shows a little bit of interest that you can sit down with and say, "Hey, let's try this," obviously that's going to impact what we're doing in the classroom. If we find something really interesting, we share it with the ones that we know are going to be open to it again.

P1, who taught in a similar setting to P8, experienced a lack of ability to influence her more “traditional” peers. Her peers responded to her technology ideas with an attitude like, “okay, more power to you if it works for you” and P1 acknowledged that her peers were often not willing to join in for the long run. P1 shared:

> I've even held training sessions on it because my principal loves it, and he's like, "You should host some type of PD," so I did. And then it was like I got zero. At first, they were excited, but does it actually stick, and then consistent use of it? No, but that's okay.

P12 described a decline in peer conversation and collaboration regarding technology use. As a technology coordinator at his school, he described peer conversations as revolving more around hardware issues than anything else. For the primary and elementary grades in particular, P12 described peers that have developed a sense of reservation towards too much technology and a corresponding lack of pressure from administration has led to a decline in peer conversation regarding technology. P12 said:

> I don't sense the pressure. I don't think any of my co-workers feel that pressure to, "Am I utilizing this enough?" Because, again, I just am seeing a bit of a pendulum swing. Not away from technology, but to just ending up as another one of those tools like the overhead projector or the text book.

P1, P8, and P12 all discussed their peers as an influential part of their use of technology, just in a different way than those in settings with that collective desire to collaborate about technology use.

Technology natives. For the grade 3-5 teachers interviewed, student attributes and behaviors provided a strong micro-level environmental influence on their student-centered technology use behaviors. Study participants described their students as technology natives and were influenced by their specific attributes and behaviors with technology. The teachers in this study described the grade 3-5 students as “savvy” (P13),

“intuitive” (P1), “creative” (P7), “comfortable” (P3), and students that “learn actually very easily” (P14). P8 added “fearless” to the list of descriptors as she reflected on her third graders:

> They're fearless when it comes to technology. Where I think adults are a little bit more intimidated by it. They'll get a tablet or mom's new phone and they'll have it figured out before the adults will. And just I think that level of fearlessness obviously they already have. They're willing to try it.

Students are very comfortable with the devices and use them fluidly. P8 reflected, “I think we're almost fighting a losing battle. These kids have grown up holding phones and iPads. So, it's what they like, it's what they're comfortable with.” P7 explained her perception on how the comfort level may have emerged in the home. P7 said:

> I believe, because it's how you've grown up. Because with my two-year-old, or my own kid, he's doing the same thing that his eight-year-old brother is doing and he's two. But because he watched his brother do it, he knows how to do it. He doesn't have an iPad but he knows how to get into the iPad because his siblings have shown him.

P8 reflected, “I think they're just wired differently now. I think there's a comfort there and an excitement there for them that it really allows you to just let them kind of run with it sometimes.” Further, P7 explained that student comfort with technology has changed the way she teaches with technology. P7 said:

> I'm not hand-holding anymore on how to use the machine, we can just do the things that are on the machine instead, like going to the internet and doing a

> research project. I don't have to teach you how to use Google Docs because you already know how, so we're just going to use Google Docs to do this assignment or Google Slides to do this assignment and I have to teach you how to use it

Similarly, P14 has changed her approach to teaching due to new student attributes. She shared:

> Ten years ago, I would have taught them-- I had taught our programming class and we taught it as if I taught them step by step. This is how you-- they learned by doing still and with so many things, I had to teach them how. Students nowadays, you still teach the habit but they catch on so quickly, that if you taught the same way what you did ten years ago, they would be very bored. So, they're different learners.

Study participants also described students with negative descriptors regarding technology such as “addicted” (P14), “the loneliest generation” (P3), and “sneaky (P13). Participants expressed concern about these attributes. P3 reflected that kids sometimes feel a little too comfortable or addicted to technology. P3 surmised, “I can tell the kids that spend a lot of time on their screens because it takes them a long time to actually follow that instruction [to deactivate iPads].” P13 shared concerns about student technology addiction, as well. She said:

> And now that I'm back to fifth grade…There's only one or two that have cell phones, and all have home computers, and most of them have their own devices, but as a six and seventh grade teacher, they all had better phones than I do, latest and the greatest and multiple devices, and I knew they were really on it too much

> because they did not want to go outside for recess. They just did not want to go out. I just had to shoo them outside. They wanted to stay in, and they begged to be on a computer.

P14 described her concern about her fifth-grade students seeking artificial satisfaction through technology. She said:

> I have students who go to bed with their technology. They're just waiting for someone to post something because that's where they're really finding their satisfaction, their worth…I just think we have a big job ahead of us with that, and I think my philosophy is don't take it away because you have to help them learn how to deal with it.

P3 shared her concern about students lacking intrinsic motivation. She said, "They just want you to tell them the answer. They just want you to do it for them. And they don't want to do research. They don't want to try hard." Contrastingly, however, she noticed that this tends to change when using technology. P3 continued:

> But I see a difference sometimes when we do technology. Their confidence builds…They don't feel as defeated; like I can't do this. And so, again, you don't want to enable kids to only do things through technology. That's not healthy. But you want to teach them how those skills of working through a technology project is the same thing as working through your book trying to find research. And it's just hard. We're in a very different culture where we get things really quickly.

The grade 3-5 teachers in this study considered their students to be technology natives and expressed that this micro-level environmental factor influenced their student-centered technology practices.

Discrepant Cases

Although no discrepant cases occurred in this study, discrepancies in participants' experiences were found. In particular, the wide variance of school environments led to differences primarily in the themes recorded for RQ3. These discrepancies were shared in the study results.

Summary

In Chapter 4, I explored answers to three research questions. The pedagogical influences of student-focused, purposeful learning, pedagogical beliefs, and time answered Research Question 1. For research Question 2, I reported the attitudinal influences of value beliefs, reevaluation of tech use, and professional mindset. The environmental influences of availability and usability, administrative leadership, collegial engagement, and students as technology natives answered Research Question 3. In Chapter 5, I will delineate my interpretation of these findings.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this interpretive descriptive qualitative study was to examine how pedagogical, attitudinal, and environmental factors intersect to influence the student-centered technology practices of teachers in grades 3-5 in faith-based schools. A large amount of primarily quantitative research has already established that many individual factors influence teacher technology use, as was described in the literature review in Chapter 2. The results of this study, shared in Chapter 4, reported findings according to the individual factors of pedagogy, attitude, and environment in alignment with the Research Questions for this study. While the findings were separated for data analysis purposes, in reality, according to social cognitive theory (Bandura, 1986), these factors work concurrently to influence a teacher's decision to use student-centered technology. Therefore, the discussion, conclusions, and recommendations for this study will focus primarily on the juxtaposition of the influences in the form of overlapping results.

An interpretive descriptive qualitative approach was the best methodological design to examine how pedagogical, attitudinal, and environmental factors intersect to influence the student-centered technology practices of teachers in grades 3-5. Interpretive description allows for the exploration of real-world experiences by eliciting participant perspectives (Creswell, 2013; Patton, 2015; Thorne, 2016). I chose this design because it is geared toward use in clinical practice settings and is common in education research (Kahlke, 2014; Thorne, 2016), it is intended for smaller qualitative studies that seek to capture themes within subjective experiences (Thorne, 2016), and it encouraged me to

draw from models and concepts to frame my research (Merriam & Tisdell, 2015), namely social cognitive theory (Bandura, 1986) and first and second order barriers to technology integration (Ertmer, 1999).

The results of this study confirm that the decision to use student-centered technology for instruction is a complex and multi-faceted process that includes the influences of pedagogical, attitudinal, and environmental factors. The individual influences on technology use synthesized in the review of the literature in Chapter 2 were confirmed in this study. No existing knowledge on the pedagogical, attitudinal, or environmental influences on technology use was disconfirmed. The key findings from my study that extend existing knowledge center around the intersection of these influences, with special interest attributed to the student, representing a micro-level environmental influence that contributed to changes in teacher attitudes and pedagogical uses of technology. Teachers in this study described their students as technology natives that have grown up with technology in their hands, skilled, and intuitive, yet are also potentially overexposed and reliant upon the use of technology as a toy rather than a tool. Student attributes powerfully influenced the teachers' attitudes and pedagogical approaches, especially regarding time spent using technology in the classroom and the use of technology to provide differentiated learning experiences. The nonpublic, faith-based setting of this study also extended the knowledge of environmental influences on student-centered technology use by acknowledging that recruitment, marketing, monetary issues related to a church budget and donations represent unique contextual challenges

that nonpublic schools must navigate to equip their teachers for technology implementation.

Interpretation of the Findings

In this section, I will present the interpretation of the findings aligned with the conceptual framework for this study. First, I will describe the findings for each individual influence on student-centered teacher technology use including pedagogy, attitude, and environment in relation to first and second order barriers to technology use (Ertmer, 1999). Second, I will juxtapose the influences on student-centered technology use in the form of overlapping results as I share my interpretation of the findings according to social cognitive theory (Bandura, 1986).

Interpretations of Findings According to First- and Second-Order Barriers to Technology Integration

First- and second-order barriers provided the structure, context, and language for the investigation of pedagogical, attitudinal, and environmental factors that influence the student-centered technology practices of elementary teachers (Ertmer, 1999). Second-order barriers are internal to the teacher and include the constructs of pedagogy and attitudes about technology. First-order barriers are external to the teacher and include concepts such as access to resources, peer support, and training. First- and second-order barriers work together to influence teachers' decisions to use student-centered technology. Results will be interpreted in coordination with the peer-reviewed literature presented in Chapter 2.

Pedagogy: Second-order barrier to technology integration. Findings from the

data confirmed the knowledge that teachers who espouse student-centered technological beliefs and practices demonstrate technology use that emphasizes the needs of individual students and offers integrated, authentic, and purposeful learning experiences with technology (Burke et al., 2018; Deng et al., 2014). Qualitative insight extended this knowledge by revealing that the participants' pedagogical use of student-centered technology was highly influenced by the students themselves, with special emphasis on student response to technological experiences and the differentiated opportunities that allowed for meeting diverse learning needs, offering students choice, and engaging students in self-assessment. Student-centered technological experiences were crafted to enhance learning, provide opportunities for 21st century skill development, and share student work in authentic contexts (Dondlinge et al., 2016; Moon et al., 2016; Panorkou & Maloney, 2015).

Findings also confirmed that the pedagogical beliefs to practice phenomenon in student-centered technology use is complex and constantly evolving (Heitink et al., 2017; Hsu, 2016; Liu et al., 2017; Mertala, 2017; Sheffield, 2015). Teachers reported evolving experiences in matching their general pedagogical beliefs to their technological practices, yet consistently emphasized the power of the faciliatory teaching role as pivotal to their approach to using student-centered technology. While the constructivist practices of the participants were evident, data confirmed that teachers often merged both constructivist and traditional beliefs as they crafted student-centered technological experiences to meet the needs of individual students. This confirmed existing knowledge that teachers who exhibit both traditional and constructivist pedagogical beliefs are better suited to select

and apply a variety of technological applications in different teaching contexts (Liu et al., 2018; Liu, Koehler, et al., 2018).

Attitude: Second-order barrier to technology integration. Findings in this study confirmed that multiple attitudinal factors work together to influence teachers' decisions to use student-centered technology. Emotion, value beliefs, and professional mindset concurrently and bidirectionally influenced teachers' attitudes and were critical to their implementation of technology for instruction (Joo et al., 2016; Moreira- Fontan et al., 2019). Findings from data confirmed the knowledge in the peer-reviewed literature that a positive emotional attitude about technology, a willingness to take risks, and an expectation for perseverance and ongoing professional growth produce a healthy professional mindset that is more willing to implement technological experiences that are also perceived as valuable (Chi & Churchill, 2016; Li et al., 2018; Rich et al., 2017; Teo et al., 2016). Value beliefs influenced participants to amplify access, downplay constraints, and find ways to integrate technology despite barriers in the school context (Admiraal et al., 2017; Cheng & Xie, 2018; Pittman & Gaines, 2015; Vongkulluksn et al., 2018).

The results of this study extended the literature, as participants explained their perceptions about what, rather than that, they valued student-centered technology. Participants' attitudes towards student-centered technology were influenced by their perceived value of equipping students for a life lived with technology, necessitating careful training regarding safety and perception of technology as a tool, as well as the dichotomous belief that both basic computing skills and the development of 21st century

skill building activities are essential for students in grades 3-5. This element of the phenomenon was not a theme identified in the literature, which may be directly related to the lack of research regarding specifically student-centered technology use or in response to the grade 3-5 student population. Further, participants expressed attitudes of reevaluation regarding their use of student-centered technology due to their concern about the overuse of screens for students in grades 3-5. The reevaluation of attitudes was revealed in teachers' perceptions about student screen time use at home as well as the intention to ensure that technology use in school represented enhanced or higher-level technological experiences.-This knowledge extends what is known about attitudinal influences on student-centered technology use.

Environment: First- order barrier to technology integration. Study participants confirmed the knowledge that environmental influences on their student-centered technology use behaviors are confounding due to a complex school environment that yields interlocking, contrasting, and simultaneous realities (Genlott et al., 2019; Kimmons & Hall, 2016; Toh, 2016). Participants reported environmental influences surrounding availability and usability issues regarding technology tools, specifically reporting 1:1 classroom device sets as influential to use, as well as budget and scheduling constraints, confirming the knowledge that meso-level environmental issues merge to influence technology use at the micro (classroom)-level (Genlott et al., 2019; Toh, 2016). The nonpublic, faith-based setting of this study extended the knowledge of environmental influences on student-centered technology use by acknowledging that recruitment, marketing, monetary issues related to a church budget and donations, represent unique

influences that nonpublic schools must also navigate. Contrary to the literature presented in Chapter 2, participants reported no influence on their student-centered technology use due to technology policy initiatives.

Participants articulated that the environmental influence of administrators, principals, and students also influenced their student-centered technology use. All findings from data regarding the role of multi-leveled administrative leadership and collegial relationships regarding the technology use behaviors of teachers was confirmed. Administrators' meso-level role in resourcing and equipping the school environment and micro-level role in engaging and supporting individual teachers simultaneously influenced teachers to use student-centered technology (Cheng & Xie, 2018; Lindqvist, 2019; Liu et al., 2016; Sun & Gao, 2019). Findings from data confirmed that informal and formal collegial engagement in using technology to teach manifested a higher plan of intention to use, critical analysis of current instructional practices, development of meso-level vertical alignment, and support for varying levels of peer readiness to use student-centered technology (Drossel et al., 2017; Hatlevik & Hatlevik, 2018; Saudelli & Ciampa, 2016). Participants also revealed that the students themselves highly influenced their decision to use technology, even surpassing the influence of meso-level influential peers. While this confirms the knowledge that teachers are most influenced by student learning in their intimate classroom context (Kimmons & Hall, 2016), participants' qualitative description highlighting students as technology natives extends our understanding of this micro-level environmental influence on student-centered technology use.

Interpretation of Findings According to Social Cognitive Theory

According to social cognitive theory (Bandura, 1986), behavior is influenced by the triadic interaction of personal, behavioral, and environmental influences. Within this triadic model, personal determinants (second-order barriers) and environmental determinants (first-order barriers) are considered to be co-factors that cause a bidirectional effect on one another (Bandura, 1977). In alignment with social cognitive theory, the multiple and simultaneous influences of pedagogy, attitude, and environment will now be interpreted by overlapping and intersecting study results.

Pedagogy and Attitude

Study participants confirmed the knowledge in the peer-reviewed literature that pedagogy and attitude represent powerful internal constructs that reciprocally influence a teacher's decision to use student-centered technology (Bandura, 1977; Liu et al., 2017; Shin et al., 2014). Participants described how their attitudes, representing emotion, value belief, and a professional mindset willing to persist and try new things, were constantly juxtaposed against their perception of pedagogical best practices. Teachers in this study described their instructional experiences with student-centered technology as influential to their evolving attitudes, which in turn influenced their decision to implement student-centered technology again in the future (Liu et al., 2017; Shin, Han, & Kim, 2014). Participants confirmed that their professional mindset, including attributes related to technology self-efficacy, influenced their pedagogical decision-making as they chose to persist through challenges related to student-centered technology implementation (Bandura, 1989; Li et al., 2018). While the influencing power of pedagogy and attitude

differed by participant, each articulated evidence of the bi-directional and reciprocal impression these two internal constructs had on the technological learning that occurred in their classrooms (Admiraal et al., 2018; Bandura, 1977; Liu et al., 2017; Shin et al., 2014).

Participants' attitudes regarding reevaluation of technology use and corresponding pedagogical behaviors extended the knowledge on this topic. Participants expressed attitudes of great concern regarding the amount of time and the manner in which students used screens at home, manifesting itself in the pedagogical decision to limit screen time and student-centered technological experiences at school. This theme has not previously been identified in the literature. A possible reason for this may include the population of grades 3-5 teachers who are focused on developmental appropriateness considerations that may vary from other populations. Additionally, participants' re-evaluative attitudes influenced their thoughtful pedagogical implementation geared towards differentiated, authentic, and enhanced learning experiences with technology. These additional perspectives may have arisen due to the emphasis on student-centered technology use and not just general technology use.

Attitude and Environment

Confirming what is known, participants in this study were consistent in their persistence through environmental challenges due to attitudes that honored the perceived value of student-centered technological experiences (Kimmons & Hall, 2016; Vongkulluksn et al., 2018). Participants expressed the concurrent and ongoing influence between significant peers, including administrators and colleagues, and a professional

mindset that embraced change, persisted through challenges, and welcomed growth (Hatlevik & Hatlevik, 2018; Hur et al., 2016). Professional development influenced attitudes and changed perspectives about tools, value beliefs, and opportunities. Findings indicated that participants were also influenced by the intersection between the micro-environmental theme of students as technology natives and their attitudes of reevaluation of technology use. Participants developed attitudes of concern regarding long-term health issues and the overuse of screen time in the home in response to their acute perception of behavioral and learning changes observed in their students who have grown up with technology in their hands. These attitudes of concern led participants to reconsider when, how often, and in what manner technology should be used in their classroom. Therefore, this knowledge extends what is known about how micro-level environment and attitudinal factors intersect to influence student-centered technology use.

Environment and Pedagogy

Findings confirm that environment and pedagogy allow for a bidirectional influence on the technology practices of teachers (Ding et al., 2019; Prestridge, 2017; Tondeur et al., 2017). In alignment with social cognitive theory, study participants explained instructional practices that influenced their use of available technology while they simultaneously articulated that the available technology, namely 1:1 classroom device sets, influenced their pedagogical approach to student learning (Bandura, 1977). Several participants explained how the recent environmental change towards more available technology had shifted their pedagogical practice to specifically include more hands-on student-centered instructional experiences that valued differentiated, authentic,

and enhanced learning (Tondeur et al., 2017). Others expressed how influential peers influenced their pedagogical approach to using technology through professional development, collaboration, or modeling (Lindqvist, 2019; Saudelli & Ciampa, 2016).

Participants articulated that their pedagogical approach was also influenced by the attributes of their students, a micro-level environmental influence. Differentiation, designed to meet varying student learning needs, emerged as an influence on the decision to use student-centered technology. This influence on student-centered technology use was not a theme identified as influential to use in quantitative studies based on general technology use, but may have emerged in this investigation on specifically student-centered technology use. Teachers described students as technology natives who were equipped, skilled, and capable, thus causing them to shift towards more open-ended instructional tasks that honored student intuition and skill regarding technology. Contrastingly, student attributes related to technology addiction and screen time concerns led teachers to implement self-imposed technology time limits and pedagogical restrictions throughout the day.

Pedagogy, Attitude, and Environment

In alignment with social cognitive theory, findings from this study confirmed that the multiple and simultaneous influences of pedagogy, attitude, and environment intersect to influence the student-centered technology practices of teachers (Gurfidan & Koc, 2016; Petko et al., 2018; Yang & Chun, 2018). How the constructs intersect to influence technology use varies by participant, however, the bi-directional power of all three determinants clearly influences their decision to use student-centered technology.

Confirming knowledge in the literature, participants overarchingly self-reported that their internal attitude and pedagogical approach most strongly influenced their decision to use student-centered technology (Bandura, 1977; Liu et al., 2017; Shin et al., 2014), although all participants could identify environmental factors including available technology tools, influential peers, and their students that also played a role in their decision to use student-centered technology. The powerful interplay of factors has been investigated in many quantitative investigations in the peer-reviewed literature (Gerick et al., 2017; Liu et al., 2016; Petko et al., 2018). My findings extend this knowledge and offer a qualitative interpretation of the lived experiences of teachers implementing student-centered technology.

Pedagogy, attitude, and environment intersected pointedly in response to the grades 3-5 students described as technology natives that have grown up with technology in their hands, skilled, intuitive, yet also overexposed and potentially addicted to using technology. Teachers were confounded by attitudes that valued technological experiences perceived as essential for life yet felt the need to minimize or moderate technology experiences at school due to their perception of the overuse of technology in the home. Pedagogical decisions were implemented with the knowledge that students desired and benefitted from purposeful and differentiated student-centered technology experiences, yet participants felt the need to keep pedagogical implementation in check with self-imposed technology use time limits. The technology native attributes that defined students in grades 3-5 presented a new theme that pedagogically, attitudinally, and

environmentally influenced how teachers chose to use student-centered technology, thus extending the knowledge on this topic.

Limitations of the Study

The limitations of this study represented occurrences that were outside my control, although they were minimal due to the implementation of the planned strategies for credibility, transferability, dependability, and confirmability. The data in this study was limited to the self-reported experiences of 14 teachers in my participant pool, collected through the sole source of interviews rather than observed behavior (Yin, 2016). Thick description of individual participants and their Faith System schools were included, addressing the dependability and credibility of study results. Researcher bias can be a limitation when conducting a qualitative study with interviews as the sole data source (Rubin & Rubin, 2012). To mitigate this challenge, I actively sought to refrain from bias through ongoing journaling and consultation with my dissertation committee during data collection and data analysis (Rubin & Rubin, 2012). The indicated limitations lead to findings that can be generalized to a larger population utilizing themes that were developed using multiple cycles of manual coding.

Recommendations

The following recommendations for further research, grounded in the strengths and limitations of the current study as well as the literature reviewed in Chapter 2, are based on the grade 3-5 teachers' perceptions of the pedagogical, attitudinal, and environmental factors that influenced their student-centered technology use in faith-based schools.

1. Several participants in this study were new to using student-centered technology and provided interesting insight regarding the influences on their shifting technology use behaviors. An in-depth qualitative investigation of the growth of new student-centered technology using teachers over time, in response to influences such as pedagogy, attitude, and environment, could elicit further understanding about instructional shifts towards student-centered technology use.
2. In this study, I investigated the influences on student-centered technology use in a nonpublic, faith-based setting. Further investigation of the unique contextual circumstances found in nonpublic, faith-based schools, including but not limited to recruitment, marketing, and monetary issues, could further extend the knowledge on this topic (Durff, 2017; Swallow, 2017; Swallow & Olofson, 2017).
3. Immediately following the collection of data for this study, the COVID 19 Pandemic of 2020 caused schools across the nation to shift to online remote learning for the last quarter of the school year. This environmental occurrence required teachers to use technology in new ways. Future studies might explore how technological instruction during the COVID 19 pandemic pedagogically, attitudinally, and environmentally influenced teachers ongoing use of technology once back in the regular face-to-face school setting.

4. Studies in the peer-reviewed literature that intentionally emphasize the intersection of multiple influences on teacher technology use are mostly quantitative in nature and lack a coherent understanding due to contrasting variables or proposed paths of influence (Gerick et al., 2017; Liu et al., 2016; Petko et al., 2018). The qualitative approach used in this study yielded new understanding, suggesting that further qualitative studies may also contribute to deeper understanding of the intersecting factors that influence student-centered technology use.
5. The outcome of this interpretive descriptive qualitative study showed that grade 3-5 teachers are strongly influenced by their grade 3-5 students. Attitudes regarding student screen time use at home and also the desire to meet learning needs through differentiation influenced teachers use of student-centered technology. Further analysis of these influences should be studied outside of grades 3-5 to see if this perception is unique to teachers of this age group. It would also be beneficial to study these new variables within quantitative studies that measure multiple influences on teacher technology use.

Implications

In contemporary classrooms, teachers are expected to equip students with 21st-century learning skills so they can be successful in a globally-connected and technology-infused world (Gerick et al., 2017; Sias, Nadelson, Juth, & Seifert, 2017), yet many teachers struggle to implement student-centered, technology-enabled instructional

practices that support these types of skill development (Delgado et al., 2015; Eickelmann & Vennemann, 2017; Magana, 2017; Ruggiero & Mong, 2015). The investigation into factors that influenced teachers who actively and currently practice student-centered technology provided further understanding of professional practices that can promote higher order uses of technology across the field of education. This is essential due to the complicated and overlapping factors that intimately influence teachers' ongoing decisions about when, how often, and in what capacity they should implement student-centered technology.

The area in which my study has the most likely potential for positive change is in the area of teacher professional practice. I examined how pedagogical, attitudinal, and environmental influences intersected to influence the student-centered technology practices of teachers in grades 3-5 in faith-based schools. Uncovering influences that caused educators to shift towards higher-level, student-focused uses of technology informs professional practice through insight for professional development and educator empowerment. Improved professional practice surrounding the implementation of student-centered technology also has the potential to leverage positive social change at a broader level. As teachers become more equipped and prepared to lead students in rich, student-centered, and technology-enabled learning experiences, students have the potential to leave K-12 education more equipped for the global and technologically-centered world in which they live. To be most effective, attention must be paid to the evolving attributes of students who have grown up with technology in their hands. Specific recommendations for practice include:

1. Technology professional development should explicitly explore pedagogical, attitudinal, and environmental issues that influence the willingness of teachers to apply and practice what has been learned. Variations in emphasis may be required to meet the needs of individual teachers.
2. Teachers should engage in self-evaluation and self-reflection opportunities that reveal how the triadic influences on student-centered technology use guide their practices with technology. Goal setting in relation to areas of challenge are encouraged.
3. Administrators are encouraged to actively develop a collaborative culture of positivity and risk-taking regarding the use of technology to promote teacher empowerment and willingness to engage in the practice of student-centered technology use.
4. To truly elevate learning for students who are technology natives, student-centered technology use must extend beyond engagement with technology to experiences that increase 21st century skill development and perception of technology as a tool that is critical for communication, collaboration, creativity, and problem solving.
5. Schools should increase communication about student technology use in the home by offering education, training, and support for parents engaged in parenting children in the digital age.

6. Nonpublic, faith-based schools, who have an emphasis on training the whole child, should consider curricular and attitudinal supports to help children develop positive and healthy perceptions of technology.

Conclusions

Technology has been present in schools for decades, yet many teachers use it in low-level, teacher-centered ways and struggle to implement student-centered technology practices that allow students to create, connect, and authentically produce content for real-world audiences. The uptake of student-centered technology is a complex phenomenon that requires teachers to manage many confounding variables that peak in the classroom environment. In this study, the simultaneous qualitative investigation of pedagogy, attitude, and environment provided a realistic understanding of the phenomenon regarding the influences on a teachers' decision to use student-centered technology. While interchangeable and reciprocally influential, participants in this study consistently positioned influences on technology use around the health, well-being, and scholastic readiness of their students, described as technology natives who have grown up with technology in their hands. Further, teachers were influenced to use student-centered technology to produce purposeful and enhanced learning opportunities in order to equip students with skills and healthy perceptions about technology that will equip them for a successful life lived with technology. Influential peers, opportunities for collaboration and support, and available and useable technology allowed teachers to have a professional mindset willing to take risks, embrace change, and pursue continued growth in technology use. Ongoing emphasis on the triadic influences of pedagogy, attitude, and

environment has the potential to yield teacher growth in the use of high-level student-centered technology, which will benefit student learning and development of 21st century skills.

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Appendix A: Google Form Survey Questions and Consent Form

Review the consent form below. If you feel you understand the study well enough to make a decision about it, please indicate your consent by clicking "I consent" and then complete the rest of the survey.

CONSENT FORM

You are invited to take part in a research study about the multiple factors that influence a teachers' use of student-centered technology. The researcher is inviting 3rd-5th grade teachers, who teach in faith-based schools, and utilize student-centered technology to be in the study. I obtained your name and contact information via your principal. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

This study is being conducted by a researcher named Shanna Opfer who is a doctoral student at Walden University.

Background Information:
The purpose of this study is to examine the multiple factors that influence teachers' decisions to use student-centered technology. Student-centered technology is described as technology that allows students to use technology in authentic ways, such as create products to represent their learning and/or use technology to develop real-life skills such as collaboration, creativity, higher-order thinking, or problem solving.

Procedures:
If you agree to be in this study, you will be asked to complete the following brief survey, which should take less than 10 minutes of your time. Then, arrangements will be made for you to take part in one 45-60 minute interview conducted virtually via Zoom web conferencing software. The interview will take place at a date and time that is suitable for you.

Here are some sample prompts that will be discussed in the interview:

- Describe your beliefs about effective ways of teaching using technology.
- Describe how your teaching experiences have affected how you feel about using technology to teach students in your classroom.
- How do the beliefs and practices of administrators in your school affect your use of technology?

Following the interview, you will receive a copy of the transcript for you to review, verify, and/or change for accuracy. This may take approximately 30 minutes to complete, based on your level of review.

Voluntary Nature of the Study:
This study is voluntary. You are free to accept or turn down the invitation. No one at your school will treat you differently if you decide not to be in the study. If you decide to be in the study now, you can still change your mind later. You may stop at any time. If the researcher recruits more volunteers than necessary, not all volunteers will participate in the study. The researcher will follow up with all volunteers to let them know whether or not they were selected for the study.

Risks and Benefits of Being in the Study:
Being in this type of study involves some risk of the minor discomforts that can be encountered in daily life, such as fatigue, stress, and/or use of your time. Being in this study would not pose risk to your safety or wellbeing.

This study will provide benefits by contributing knowledge to the field of education about technology integration, specifically in faith-based settings.

Payment:
You will receive no payment for your participation in this study.

Privacy:
Reports coming out of this study will not share the identities of individual participants. Details that might identify participants, such as the location of the study, also will not be shared. The researcher will not use your personal information for any purpose outside of this research project. Data will be kept secure by storing it on a password protected computer. Names will be stored separately from the interview data. Data will be kept for a period of at least 5 years, as required by the university.

Contacts and Questions:
You may ask any questions you have now. Or if you have questions later, you may contact the researcher via email at shanna.opfer@waldenu.edu. If you want to talk privately about your rights as a participant, you can call the Research Participant Advocate at my university at 612-312-1210. Walden University's approval number for this study is **01-29-20-0625804** and it expires on **January 28, 2021**.

Please print or save this consent form for your records.

Obtaining Your Consent
If you feel you understand the study well enough to make a decision about it, please indicate your consent by clicking "I consent" in the online survey and then complete the rest of the survey.
Yes, I consent.

Are you a former student of the researcher of this study (Shanna Opfer)?	Yes No

What grade level do you teach?	Grade 3 Grade 4 Grade 5 Combination of Grades 3, 4, or 5
How many years have you been teaching?	1-3 4-6 7-9 10 or more
How many years have you been intentionally integrating technology in your teaching?	1-2 3-5 6 or more
In this study, student-centered technology use is defined as a practice that allows students to actively participate with technology tools, create products to represent their learning, and/or use technology to develop real-life skills such as collaboration, creativity, higher-order thinking, or problem solving. To better understand how student-centered technology is used in your classroom, please place a check by ALL the ways that STUDENTS use technology.	Create digital products to showcase learning (infographic, concept map, podcast) Produce paper-based products using technology (newsletters, brochures, etc.) Present information with presentation software Practice skills with software applications or educational games Engage in coding experiences with robotic tools or applications Research content with technological tools Connect with audiences beyond the classroom (Skype, Google Hangout, etc.) Share technological products with authentic audiences Complete learning drills, review, or practice exercises with technology Use technology to collaborate with others Watch or read content chosen by the teacher through video or text Communicate with others using technology Demonstrate problem solving skills Engage with virtual or augmented reality learning experiences Experience simulation software or applications Other (place to describe)
To better understand how technology is used in your classroom, please place a	Communicate with students Project visual content during lessons

check by ALL the ways that you, as the TEACHER, use technology.	Plan technology-based student choice options that allow students to meet learning objectives Search for and access curriculum resources using technology Facilitate student learning with an interactive white board Gather formative assessment data Post class information (homework, products, etc.) on an electronic bulletin board or webpage Adapt an activity to meet individual student needs Use presentation software when teaching Other (place to describe)
Please describe 2 specific ways that you are currently integrating student-centered technology in your classroom.	
What is the best way to contact you to set up an interview time?	Email _____ Text Message _____ Phone Call _____

Appendix B: Interview Guide

Alignment of Interview Questions with Research Questions

This interview guide will be used in each interview. It includes an opening statement, two introductory questions, fifteen focused questions, and a closing statement. The interview questions in the interview guide are developed based on a thorough review of the literature on pedagogical (Burke et al., 2018; Li et al., 2018; Mertala, 2017; Ottenbreit-Leftwich et al., 2018), attitudinal (Liu et al., 2016; Saudelli & Ciampa, 2016; Vongkulluksn et al., 2018), and environmental influences (Genlott et al., 2019; Sadaf & Johnson, 2017; Toh, 2016; Vanderlinde & van Braak, 2010) and will seek to extract descriptive accounts from participants regarding the various factors that influence their student-centered technology use. Each interview question in the interview guide is aligned with a research question (see Table A1).

Table A1

Alignment of Interview Questions with Research Questions

Research Questions	Interview Questions
How do grades 3-5 teachers in faith-based schools explain the pedagogical influences on their student-centered technology use?	3, 4, 6, 8, 10

How do grades 3-5 teachers in faith-based schools explain the attitudinal influences on their student-centered technology use?	4, 5, 7, 8, 10
How do grades 3-5 teachers in faith-based schools explain the environmental influences on their student-centered technology use?	3, 9, 10

Opening Statements

Thank you for taking the time to meet with me today to discuss your use of technology in your classroom. Your perspective and insight in this area is of great interest to me and I look forward to learning from you. My questions will address how your pedagogy, attitude, and environment have influenced your use of student-centered technology. You are one of twelve grades 3-5 teachers in faith-based schools that I am interviewing as I gather data for my study.

Before we begin the interview, I would like to review the terms to the study you already consented to in the Google Form survey. Your participation in the interview is completely voluntary and you may decline to answer or opt out of the interview at any time. I expect this interview to take between 45-60 minutes and I will be recording the interview so that I can review it later. After transcription, you will have the opportunity to review the interview we have today to make corrections or add additional insight as you see fit. Your identity will not be disclosed at any time during the research process.

Many of my research questions stem around your use of student-centered technology, so I want to define what I mean by that before we begin. Student-centered

technology use allows students to actively participate with technological tools, create products to represent their learning, or use technology to develop real-life skills such as collaboration, creativity, higher-order thinking, or problem solving. When student-centered technology is taking place, students, rather than teachers, are actively engaged in the use of technology.

Do you have any questions? If you are ready, we will begin.

Introductory Questions

1. Briefly tell me about your current teaching role and the technology available to you and your students.
2. What are some of your favorite ways of implementing student-centered technology and what is it about these activities that makes them stick out in your mind?

Focused Questions

3. Who or what influences your decisions about how you use student-centered technology? (RQ1, 3)
    a. Possible follow up question 3a: How do the beliefs and practices of other teachers in your school influence your use of student-centered technology? Please share an example. (RQ3)
    b. Possible follow up question 3b: How do the beliefs and practices of administrators in your school influence your use of student-centered technology? Please share an example. (RQ3)

   c. Possible follow up question 3c: Do you have any requirements dictated to you for technology use? (RQ1)

4. What types of personal conflicts hinder your use of student-centered technology? (RQ 1,2) (follow up with prompts on pedagogy and attitude if needed)
5. Let's talk about your students – what technology is valuable for them? How does this influence your teaching practice/implementation choices? (RQ2)
6. Describe your beliefs about effective ways of teaching using student-centered technology. Walk me through a lesson or activity. (RQ1)
7. Some teachers choose not to use student-centered technology because it's stressful or produces anxiety. Talk to me about how you overcame any initial misgivings you had about implementing student-centered technology. (RQ2)
8. How has your instructional approach to using student-centered technology changed over time? How about your attitude about using student-centered technology … how has it changed over time? What's an example? (RQ 1, 2)
9. Earlier we talked about personal conflicts you may struggle with when you are deciding about implementing student-centered technology. What factors in your school environment help and hinder your integration of student-centered technology? (RQ3)
10. In our conversation today, we've talked about your teaching beliefs, attitudes, and those things in your environment that influence your uses of technology. Which element most powerfully influences your choice to use student-centered technology? Please explain. (RQ 1, 2, 3)

Closing Statement

This concludes my list of questions. Is there anything else you'd like to share with me regarding the influences on your use of student-centered technology that we have not covered already? Remember, I will follow up with a transcript of this interview so that you may review it for accuracy. Thank you so much for your time.