

THE PREDICTION OF TECHNOLOGY INTEGRATION IN THE CHRISTIAN K-12
CLASSROOM BASED ON OPENNESS TO CHANGE, TECHNOLOGY TRAINING, AND
WORK BEYOND THE CONTRACTUAL WORK WEEK

by

Troy Eugene Spetter

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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ABSTRACT

This predictive correlational study explored the lack of generalizable data regarding the use of technology in the Christian K-12 environment. The study searched for a predictive correlation between teachers' overall use of technology, openness to change, amount of technology training, and hours of work beyond the contractual work week, based on previous study in public education (Vannatta & Fordham, 2004). The target population was all teachers who work in schools that are members in good standing with the Association of Christian Schools International in the United States. Using a random sample, teachers were asked to participate in the study and data was collected based on a self-report survey. This study provides insight in the Christian K-12 environment to understand how teachers in that setting compared to previous measurement of public school teachers.

Keywords: attitudes, Christian education, integration, in-service training, K-12, professional development, technology, TAS

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List of Abbreviations

Association of Christian Schools International (ACSI)

Information and Communication Technology (ICT)

Professional Development (PD)

Science, Technology Engineering and Math (STEM)

Teacher Attribute Survey (TAS)

CHAPTER ONE: INTRODUCTION

Overview

This study discusses the shortfalls of technology and its integration into the Christian K-12 environment. While modern K-12 education seems fascinated with technology, real and meaningful integration is an isolated experience. This chapter will outline the foundations of learning and show that the body of research has yet to formulate generalizable information useful to the larger Christian K-12 population. This chapter will provide background on the topic, a statement of the problem, and discuss the significance of this study.

Background

Theoretical Background

First, the basic idea of learning must be understood. Learning concepts and theories apply to all of education regardless of its religious or secular nature. Today, technological change is the order of the day. Education has sought to make use of technology tools to align itself with the public world, but technologies benefit to education remains in question. To form the foundation for the use of technology in education, the nature of learning must first be discussed. Piaget had a simple yet revolutionary idea, that knowledge is a process rather than a state (Miller, 2002). He described it as an event or relationship between the knower and the known (Miller, 2002). People construct knowledge, taking an active role in the process of knowing, and contribute to the form knowledge takes (Miller, 2002). Miller (2002) even suggested that human beings actively seek out knowledge and interpret information in their environment. The key is an active relationship. The notion refutes any indication that soaking up knowledge is a passive action.

Kolb (1984) developed a foundation that suggested that the learning process is not the same for all humans. Kolb (1984) continued to argue that humans create themselves through the choices and decisions they make. Those choices determine the events people live through, and those events influence future choices. It is then logical to argue that no two people are the same and each will learn with a slightly different process. Attempting to better explain how humans learn, Kolb (1984) developed a theory of learning styles but qualified his development with the idea that individual learning styles are more complex than the simple topologies he attempted to explain them with.

Historical Background

In the United States, education places students in classroom groups based on age, and is filtered by academic development with no consideration of learning style. Kolb (1984) argued the educational process must be conducted in a way that attends to individual learning styles of the students and fosters their development. Kolb (1984) continued to note that careful identification and management of these learning styles are essential in the learning process. Learning environments that use a learning style, dissimilar to that of a student-preferred learning style, tend to create rejection of that learning by the student (Kolb, 1984). Considering this, it has become the role of teachers to depart from their own learning style and incorporate methods encompassing many styles.

The design of curriculum suggests a deliverable associated with reaching a content objective. Kolb (1984) suggested curriculum should include learning style, growth, and creativity objectives to successfully reach all students. Several studies (Habib & Johannesen, 2014; Hepp, García, & Holgado, 2015; Kolb 1984) suggested a shift in the role of educators

from a dispenser of knowledge to that of a coach. This shift required educators to give up some level of authoritarian control and empower students as co-authors in their own education.

Social Background

Many of today's students have a large background of knowledge and digital skills, which are unstructured and cannot be viewed as digital competence (Hepp et al., 2015). It has become the teacher's role to break out of the traditional, one style delivery method and make use of technologies potential in the classroom.

The technology environment today presents a unique opportunity for teachers. The goal of modern education is to make use of technologies ability to address multiple learning styles and personalize the experience for each student. With the advantages of technology, K-12 and higher education have been seeking a formula for technology's successful integration into the learning experience for decades. Kolb (1984) argued that technology can play an important role in facilitating a transition in education by providing many alternate modes of delivery.

Technology has made huge advances since the 1980's, playing a vital, productive part of business and personal life around the world, but struggles to be a part in K-12 education.

Using technology enables information to be learned and shared, making it possible to train students that can adapt to the new social challenges it has presented (Hepp et al., 2015). Educators should therefore take advantage of this new source of intrinsic motivation by using technology, and incorporating it to develop activities that encourage students to take an active part in their learning process (Hepp et al., 2015).

The advantages are evident, yet many teachers fail to make use of such a powerful tool. Many younger teachers educated in modern colleges still see technology as an additional element to education and not an integrated component (Hsu, 2016). Teachers are so overwhelmed with

the day-to-day rigors of teaching, that they simply do not have time to innovate with technology (Winslow, Smith & Dickerson, 2014).

Just as students need time to learn new concepts and relate them to their own learning styles, teachers learn in a similar way. Opportunities for teachers to learn this transformational behavior are limited by lack of in-service training, budget cuts, and the daily demands of the job (Winslow, et al., 2014). Schools must change their behavior if they expect teachers to take meaningful advantage of the potential of technology.

Christian K-12 Education

Christian K-12 schools make up a significant portion of the population in the United States. According to the National Center for Education Statistics (2016), 10% of all students in the United States attend private schools. Again, according to another report by the National Center for Education Statistics (2017), 25% of the schools in the United States are private schools affiliated with some nonsectarian or religious organization.

When comparing assessment data between public and private schools in the National Assessment of Educational Progress or NAEP ratings from the National Center for Education Statistics (2017), private school students score higher in both math and reading tests at the fourth and eighth grade levels with consistent performance that has been higher than public school students since 1990. When examining the data, Christian K-12 schools are a significant part of education in the United States, with a historic performance rate above the typical public school. The Christian K-12 environment clearly has some significance to add to the body of research, and yet this environment remains untouched by research regarding educational technology.

Problem Statement

Despite needed change, studies (Agbo, 2015; Allen, Lowther & Strahl, 2007; Habib & Johannesen, 2014) suggested that many teachers were not taking advantage of technologies potential to transform their classrooms. Pre-service teachers are not provided with pedagogical technology training, and their integration of new technology can be limited to personal experience. In-service teachers are commonly expected to adapt and learn new technologies without formal training. Teacher support seems inadequate to encourage wide-spread integration of technology into the classroom experience despite its potential benefit.

Research indicates no that consensus has been found to explain the lack of technology use, and research has not examined the contributions of the Christian K-12 environment despite its clear achievement advantage. Teachers need ongoing support and opportunities to experiment with new technologies and gain confidence using them in the classroom (Mirzajani, Mahmud, Ahmad & Wong, 2016). Long-term development of teachers, sharing of information or content, partnerships, support from leaders, and administrators are all major factors that influenced teachers' motivation to integrate technology into their practice. To understand this lack of technology integration, in-service teachers' training and attitudes must be explored to better understand how to aide them. The problem is that Christian K-12 education has been largely ignored in the body of research and there are no studies that attempt to understand variables that affect teachers' overall use of technology in a Christian K-12 environment.

Purpose Statement

The purpose of this predictive correlational study is to explore a gap in current research regarding in-service training, teacher attitudes and commitment, and the prediction of a teachers' overall use of technology in the Christian K-12 classroom. The criterion variable will be

generally defined as teachers' overall use of technology. For the purpose of this study, overall use of technology is defined by teachers' use of types of technology, and students' use of types of technology as reported by the teachers and their frequency of use in the classroom (Vannatta, & Fordham, 2004). The predictor variables are generally defined as openness to change, hours of technology training, and hours spent beyond the contractual work week. This study's target population is all teachers working in Christian K-12 schools in the United States accredited by the Association of Christian Schools International (ACSI). A random sample of the population ($n=70$) was used for representation of teachers in the United States. The study attempted to find a predictive relationship between the criterion and predictor variables.

Significance of the Study

With previous research focused on public education, Christian K-12 schools have no generalizable data to enable the transformation technology demands of their educational environments. One study found alarming statistics searching for information on the topic of blended learning in public education (Torrissi-Steele & Drew, 2013). Of the 827 articles located in their search, 69.4% were "how-to" articles documenting single cases. Additionally, 25.6% were studies with a focus on the students' point of view. Only 4.9% of the literature found in their study examined technology from the teachers' point of view. Among that small group, only 0.6% focused on why teachers do or do not make use of technology (Torrissi-Steele & Drew, 2013).

While the topic of blended learning is only part of the larger focus on technology in education, the study is an example of the limited availability of data focused on teachers' motivations. Within this small body of research, no previous study provides insight that is generalizable to the larger population of Christian K-12 teachers in the United States. Many

studies (Bozkurt, Demir, & Vural, 2014; Güven & Gül, 2016; Winslow et al., 2014) focused on small populations or isolated areas reflecting pocket environments in public school settings. Other studies (Allen, et al., 2007; Ruggiero & Mong, 2015) used larger populations, but disqualified their results as not generalizable to the larger population.

Mirzajani et al. (2016) suggested that teachers may fear technology and recommended significant changes in pre-service teacher training. Ruggiero and Mong (2015) also argued a case for inadequate training and suggested changes for in-service teachers. Others (Bozkurt et al., 2014; Lehiste, 2015) argued that training does increase teachers use of technology but failed to examine teacher motivations for using it.

Teachers often experience anxiety and concern when faced with change. Chiu and Churchill (2016) discovered teachers who faced concerns about technology related that anxiety to worries of a heavier workload or loss of control in the classroom. Their work also showed teachers who are presented with evidence of a technology's usefulness experienced a change in thinking toward technology integration. This study begins to provide evidence of successful technology integration to teachers in Christian K-12 education, where little research-based evidence exists. Teachers will then have research to understand the power they hold within themselves to transform the classroom by taking advantage of the benefit of technology. Leadership in the Christian K-12 environment has now been given a research-based foundation to understand how teachers integrate technology, make better use of resources, improve the working environment, and redirect funding based on results.

Previous research has been conducted in limited samples or in isolated cases providing no generalizable data on a national scale. Much of this study was based on the pilot study by Vannatta and Fordham (2004) in the development of the Teacher Attribute Survey (TAS) used to

measure the variables in this study. This study gathered data from a stratified random sample of Association of Christian Schools International (ACSI) Christian K-12 schools in the United States who agreed to participate. While the sample population focused on teachers in ACSI accredited Christian schools, the data provided valuable insight for private K-12 education across the United States and a benefit for public education with consideration of the studies limitations.

Research Question

RQ1: Can overall use of technology be predicted by examining openness to change, amount of technology training, and hours of work beyond the contractual work week for Christian K-12 teachers?

Definitions

1. *Attitude* – The psychological state in which something is perceived positively or negatively (Akkaya, 2016).
2. *Blended Learning* – The use of internet-based technology tools inside and outside the classroom to enhance the learning experience (Mirriahi, Alonzo, McIntyre, Kligyte, & Fox, 2015).
3. *Integration* – The use of technology in the classroom aligned with the goals of teaching so that its use is almost transparent (Winslow et al., 2014).
4. *Disposition* – A person's attitudes and beliefs toward a topic. One's commitment to improvement and willingness to accept change (Vannatta, & Fordham, 2004).
5. *Flipped Classroom* – A classroom model where teacher lecture is replaced or minimized by using tools such as educational videos viewed by students at home, and classroom time is used for interaction and practice (Kostaris, Sergis, Sampson, Giannakos, & Pelliccione, 2017).

CHAPTER TWO: LITERATURE REVIEW

Overview

This review of the literature will examine barriers found in the body of research, locate patterns, and point out areas where further research is needed. The current body of research has a lack of generalizable data, leaving Christian K-12 schools and educators with little concrete solutions or insight on how to achieve technology integration in their environment. Chapter Two includes an overview of the theories that form the basis for this study, followed by a review of related literature, including a discussion comparing public and Christian education, the effect of technology on education, issues and barriers to its integration, potential environmental factors related to technology integration, and solutions found in previous research.

Theoretical Framework

The question of how teachers can be motivated to integrate technology has been a topic of debate since the PC revolution in the early 1980s. Educators have been asking why technology should be used in the classroom and what purpose it serves in education since that time. Before such questions can be answered, the fundamental ideas of learning must be discussed. Building a framework upon which this study based its assumptions of learning was the first important step.

Learning Foundation

Piaget (2003), founded the basis of modern learning theory with his study of epistemology starting in the 1950s. Piaget's primary focus was the study of relationships between actions or thoughts, and the objects of experience (Miller, 2002). Piaget's learning theory included how students learn by associating new material with previous experience, to form lasting new ideas (Miller, 2002). Piaget argued that knowledge is not a state, but instead,

an action. In this action, people construct knowledge by actively selecting and interpreting information in their environment. Humans then contribute to the form knowledge takes in themselves (Miller, 2002).

Building on Piaget's theory of epistemology, researchers discovered students learn best from experience (Kolb, 1984). That experience is formed through an activity, or process of putting new ideas into practice (Kolb, 1984). Researchers continued to build upon Piaget's theory incorporating a train of thought referred to as neo-Piagetian, stressing the importance of support provided by teachers during a student's experience with new ideas. Different students are expected to take difference paths to acquire new concepts, or even progress at different rates aligned with their individual strengths (Miller, 2002). Teacher's encouragement and guidance during the process is stressed, while ensuring that students do not take in too much information that overloads their cognitive processes (Miller, 2002).

Work on the topic of learning continued to develop educational theory into modern day theory. Modern students appear to learn best through association of real world experiences that generate connections relatable to their lives (Kolb, 1984). Miller (2002) argued that these connections create lasting memory of new material and learning that lasts beyond the next test.

When considering students, the first response is to think of minor-aged individuals, but this is not always the case. The learning process is not exclusive to minor-aged students and extends to adults in real ways. Learning is a dialectic process integrating experience, concepts, observations, and action. The impulse of experience gives ideas their moving force, and ideas provide direction to impulse (Kolb, 1984). This method of learning through experience with a topic and forming connections to previous experience, serves as the model for modern

constructivist education. The goals of educators should be to stay relevant to modern society and culture while not losing its foundational construct, so its development continued.

Learning Styles

Epistemological theory further developed the theory of learning styles. Kolb (1984) argued that not all persons learn in the same way. Individuality and variability are exhibited in the learning process (Kolb, 1984). Humans look for simple models to help them understand infinitely complex topics and the theory of learning styles is an example (Kolb, 1984). While acknowledging that every topic in the K-12 classroom cannot be taught in the same method or use the same tools, even skeptics of learning styles admit that each student is a unique individual with unique learning preferences (Cuevas, 2015). It is important to understand that learning styles are only a simplistic attempt to understand the complex variability of learning differences between students. Cuevas (2015) argued that good teachers will develop a variety of ways to present content and engage students without pigeonholing them into learning categories or specific single styles.

Learning styles play an important role in education and form a part of the foundational theory for this research. Most classroom environments appeal to one traditional learning style, and tend to handicap students who prefer to learn in different methods (Kolb, 1984). This area of limitation is where technology shines through. Modern technology facilitates a shift in the role of the teacher from dispenser of knowledge, to that of coach, or guide, and opens many alternate methods of delivery for learning (Kolb, 1984).

Work in learning styles is based on the idea of human diversity. Influence in differences between individuals can be anything from genetics, family belief systems, religion, to national or even local culture (Kolb, 1984). All the factors of genetics and environment influence everyone,

creating a preference for the way a person learns. Kolb (1984) explained some of that variance in preference or learning style with categorization of learners based on preference of the senses. Kolb (1984) continued to discuss how human behavior tended to relate new learning with previous experience to form lasting connection. Kolb (1984) created the idea of “experiential learning” with this theory and published a book of that name.

In this theory of learning students are classified based on a dominant preference for learning such as auditory, visual, or tactile. Understanding that no one has a single learning style, but one that is dominant can give teachers a simplistic way to understand a complex topic. Kolb (1984) showed human preference toward a style of delivery when learning a new topic, and how an individual may relate that topic to previous experience.

Student-Centered Learning

Modern education continued to translate work on learning styles into a new framework now called learner-centered or student-centered instruction (American Psychological Association Workgroup, 1997). The American Psychological Association Workgroup (1997) outlined a framework for complete reform of school systems in the United States and the methods used for delivery. The focus of this framework was based on a learner-centered set of principles developed in a joint effort with groups of educators, researchers, and policy makers to create a basis for reform in schools in the United States (APA Workgroup, 1997).

When coupled with pedagogical change, technology enables the classroom to shift to a student-centered learning environment allowing teachers to identify and build upon learners’ prior knowledge (Polly, 2014). It is important to note that technology is not the central part of this shift in learning but is an important catalyst used to support teaching and learning.

Technology by its nature is a learner-centered tool that provides opportunities for dynamic learning to take place (Polly, 2014).

The introduction of technology into the classroom harbors many troubles when used in ways that do not align with human learning preferences (McKnight, O'Malley, Ruzic, Horsley, Franey, & Bassett, 2016). While the integration of technology is an important step in education improvement, it is imperative to consider the focus is not on technology itself, but rather how technology changes teaching and learning (McKnight et al., 2016).

Related Literature

After seeking previous research regarding technology in the Christian K-12 environment and teachers' motivations, it was discovered that no research had addressed the topic in the last 10 years. It became necessary to expand the focus of the search to include public K-12 educational environments. Using data from public educational studies presents a base to compare with Christian education. Before discussing the nature of technology in education, is it best to first create a comparative picture of typical public and Christian K-12 educational environments. While the basic intent of the both types of schools is to educate children as they grow into adults, the way they go about that education is different in many ways.

Public Education

Public schools are run by local and state government with indirect involvement from the federal government by establishment of curriculum standards to qualify for federal funding. Public K-12 education is funded by the taxes of citizens that reside in each school district. Such tax money is often not enough to fully fund public schools, so schools are given a portion of their funding from federal programs (Cannon, Danielsen & Harrison, 2015). In return, the federal government sets standards for the curriculum that public schools must follow to qualify (United

States Department of Education, 2005). Due to the tax-based system, students who attend public schools do not pay tuition, and textbooks are typically provided at no charge. Some school systems do charge extra fees for technology devices, extracurricular activities, and sports participation.

Public school curriculum regulated by state and national standard gives teachers in such schools very clear and detailed goals laid out for them for each school year. Teachers are expected to reach those goals and include prescribed activities, texts, and other resources in the process. While public school teachers do have a degree of freedom in their delivery, they must meet a set of goals to be deemed effective in their jobs. Those goals will often include measures for student standardized test scores. Ballou and Springer (2015) argued that public-school teachers may feel pressured to teach specifically the subjects that students will be tested on to improve their achievement scores. The same teachers felt the school year did not provide adequate time to explore other topics they believed were of value to their student's development. Ballou and Springer (2015) argued that measurement of public school teachers' performance with students standardized testing scores was inaccurate or incomplete.

Governmental control of public schools means they fall under the obligations of the United States Constitution and its separation of church and state outlined in the first amendment (Fraser, 2016). Generations of legal argument has dictated that public schools cannot teach from any religious stand or support one religion over another. Public schools can teach courses on world religions from an object point of view (Fraser, 2016). The modern legal argument in the United States allows for students to participate in a personal religious practice but limits agents of the schools to act on a school's behalf or endorse any such practice (Fraser, 2016).

Christian Education

Christian K-12 schools are private institutions that do not currently qualify for tax-based funding because of their religious nature. Christian schools tend to be run by church-based organizations or other religious non-profit groups. Fraser (2016) discussed law around the early 1800s in the United States and noted that many organized schools were controlled by the Catholic church. According to current legal argument, the religious foundation of Christian schools prevents faith-based schools from receiving government funding, but this was not always the case (Fraser, 2016). Today, Christian schools get their funding mostly from the tuition of their students. Scott (2013) noted that 83% of Association of Christian Schools International (ACSI) budget costs are covered by tuition. Occasionally, community businesses, other local churches, charities, and private individuals will donate to Christian schools for additional funding. Just as in public schools, textbooks are normally provided by the school at no charge. Students often pay extra fees for technology devices, extracurricular activities, and sports participation just as they do in public schools.

Perhaps the most noticeable area where public and private K-12 schools differ is in teacher salaries. According to the National Center for Education Statistics (2018), the average teacher salary in public K-12 schools during the 2015-2016 school year was \$58,064.00. In comparison, Scott (2013) presented data that the ACSI average teacher salary for a teacher with a master's degree was only \$32,394.00. Scott (2013) continued to note that even the average lead administrator salary was only \$54,392.00, still below the average for public teachers.

Where Christian schools deviate more from public schools is in control, curriculum, and classroom size. First, control of Christian schools is typically by a governing board composed of local community people or church members. Decisions about the schools' direction and its

curriculum are highly affected by the local people (Van Brummelen, 2009). The board will often ask for input from teachers in specific disciplines and sometimes hold meetings for parents to preview content. This active input from members of the local community empowers parents of students and others involved in the process to feel more of an ownership over the school (Van Brummelen, 2009).

Another major area of difference is in curriculum. While some Christian schools do use resources like the public schools, their focus dramatically changes delivery. Teachers in Christian schools often have a wide range of freedom in the resources they use, the texts their students read and the activities they participate in (Van Brummelen, 2009). Students in Christian schools are subjected to standardized testing like students in public schools, but schools are free to choose what test they use and what emphasis its subjects take in the classroom.

In addition, student-teacher ratios tend to be much smaller in Christian schools. According to the National Center for Education Statistics (2018), public K-12 schools held an average student teacher ratio of 16 to 1 in 2014. Private schools in the same year held an average student teacher ratio of 12 to 2. This smaller ratio could suggest more one-on-one instruction time in Christian schools.

While public and Christian K-12 schools share the goal of educating the nation's children, the way they go about it is dramatically different. Public schools are funded and controlled by the government, while Christian schools are governed and controlled by their local communities. Public school teachers are bound by a set curriculum and standards, while teachers at a Christian school often experience a larger range of freedom. Public school teachers must stay objective in the discussion of religious topics while Christian school teachers are encouraged to share their faith with students, and are required to incorporate that faith into the

curriculum (Van Brummelen, 2009). Christian schools are often a larger financial burden on the families of students who attend due to their funding model, but tend to experience smaller classroom sizes and suggest more one-on-one instruction (Cannon et al., 2015).

Both types of schools have similar general structure, but the differences require examination of the Christian K-12 environment, its teachers and their use of technology. In the body of research, the topic of technology in education is not a new discussion. Technology has been discussed and argued in education for the past 30 years. Since the focus of this study was specifically technology in the Christian K-12 environment it is important to note that area of research was completely uncharted territory. A search for related literature was conducted using keywords such as: Christian, education, school, K-12, and technology. The search resulted in only one related study by Wozniak (2009), which explored the use of technology tools in Christian distance, or field education programs. No other studies within a 10-year span even attempted to research technology in Christian K-12 education. With such a limitation, the search for related literature was expanded to include public education. While the public K-12 educational setting may not be the same as the Christian environment, it does provide a relatable foundation to base discussion upon.

Defining Technology

Technology is a generic word that is often misinterpreted. A century ago using the word technology in a sentence could have referred to the newly-introduced automobile. Technology changes over time and it is important to establish a definition for this research. Kale and Goh (2014) used the word technology interchangeably with the phrase information communication technology (ICT). Their term is defined as any device or computerized system that makes use of collaborative tools, communication, publication, Internet, or network-based technologies (Kale

& Goh, 2014). With this understanding, technology is not just a computer, but any modern information system that makes use of computer or electronic devices to support the learning process. Technology is often particularly defined by those who use it based on one's own experience and background.

Technology is broadly defined among all teachers, with those teachers having more experience (greater than 15 years) listing more technology tools than those with less experience (Ruggiero & Mong, 2015). This variance in definition of tools could generate a gap in defining technology integration between generations. A teacher with 18 years of experience may consider the use of a slide show as technology integration, whereas a teacher with under five years of experience may not feel the same.

While Polly (2014) referenced Internet-based activities using computers or document cameras to display complex mathematical formulas, other studies use varied levels of technology in the definition. Haihong and Garimella (2014) specifically studied teachers' adoption of iPads. Kimmons (2015) looked only at Internet learning management systems. Vannatta and Fordham (2004) used an array of technology based tools ranging from simple slide show or word processor programs to digital video equipment and multimedia software.

When considering the results of this or any other study on technology in education, the definition of what constitutes technology is important. Research will often differ vastly in measurement of technology integration; because of this, differences will exist throughout definitions regarding the very idea of what technology tools are. The definition of technology tools in this study will take its meaning from Vannatta and Fordham (2004) who also developed the instrument that will be used. Vannatta and Fordham (2004) used a range of tools to define technology, allowing a range from simple presentation software on to complex computer

software and hardware. The Teacher Attribute Survey (TAS) used by Vannatta and Fordham (2004) allows participants to write-in additional technology tools that may not be included in the primary list. This broad inclusion of tools in the definition of technology ensures participants in the study will not exclude use of technology tools due to a narrow definition of the term.

Effects of Technology

Educational organizations have made considerable investments to emphasize the integration of technology in the classroom. Despite that investment, it is not exploited by most teachers (Mirzajani et al., 2016). Not all educators are aware of the benefits of information and communication technology (ICT) or how to take advantage of it in the classroom (Mirzajani et al., 2016). If that is the case, the factors needed to encourage meaningful integration must be explored. The success of technology implementation is not dependent on the availability of one factor, but is determined through a dynamic process involving a set of interrelated areas (Agbo, 2015).

During the past few decades, technology's exponentially increasing ubiquity and applications available via the Internet to support instruction, assessment, and classroom management have combined to create a climate of technological opportunity in today's schools (Winslow et al., 2014, p. 46). With the opportunities provided by technology and modern day needs that are based on technology, its use is now more of a necessity than a preference (Akkaya, 2016). Despite this increasing level of technology in education, its pedagogical integration has not been achieved by the population of teachers. The existence of technological infrastructure in the classroom does not mean that technology is used in the teaching process (Akkaya, 2016). While there is much to learn on the role and impact of educational technology, some teachers are motivated to use the potential of technology in educational practice while others do not share this

affinity (Tondeur, Kershaw, Vanderlinde & van Braak, 2013). In addition to the direct shift in the teaching focus and changes in learning for students and teachers with the new opportunities technology provides, there are unintended side effects of a successful integration of technology.

Because of the strong focus on the adoption and integration of technology into K-12 classrooms, it is important to discuss the benefits of technology. Research has suggested that technology integration into the classroom has a positive association with reading and mathematics performance across various grade levels (Larosiliere, Kobelsky, & McHaney, 2016). The impression is that academic performance can be improved by equipping teachers with technology, training, and infrastructure to make use of technology in the classroom (Larosiliere et al., 2016).

Kimmons (2015) studied use of online systems by schools in Florida, and found no significant benefit to the use of such systems over schools who did not use them. Kimmons (2015) noted that a single technology system did not prove any significant change in student achievement, while schools that employed a combination of technologies in a system of change did see significant improvement in achievement.

Harper and Milman (2016) performed a search for evidence spanning 10 years of research in school systems around the world to answer the question of technology integration. Some of the results in their study are expected, but some of the unintended effects of technology are surprising. While the research was limited specifically to one-to-one technology programs or similar programs, where one laptop or tablet per student was used, the findings presented increased achievement scores in several areas. Most notable were the subject areas of reading and math for elementary and middle school aged students (Harper & Milman, 2016). The study compared schools using one laptop per five students with schools using one laptop per student,

and found significant increases in achievement scores in schools using one-to-one ratio programs (Harper & Milman, 2016).

Many teachers affirm that students are more engaged in learning tasks if they are required to use technology (Wang, Hus, Campbell, Coster & Longhurst, 2014). Twenty-first century skills are essential in education, arising from a belief that only with these skills can students succeed in a globally competitive world where interconnectivity is expected (Kale & Goh, 2014). Educators have questioned if students born into modern technology inherit skills for its productive use. Hepp et al. (2015) suggested that being born in a socio-technologically rich context does not automatically imply that one can work and study in digital environments profitably and efficiently.

Christian teachers are often encouraged to address the lack of skills by modeling behavior with such tools for their students as part of character education in the overall process (Van Brummelen, 2009). Technology initiatives can be complex, and preparation for their proper execution an important part of success. The promotion of traits like grit, self-control, teamwork, and service to a common good all seem to be desirable parts of preparation for effective integration (Cho & Littenberg-Tobias, 2016). It is important to note that the worth of a technology-driven shift in education is not fixed. Just as the purpose of education varies for different students, so also can the worth of technology (Cho & Littenberg-Tobias, 2016).

Kimmons (2015) argued against large-scale technology deployments in schools when the study failed to find significant changes in student achievement scores. Other research found less tangible effects of technology programs in several mixed method studies. Students in one-to-one programs often experienced a more powerful and deeper learning experience. Students engaged in creative writing, multimedia presentation, and data analysis then reported a sense of

empowerment or accomplishment from their studies (Harper & Milman, 2016). While in some of these cases students did not show increases in achievement scores, the relationship between teacher and student experienced a profound change (Harper & Milman, 2016).

One study exposed students to a flipped classroom to test the potential of the method. In that study students participating in the flipped classroom environment showed a consistent pattern of higher achievement, and findings suggested a higher satisfaction for the use of technology and the learning process (Kostaris et al., 2017). Students in the experiment group of the study had higher confidence levels engaging with learning activities and paid more attention during learning delivery. The most interesting measurement of the study provided a relevance dimension indicating students in the flipped classroom experiment felt the learning was more relevant to their own interests, when in fact, they experienced the same learning topics as the control groups (Kostaris et. al., 2017).

Research has indicated that students and teachers benefit from technology programs with increased skills in writing, problem solving, motivation and collaboration (Cho & Littenberg-Tobias, 2016). Others such as Kimmons (2015) argued that such results are not typical or statistically significant. It is important to note that Kimmons (2015) discounted his study data with a small sample and too narrow of a focus to accurately represent the larger population of K-12 schools. Pierce and Cleary (2016) presented data showing higher achievement in mathematics and reading scores in schools with technology programs when compared with traditional methods.

Pierce and Cleary (2016) continued to show a growing body of evidence that educational technology is slowly changing the face of K-12 education with innovations including customized learning programs, peer-to-peer teaching and inverted classrooms. Their study promoted

advances in K-12 education due to the integration of technology providing such diversity of tools to schools they can build completely customized programs to meet the needs of their students (Pierce & Cleary, 2016).

Less measurable changes reported in students during educational technology programs were increases in productive collaboration, effective differentiated learning, and student independent ownership of learning (Harper & Milman, 2016). Even more interesting changes included increased student motivation, decreased absence rates, and significantly decreased disciplinary actions at schools with one-to-one technology programs (Harper & Milman, 2016).

Cho and Littenberg-Tobias (2016) discussed the promotion of non-academic skills with school's development of student character. The discussion continued to present value in technology shifts in education, by presenting school programs for the improvement of students' sociopolitical and cultural awareness. The result of such programs was improvement in students' self-understanding, community-life, and academic knowledge (Cho & Littenberg-Tobias, 2016). Information in the study found that schools tend to focus more on a whole student education program in conjunction with technology programs rather than academics alone like traditional programs (Cho & Littenberg-Tobias, 2016).

With these changes it is important to note the presence of a technology program was the only reason the schools were researched. The presence of technology alone changed nothing and could create negative change without effective integration. The presence of a successful technology program was a sign that greater change in the studied schools had taken place. These environments are only established after technology is pedagogically integrated into teaching in a sustainable way (Chiu & Churchill, 2016). Harper and Milman (2016) discovered that technology programs worked best when used with constructivist principles guiding

implementation but also noted that not all teachers are adequately trained in constructivist learning. The training and other barriers must be addressed if schools are to experience the positive effects of such program changes.

Issues and Barriers in Technology Integration

Considering the apprehension by teachers to use technology in their classrooms, Wang et al., (2014) presented survey data from 2,067 U.S. middle and high school teachers on their inside and outside of school technology experiences. When comparing the result with the total U.S. adult population, the survey discovered that teachers are far more advanced than the average adult population regarding ownership of technology gadgets, engaging in Internet activities, and confidence in their technology skills. The younger teachers (ages 22-34, born between 1980 and 1990) demonstrated similar traits of digital natives, and were more likely to use social networking sites and technology to pursue their personal interests (Wang et al., 2014). When comparing the frequency of their technology usage inside and outside of school, teachers had higher use of presentation tools at school, and higher use of other technologies outside of school (Wang et al., 2014). The research showed higher use of technology in teachers, but suggested teachers have a skewed interpretation of technology's place in education.

When comparing students' and teachers' school technology experiences inside and outside of school, research discovered teachers' frequency of using various technologies was higher than students' both inside and outside the school (Wang et al., 2014). Technology use was especially higher when considering the use of productivity tools. A pattern began to emerge in the literature suggesting a disconnect between teachers' personal use of technology and its use in the classroom (Wang et al., 2014). Teachers are only likely to use technology when it meaningfully matches their pedagogy (Kale & Goh, 2014). The evidence continued to suggest a

disconnect between the personal and educational use of technology in teachers' lives. While teachers have adopted technology as an integrated part of their personal lives, that adoption has not made it into the classroom.

With such a high use of technology in personal life, one study showed teachers view technology in education as an additional elemental and not an integrated part of the process (Hsu, 2016). This ironic finding must be addressed if students are to benefit from the expanded capabilities technology offers. Evidence suggested using technology in the classroom can offer opportunity for teachers and students, allowing teachers to spend more time with individual students as guides or coaches (Chiu & Churchill, 2016). The change in environment encouraged individual and independent learning by doing, sharing, and peer-review, which made teaching more effective (Chiu & Churchill, 2016). The primary problem is this environmental shift does not occur unless technology has been integrated in a pedagogically meaningful way.

Fear and anxiety. Researchers have tried to understand and explain the reasons for limited technology adoption in teaching by taking into consideration many factors. Some of those factors are: educator stress, limited teachers' experience with technology, opportunities for continuing teacher education, and professional development (Mirzajani et al., 2016). There is a possibility that teachers' beliefs and attitudes influence their use of technology in the classroom, and they may not consider themselves adequately qualified to incorporate technology into the educational process (Mirzajani et al., 2016).

Chiu and Churchill (2016) discovered teachers face fear or anxiety toward technology because of the change it brings. In their study, teachers were examined and categorized based on their positive or negative initial attitudes toward technological changes. Teachers noted fears of a heavier workload due to learning to use new technology or potential loss of control in

classroom procedures because of technology (Chiu & Churchill, 2016). Teachers who experienced higher levels of anxiety were less likely to use technology or found it more difficult to use.

When facing changes to their environment such as new technology, another area teachers face a level of anxiety is in performance expectancy (Reychav, Warkentin & Ndicu, 2016). The idea of performance expectancy is when a new technology is introduced, an individual believes a certain level of performance is expected using the new system. This belief generates anxiety for a teacher learning to use that new system (Reychav et al., 2016).

Vannatta and Fordham (2004) discussed how the more open a teacher is to the change associated with any shift in education, the more likely that teacher is to integrate technology. The theory of how to change a teachers' belief or reduce the anxiety level is founded on experiential learning and Kolb's (1984) idea of learning new information based on connections with previous experience.

This constructivist view of learning begins to make the case for pedagogical training of educators to build their confidence using technology in the classroom. Pittman and Gaines (2015) reinforced that idea by classifying teachers as learners in the process.

Lack of training. A deeper examination of the literature began to show another potential problem area that can be addressed. Teachers without training or pedagogical experience in technology will tend not to use it in their classroom. In practical observation, such teachers tended to look for reasons to avoid using technology instead of seeking the training to use it (Güven & Gül, 2016).

While pre-service teacher training provides little technology focus, pre-service teachers do show confidence in their ability to use technology, but the same teachers when given the

opportunity to use technology in the classroom rarely do so (Koch, Heo & Kush, 2012). When asked, teachers felt technology integration was a process and described practices for integration which their own background played a part in the implementation (Ruggiero & Mong, 2015). Their focus was on their own personal background, due to an absence of technology training in practice. Many teachers lack knowledge about the effectiveness of technology in teaching, as they have not been presented evidence to help them understand the importance of its integration (Mirzajani et al., 2016).

Several studies (Hepp & Garcia, 2015; Hsu, 2016; McKnight et al., 2016; Mirzajani et al., 2016) noted a lack of pedagogical technology training with pre-service training programs and in-service training. In each of the studies teachers who did make use of technology found ways to educate themselves reading trade magazines, books, or personal experimentation with technology to improve their skills. One of the most interesting characteristics of each research study is that teachers faced similar lack of pedagogical technology training regardless of their environment.

Hepp (2015) made a significant case for several behaviors teachers should incorporate to enable learning from practice. One such behavior was experimentation. Teachers should be willing to explore new technology tools and allow themselves to enter such an experience without pre-judgements (Hepp, 2015). Just as important in the study, Hepp (2015) felt teachers should innovate in the classroom and document what they experience to share with other teachers. Such behaviors are not normal practice with many teachers resulting in lost opportunities for teachers to train one another.

Blackwell, Lauricella and Wartella (2016) argued that teachers with higher support from their schools tended to have higher technology use and a more positive attitude toward

technology. In addition, in-service teachers discussed pedagogical technology training as poor or simply unavailable (Kalonde & Mousa, 2016). It has been found that visible evidence for the usefulness of technology as a tool for learning, and exposure to training will gradually change a teacher's attitude toward technology (Chiu & Churchill, 2016).

Pierce and Cleary (2016) presented the idea of technology integration in K-12 education from the perspective of a business supply chain. In such a chain, if one component or section does not function, the chain and productivity fail. When that model is converted to K-12 education, teacher training becomes a critical part of the chain. If adequate pedagogical training does not occur, full and productive technology integration will fail (Pierce & Cleary, 2016).

Administrators and management. Another major barrier for the integration of technology is a lack of discussion or participation from teachers centered around the acquisition of technology (Habib & Johannesen, 2014). Teachers described that acquisition process of one case as committees of people with technical backgrounds discussing various aspects of technology devoid of teacher participation (Habib & Johannesen, 2014). Examination in that case revealed only a minority of the participants felt the use of educational technologies was driven by teachers themselves (Habib & Johannesen, 2014). Educational leaders play a role as catalyst, but it is teachers who are key to the integration in the teaching and learning process (Larosiliere et al., 2016).

Data from the study pointed towards a gap between the perceived status of educational technologies among managers and how much those technologies are a part of the pedagogical practice in the classroom (Habib & Johannesen, 2014). The same study noted that only a minority (27%) of teachers expressed that they felt involved in the mapping of needs for educational technology, or in the choice of which educational technologies should be

implemented in their institution (Habib & Johannesen, 2014). Informants in the study described not being involved in the process of acquiring and implementing software and hardware (Habib & Johannesen, 2014).

While school management often makes purchase decisions, it is the teachers who play key roles in the effective integration of technology. Teachers decide the type, frequency, and quantity of technology tools they use in design and practice in their classrooms (Teo, 2014). School administrators must not overlook the power of the classroom teacher. In any technology integration initiative, the extent to which technology is accepted and is successful for teaching and learning depends on the level of acceptance by the teachers (Teo, 2014).

Larosiliere et al. (2016) noted the need for a symbiotic relationship where management positively influenced organization-wide technology integration, infrastructure development, and training, while those aspects encouraged teachers to integrate technology into their classrooms.

Teachers have a need to feel involved in the adoption of technology; the literature suggested a connection between involvement and pedagogically sound use of technology. The underpinning to many problems is the fact that most technology policies are imposed on teachers by their educational department. Some educators resent being forcibly included in a technology integration program just because their school had been selected to participate (Mirzajani et al., 2016). A way around this is by empowering teachers to create changes in their schools by focusing on action, and making teachers into leaders who will eventually become agents of change (Agbo, 2015). In this way teachers become part of the process and gain personal ownership of a technology initiative. This point is more critical in Christian K-12 schools where parent and teacher involvement is encouraged to a greater degree than public education (Van Brummelen, 2009).

Environmental Factors to Technology Integration

While not primary considerations in this study, there are several environmental factors that should be discussed. Recognition of such factors are important to note as they do influence the educational environment even if not significant to this study. Educational technology confusion seems to lead to a paradoxical situation whereby, on the one hand, the idea of educational technology is bequeathed a focal place in the network as it symbolizes innovation, progress, and effectiveness.

The tangible technological artifacts that are meant to improve teaching quality, and quantity seems interred in a labyrinth of administrative procedures and indistinct lines of authorization and clearance (Habib & Johannesen, 2014). The processes of involvement and participation are not significantly present in normal operation of schools, and do not emerge as prevalent when looking at use of the technologies. The implementation of technology seems something that just happens. Many teachers' descriptions of how the decision-making processes are carried out are at best vague and abstract (Habib & Johannesen, 2014).

The notions of technology policy and purpose of using educational technologies are blurred among academic staff members with little signs of engagement or enthusiasm for the issue (Habib & Johannesen, 2014). Interviews with teachers participating in a technology integration program stressed the role of the school to provide "just in time support" or "support on demand" to encourage effective technology integration (Tondeur et al., 2013, p. 444).

Funding and control. While funding was not a factor in this study, the self-report nature of the instrument could be influenced, to some degree, by the funding argument. In the United States, the law system currently restricts funding of primary and secondary education to schools under the jurisdiction of the state (Toma, 1996). Public schools are fully funded through

taxpayer dollars in the K-12 system (Toma, 1996). While changes to the law are always proposed, legal limitations require private schools to seek funding from other means.

In the United States, 10% of the population of K-12 students were enrolled in private schools over 20 years ago (Toma, 1996). According to the National Center for Education Statistics (2016), today that number is still at 10%. Interestingly, 25% of the total schools in the United States are comprised of private schools (National Center for Education Statistics, 2017). These numbers suggesting the possibility of smaller student-teacher ratios in most private schools.

Toma (1996) discussed funding for private schools more than 20 years ago as largely tuition-based. Then schools occasionally sought grants or benefited from endowments to enhance their funding, but those cases were limited (Toma, 1996). Updated research suggests a changing dynamic with the introduction of school vouchers in many local systems, which are now also being considered on a national scale (Cannon et al., 2015).

Details of funding in public schools seem to vary just as much as private schools. Cannon et al., (2015) noted that funding in public school's systems can vary with respect to local funding even within a district. This variation in funding creates some areas more capable of incorporating technology financially than others.

When examining the differences between public and private schools, the issue of control also seems to have significant impact. In a study investigating the effects of school vouchers on housing markets (Cannon et al., 2015), the research noted that local control of the school seemed to be the most important factor driving a desirable school. While the finances were important, data suggested when a school was less bureaucratic and more locally controlled it was more desirable (Cannon et al., 2015). The study noted one case, which a public school was converted

to a private charter school, retaining its leadership, teachers, staff, and served the same students. The result of that conversion was a higher performing student body. The researcher attributed this positive shift to the local control of the school (Cannon et al., 2015). The idea of working in a school perceived as more desirable could potentially influence a teachers' responses. While not investigated, the control factor is discussed for its potential influence on the self-report survey used in this study.

Differences in funding and control of schools provide no significant evidence of technology integration or teacher success, they are discussed as environmental factors that may influence a school's technology integration or a teachers' self-report responses in the study.

Solutions to Lack of Technology Integration

K-12 education is fascinated with the placement of advanced technology into the classroom, but teachers lack the skills required to perform pedagogical integration without experience outside their pre-service training. The body of research seems to find no consensus when considering a unified and generalizable solution. The integration of technology is deeper than simple appearance of technological tools in the curriculum (Ruggiero & Mong, 2015). The question of how teachers integrate technology into the classroom is a constantly moving target with technology advances almost every day. New methods are introduced, tried, and take root or die in education regularly (Ruggiero & Mong, 2015).

Hampered by the rigors of the job, energy, and time commitment required of their day-to-day duties, teachers need innovative, efficient, and immediately beneficial professional development to support their use of technology in the classroom (Winslow et al., 2014). Actions are needed that enable educators to become technologically competent (Hepp, 2015). Studies suggested several critical factors to teacher's integration of technology. While some consider the

most important as in-service training, others such as age, readiness, motivation, time commitment, and technology competency play important roles (Allen et al., 2007).

In the interest of discovering which teacher traits best predict that teachers' technology integration, Vannatta and Fordham (2004) studied an array of possibilities. In the end, they found three variables when measured together seem to accurately predict a teachers' classroom technology integration. Each of those three variables will be discussed.

Openness to change. The use of technology in the classroom offers diverse opportunities for teachers and students (Chiu & Churchill, 2016). Integration can shift the learning process toward students allowing teachers to spend time with individuals. While this shift encompasses the idea of a student-centered learning environment, change of any kind tends to bring about anxiety and concern for teachers (Chiu & Churchill, 2016).

Studies show teachers with a positive attitude toward using technology will have less anxiety, and teachers with higher levels of anxiety tend to have a more negative attitude when using a new technology (Chiu & Churchill, 2016). This anxiety level when faced with a new program or shift in teaching is referred to as a teacher's openness to change (Vannatta & Fordham, 2004). This measure attempts to gauge how willing a teacher is to try something new. Teachers are often focused on the perceived risk or estimation of possible risk associated with a change or new technology. The perception of risk has little to do with the actual consequences of the change (Howard & Gigliotti, 2016).

Ironically, teachers are evidence-based creatures and the visible evidence of the usefulness of technology as a tool for learning is an important factor in classroom adoption (Chiu & Churchill, 2016). Without visible evidence, faculty may fear technology as something they do not understand (Mitchell, Parlamis, & Claiborne, 2014). The natural reaction when presented

with a change is for individuals or groups who do not understand it to stand in opposition to such a change and display negative reactions that need to be overcome (Mitchell et al., 2014).

Mitchell et al., (2014) continued to refer to such resistance as a person attempting to make sense of something new and it should be viewed as an opportunity in the process of change.

One study focused on teachers' use of tablets in an early childhood educational setting, with results that showed teachers who had even a one-point increase in attitude on the studies measurement scale were two to three times more likely to use tablets in learning (Blackwell et al., 2016). In the study, teachers were given freedom to choose the level of integration and applications used in their classroom. Teachers with higher positive attitude scores tended to make more pedagogically integrated use of tablets in their lessons, while teachers with lower attitude scores used tablets for more basic skills, and less frequently (Blackwell et al., 2016).

Openness to change can be seen in a teachers' behavior or reaction to a change in their environment (Chiu & Churchill, 2016). Research (Blackwell et al., 2016; Chiu & Churchill, 2016; Mitchell et al., 2014; Reychav et al., 2016; Teo, 2014) discussed evidence of a teacher's openness to change with traits in attitude, but also by examining the time a teacher spends learning to use a new technology or how to implement a change for the most benefit in their classroom. Such evidence of time commitment is also a critical part of this study.

Technology training. Considering society's demand for the technological training of its teachers, the time devoted to technology in the curricula of teacher-training programs is insufficient. For educational organizations to integrate technology in normal operations their members must have the needed professional training (Larosiliere et al., 2016). Training must focus on the pedagogical application of digital tools rather than on their generic use (Hepp, 2015). One of the reasons related to the lack of technology use in schools is the lack of effective

pre-service training for teachers to acquire sufficient skills before they enter the classroom (Akkaya, 2016).

In a study of K-12, Internet-based technology systems, Kimmons (2015) noted that accurate comparison between systems was difficult, because no two systems were the same. Anderson and Groulx (2015) argued that preparing prospective teachers to integrate technology during pre-service training could help bridge the gap between the ideal and the actual, but it cannot replace experience with the actual. The argument did not discount pre-service training, but stated its need to be continued while teachers are in service to attain actual technology integration (Anderson & Groulx, 2015). Pierce and Cleary (2016) noted potential solutions to the training dilemma by providing teachers with Internet-based educational applications that could provide topic training for teachers to use and learn as they continue to expand their capabilities.

Haihong and Garimella (2014) performed a study in the Hawaii FIRST Pre-Academy, which is a technology-infused professional development (PD) program. Their study found science, technology, engineering, and math (STEM) disposition and technology integration measures across participants in specific activities were significantly higher than those for teachers who did not participate. The study indicated on some scale that in-service teacher training made a significant difference on technology integration. Haihong and Garimella (2014) performed their study in a pre-test, post-test experiment with teachers learning to use iPads. Their result showed the perceived usefulness of iPads; participants reported measurably higher means for learning new tasks, exploring additional materials, and accessing course information at the end of the study when compared to the beginning. The literature suggested schools have used varied levels of in-service teacher training during technology integration programs to

encourage development. For technology integration to be accepted in the classroom, the teacher needs to be a key stakeholder in the adoption process.

Providing technical training to teachers is a good start, but general technical training is not enough. Teachers also need professional development in the pedagogical application of those skills to improve their teaching (Lehiste, 2015). The important point to note is teachers consider technology as an additional item, not part of the process when they do not have pedagogical training in its application. Many teachers consider the introduction of technology to their classrooms as an added stress and not a benefit. The proliferation of technologies has complicated the teaching-learning process, and finding the best ways of integrating technology into classroom practices is one of the challenges the 21st-century teachers face (Agbo, 2015).

Another study investigated the effectiveness of web-based professional development for in-service teachers with enlightening results (Kao, Tsai, & Shih, 2014). Teachers' web-based professional development self-efficacy had positive correlation with their attitudes toward web-based professional development. Teachers with higher web-based professional development self-efficacy expressed favorable attitudes toward web-based professional development. This study suggested one of the most critical factors in training or the use of technology is the attitude of the teacher (Kao et al., 2014). The result of an ongoing training program should be a reduction in anxiety and improved integration of new technology (Chiu & Churchill, 2016).

Working together, teachers can examine their beliefs and practices to understand how they impact student learning (Curwood, 2014). There is a critical relationship between self-confidence and using technology in teaching. When a teacher has self-confidence, he or she will have a positive attitude toward technology and will be motivated to use it in the classroom (Mirzajani et al., 2016). Technology in the environment is an important step, but it is imperative

to focus beyond the technology into how it enables teaching and learning (McKnight et al., 2016). The literature suggested that pedagogically relevant training made a difference.

Working beyond the contract. Time commitment is often cited as another crucial factor for teachers when faced with the prospect of developing skills to appropriately integrate technology in lessons (Allen, Lowther & Strahl, 2007, p. 28). According to a report on teaching and learning from the Organisation for Economic Co-operation and Development (2013), teachers in the United States spend an average of 45 hours a week working. Of those hours, 18 are spent working on tasks other than teaching.

Teachers often worry about a heavier workload when learning or using a new technology (Chiu & Churchill, 2016). In addition, they are concerned about potential loss of control in the classroom due to their own lack of familiarity with technology (Chiu & Churchill, 2016). Teachers who show such concerns and take the time to experience and get familiar with a new technology or instructional method have been known to change their beliefs when observing their students successfully learn with the new technology (Chiu & Churchill, 2016).

Vannatta and Fordham (2004) found teachers who spent more of their own time beyond the contractual work week tended to be more successful with integration of technology in the classroom. Teachers must understand the requirement for additional time can become an investment in time saved in the future when technology-enhanced courses begin to save time for teaching once they are developed (Allen et al., 2007).

One study that focused on how teachers use technology found improved access as one of the most cited benefits (McKnight et al., 2016). Teachers could access student work from home, and students were able to gain valuable feedback on their work beyond classroom time

(McKnight et al., 2016). The technological environment freed teachers from their classrooms and encouraged collaboration with other teachers (McKnight et al., 2016).

Teachers in the study continued to provide details about a total restructure of their time, allowing them to spend more time providing coaching or direct support with students in the classroom, and spending far less time grading or on administrative tasks (McKnight et al., 2016). McKnight et al. (2016) continued to point out that teachers felt more effective with their time once they learned to use technology.

Teachers can create, use, and share resources using their classroom computer without the need to purchase any software (Ruggiero & Mong, 2015). Project Tomorrow published in 2011 also found teachers often no longer need to purchase expensive software or hardware to provide access to digital content (Ruggiero & Mong, 2015). Teachers have already begun to adjust their classrooms to integrate these tools. Classroom use of Internet-based videos and podcasts alone has increased more than 50% since 2008 (Ruggiero & Mong, 2015).

Teachers that take the time to keep up to date with changes in technology feel more effective in their teaching (Ruggiero & Mong, 2015). Just as other professionals take time to keep up to date with their skills, research suggests teachers who read trade magazines, participate in training, or experiment with new ideas are more confident (Mizanjani et al., 2016).

Bringing Technology and Education Together

Effective integration of technology into learning systems is much more complicated than providing computers and securing a connection to the Internet (Agbo, 2015). There are potential benefits and pitfalls to consider, but changes in the educational environment demand a shift from instructor-centered to student-centered learning (Chiu & Churchill, 2016; Polly, 2014).

The use of technology creates a powerful learning environment, transforming the learning and teaching process in which students deal with knowledge in an active, self-directed and constructive way (Agbo, 2015). Teachers play a critical role in the teaching and learning paradigm shift. They must understand the potential role of technology in education and become effective agents able to make use of technology in the classroom (Agbo, 2015).

Mirzajani et al. (2016) revealed that a student-focused pedagogical attitude, computer experience, positive attitude toward computers and personal entrepreneurship of the teacher created a positive influence on the inventive use of technology by the teacher. Content and pedagogical knowledge are precursors to successful technology integration. Effective teachers can use technology in a pedagogically-sound way (Ruggiero & Mong, 2015). This shift does not seem to take place unless teachers are open to change, participate in technology training, and are willing to experiment with new ideas outside of the contractual work week (Vannatta & Fordham, 2004).

Personal characteristics may influence how teachers use computers, and teachers' preferred learning style is one such factor (Agbo, 2015). Several other factors that enable teachers to engage in innovative practice are: support at senior management level for implementing new practice, addressing financial implications where appropriate, involvement of several members of staff, fostering a culture within schools of collaboration and mutual support and willingness to take risks. Expressing the role of school leadership is clearly central in meeting several of these preconditions (Agbo, 2015), just as the symbiotic relationship between administrator and teacher is important (Larosiliere et al., 2016).

Technology is a moving target and learning to use it requires a willingness to make mistakes. Learning from those mistakes, taking risks, showing an openness to change, and

spending time outside of the contractual work week are traits of teachers who tend to show high levels of pedagogical technology use in learning (Vannatta & Fordham, 2004). Research findings suggested three areas when measured together best predict teachers' use of technology. Those variables are willingness to commit time beyond the contractual work-week, participating in technology related training, and an openness to change (Vannatta & Fordham, 2004). When studied together, these factors lead the research to discover the process of learning technology takes time. Teachers who were willing to spend time playing with technology on their own time, learning in classes outside their normal obligations, and who showed a willingness to take the risk of trying something new in the classroom were the more successful (Vannatta & Fordham, 2004).

Summary

Modern education has been provided with opportunity in the expanding world of technology, and teachers are key in the adoption of technology systems (Mitchell et al., 2014; Reyhav, et al, 2016; Teo, 2014). Despite this opportunity, many educators find reasons not to use technology instead of making time to learn how it can best serve their student's needs (Güven & Gül, 2016). Despite that reluctance, guidelines in the United States now encourage a shift to student-centered learning where technology plays a central role (Polly, 2014).

Barriers in the research focus on integration of technology into lessons, students' lack of computer skills, teachers' lack of training, teachers' lack of exposure to technology, and lack of time to implement technology-integrated lessons (Hsu, 2016). Highly-educated teachers who are skilled with technology are often innovative and adept at overcoming these obstacles, but they do not integrate technology on a consistent basis (Agbo, 2015). Teachers consistently note that

students do not have enough time at computers, and teachers need extra planning time for technology lessons (Agbo, 2015).

This lack of integration presented areas lacking in support of modern teachers. Areas such as support from leadership, infrastructure support, and pedagogically relevant technology training, provide barriers to effective technology integration. The literature showed teachers need to be supported with in-service training and encouraged to experiment with technologies that might fit their environments (Habib & Johannesen, 2014; Lehiste, 2015; Ruggiero & Mong, 2015).

Christian, and public K-12 education both face barriers in the meaningful integration of technology. Christian private education seems to benefit from direct local involvement, while public education is often burdened with the governmental bureaucratic control it was designed around. Public and private K-12 schools face funding issues that are unique to their nature, but just as diverse as the schools themselves.

Research has extensively focused on public K-12 education and technology, but this study used a previously developed model (Vannatta & Fordham, 2004) and focused that instrument toward Christian K-12 education. While the body of research for public K-12 educational technology integration is vast, this same topic is neglected in Christian K-12 education. According to the National Center for Education Statistics (2017), 25% of all the schools in the United States are private schools. In a previous report from the National Center for Education Statistics (2016), 10% of the student population in the United States attend these private schools.

With such a large section of students and schools in the United States, no known previous research has attempted to explore reactions of teachers in Christian education or if they exhibit

similar traits to teachers in public education considering the adoption of technology into the K-12 environment. The findings of this study contribute significantly by building upon the previous research conducted by Vannatta and Fordham, (2004) and begin to develop data for Christian K-12 education that did not yet seem to exist. Until now, Christian K-12 teachers have had no relevant data to their environment despite the resources available on the topic.

CHAPTER THREE: METHODS

Overview

In this chapter the study design, research question, testing method and instrumentation will be presented. This chapter will discuss the methods that were used in the study, provide a detailed description of the instrument development, and present the instrument's measurement methods and validity ratings. Finally, data analysis procedures and tests will be discussed ending the chapter with the conditions required to either accept or reject the null hypothesis.

Design

This study used a predictive correlational design. Correlational research attempts to discover the relationships with variables using correlational statistics (Gall, Gall & Borg, 2007). This correlational research measured a teacher's overall use of technology (criterion variable) and its relationship with openness to change, amount of technology training, and hours of work beyond the contractual work week (predictor variables). The criterion variable (teachers overall use of technology), defined by teachers' use of types of technology and students' use of types of technology as reported by the teachers and their frequency of use in the classroom (Vannatta, & Fordham, 2004), were measured by a series of questions that assign value to the frequency of technology use in the learning environment. The first predictor variable (openness to change) was measured through a series of questions in which teachers responded with how strongly they agree or disagree with each side of an argument. The final two predictor variables (amount of technology training, hours of work beyond the contractual work week) were measured by the self-report method. Correlational research was best used for this study because it measures the strength of the relationship between the criterion and predictor variables without attempting to manipulate their values (Gall et al., 2007). This study was conducted ex post facto, or after the

fact, without experimental modification, to best understand the participants in their natural environment. Any experimental modification would alter the result.

Correlational research measures the strength of the relationship between criterion and predictor variables by using a statistic known as the correlation coefficient represented by an r in the expression (Gall et al., 2007). The value of r is typically measured with a scatterplot between two variables. The variables plotted one on each x and y axis resulting in a pattern in the plot. If a result was expressed $r = 1.00$ representing a perfect positive relationship, it would indicate that for each value on the x axis, the y axis would increase by one (Gall et al., 2007). While such a test does not prove causation, it does show positive or negative effect. If one or more predictor variables are present, then it is likely to have the expressed effect on the criterion variable.

To best understand the population of Christian K-12 teachers and the conditions they face, it was important to study them in their natural environment. In most cases the targeted schools that participated in this study have already implemented a technology program at some level. To understand the impact any reform has had on a teacher's overall use of technology, it is important to first determine the teacher's current beliefs (Hsu, 2016). This foundational idea supports the reason that data for this study was collected without experimental modification. Experimental modification would have changed the existing environment and skewed the study results.

In their study, Vannatta and Fordham (2004) created the Teacher Attribute Survey (TAS) used as the instrument in this study. During their analysis, Vannatta and Fordham (2004) found three variables when measured together best predicted a teacher's overall use of technology. The findings in that study formed the basis for the research question and variables used in this study.

Research Question

Participants were sorted based on their self-reported overall use of technology. The research question was then tested to determine if there was a predictive correlation between the predictor variables, when compared with the criterion variable, overall use of technology.

RQ1: Can overall use of technology be predicted by examining openness to change, amount of technology training, and hours of work beyond the contractual work week for Christian K-12 teachers?

Hypothesis

The null hypothesis for this study is:

H₀: There will be no statistically significant predictive relationship in overall use of technology, when compared with openness to change, amount of technology training, and hours of work beyond the contractual work week for Christian K-12 teachers.

Participants and Setting

K-12 schools in the United States are required to have a governing body that oversees the curriculum and educational standards to ensure students meet minimum qualifications for graduation. Public schools have oversight by the department of education and accrediting districts, which divide the United States into six zones. Private schools do not fall under the same public districts and seek oversight from established bodies such as the Association for Christian Schools International (ACSI). ACSI conducts' standards oversight for private K-12 and higher education institutions in the United States and internationally. ACSI conducts regular reviews of their member schools. If a school is not meeting the organizations standards it is placed in a probationary state and given a specified time to correct any issues. ACSI educational

standards and regular review of its member schools ensures a high level of performance and achievement.

Participants in this study were adult teachers who worked in ACSI member K-12 schools in the United States, where their schools were not in a probationary state. The target population was all teachers serving in these schools in the United States who were teaching at least half-time schedules. No minors were used in this study. Participation was voluntary, and no monetary compensation for participants was extended.

Due to the environmental factors and the wide-spread nature of the population, a simple random sample was the most practical. The random sample method was used to represent all regions of the United States. An email was sent to all qualified ACSI member school leaders in the United States (see Appendix C) requesting agreement for participation in the study, providing a brief outline of the study and its goals. Once a school leader agreed for their school to participate that school leader forwarded the invitation email containing a link to the survey to the school's teachers. Once teachers clicked on the link they were presented (see Appendix D) with a brief outline of the study, the data it collected, and assurance of anonymous participation. Teachers then clicked a consent button to proceed into the survey. The survey continued open for participants for approximately 11 weeks, until active participation ceased. According to Gall et al. (2007), 66 is the required minimum for a medium effect size with a statistical power of 0.7 at the 0.05 alpha level. Total sample size was 70 participants ($N=70$) which exceeds the minimum requirement.

The study collected some demographic information about the sample population. The sample consisted of 56 females and 14 males. The number of years teaching ranged from one to 46 years. This study did not collect information regarding ethnicity, age, subject and grade level

taught as Vannatta and Fordham (2004) noted, such information could be used to identify individual participants. Such demographic information was not required for an accurate measurement of correlation in the study and was omitted to ensure participants felt assured of anonymity.

Instrumentation

The instrument that was used in this study is the Teacher Attribute Survey (TAS) (see Appendix E). Permission to use the instrument was requested and received (see Appendix G). Developed as part of a study (Vannatta & Fordham, 2004) to predict overall use of technology in the classroom by using a range of predictor variables, the instrument measures the criterion variable and predictor variables used in this study. Table 1 breaks down the individual sections of the survey, its scales, and Cronbach alpha validation scores for each section that requires individual validation. The instrument is a 71-item self-report survey, built from items written by the researchers and items from previous instruments.

The survey is broken into five sections. Section A was measured on a Likert scale of one through six. One starting at strongly disagree to number six at strongly agree. Section B used a semantic differential scale of bipolar statements. In this section, two statements present opposite sides of an argument. The participant chose one of five levels of agreement between the two arguments. Sections A and B covered questions one through 36 and measure the predictor variables of teacher self-efficacy, teacher philosophy, and openness to change. Vannatta and Fordham (2004) argued the variables represented in these two sections are referred to as teacher disposition but are scored individually. Higher scores in these variables indicated a positive disposition, but no single score for disposition was provided.

Sections C and D were based on a four-point Likert scale to measure the frequency of technology items that were used. The scale ranges from one reflecting not at all, to four reflecting all the time. These sections covered questions 37 through 66, producing a combined single score (Vannatta & Fordham, 2004) known as Overall Use of Technology. This study used overall use of technology to measure the criterion variable. Validation for overall use of technology achieved a Cronbach alpha of 0.8878. When tested for validation, overall use of technology scores ranged from 0.50 to 3.50 with a higher score showing higher use of technology.

The final section E was an open report section that asks demographic questions such as hours of training, gender, and number of years' experience in teaching. Section E measured amount of professional development, amount of teacher technology training, years of teaching, hours of work beyond the contractual work week, and willingness to complete graduate courses without a salary incentive that will be used for predictor variables. Due to the open answer nature of the questions in this section, Vannatta and Fordham (2004) reported the section does not require individual validation.

The reported average time to complete the survey was between 15 and 20 minutes (Vannatta & Fordham, 2004). The TAS survey was pilot tested in six Northwest Ohio schools. The instruments overall validation achieved a Cronbach's alpha score of 0.9083. Since its development, the TAS has been referenced by other studies in discussion more than 400 times.

Table 1

Teacher Attribute Survey Validation (Vannatta, & Fordham, 2004)

Variable	Definition	Items	Scale	Cronbach
Teacher Self-Efficacy	Beliefs of ability to affect student performance	1-16	1-6	0.7287
Teacher Philosophy 1	Teacher-centered vs. Student-centered	17-25	1-6	0.6102
Teacher Philosophy 2	Constructivist vs. Traditionalist	32-36	1-5	0.6914
Openness to Change	Willingness to take risks and learn from mistakes	26-30	1-6	0.6919
Teacher Use of Tech	Frequency of instructor use of a variety of technology tools and applications in the classroom	37-51	1-4	0.8516
Student use of Tech	Frequency of student use of a variety of technology tools and applications in the classroom	52-66	1-4	0.7966
Overall Use of Tech	Frequency of instructor and student use of a variety of technology tools and applications in the classroom	37-66	1-4	0.8878
Continue Grad Course Without Salary Incentive	Willingness to take graduate courses if no salary incentive was provided	31	1-6	
Professional Development	# of actual hours in the past two years	67	open	
Technology Training	# of actual hours in the past two years	68	open	
# Hours Beyond Work Week	# of hours, one typically works beyond the contractual work week to prepare for teaching	69	1-6	
Gender	Male (1) or Female (2)	70	1-2	
# of Years Teaching		71	open	

Adapted from "Teacher Dispositions as Predictors of Classroom Technology Use." By Vannatta, R. A., & Nancy, F., 2004, *Journal of Research on Technology in Education*, 36(3), p. 256, Copyright 2004 International Society for Technology in Education. Adapted with permission.

Procedures

First the researcher sought approval of the Institutional Review Board to perform the study (see Appendix A). Then official permission from Association of Christian Schools International (ACSI) was sought (see Appendix B). Next, the researcher drafted an invitation email (see Appendix C) that was sent to school leaders, from ACSI officials, asking schools for willingness to participate in the study. Once a school leader agreed to participate, the leader forwarded an electronic survey link from Survey Monkey from their invitation email to teacher participants within the school's email system. Participants read an informed consent document through the survey link and clicked a box agreeing to participate (see Appendix D). With this method, each participant's identity was protected, and no individual teacher contact information was shared with the researcher or ACSI officials.

The survey used targeted questions in the self-report method to collect quantitative data from the sample population. Participants responded by checking boxes with the assigned value most like their personal beliefs, entered the number of times a technology was used in a given period, and entered values for their technology training and hours worked beyond the contractual work week. The survey used Internet-based technology from Survey Monkey to collect data and generate scores. The survey technology used in this study (see Appendix E) provided a cross platform tool where participants can participate in the study anonymously from standard desktop computer and mobile devices. All the data was collected through the TAS (see Appendix F) instrument. Statistical calculations were performed using IBM SPSS software.

Data Analysis

The study relied on a survey using the self-report method to collect data from the sample population. The survey collected data on predictor variables (openness to change, amount of

technology training, and hours of work beyond the contractual work week) and the criterion variable (overall use of technology).

A multiple regression analysis was used to determine if overall use of technology could be predicted by examining openness to change, amount of technology training, and hours of work beyond the contractual work week for Christian K-12 teachers. First the data was screened and checked for inconsistencies using a box and whisker plot. In order to conduct a multiple regression analysis, a few assumptions had to be met. The assumption of normal distribution was checked using the Kolmogorov-Smirnov test since the sample ($n = 70$) is greater than 50 (Gall et al., 2007). The assumption of bivariate outliers was tested using a scatter plot. The assumption for multivariate normal distribution was also tested using a scatter plot. The assumption of non-multicollinearity among the predictor variables was also checked. In such a test, if the variance inflation factor (VIF) is between one and five, this assumption will have been achieved. If the VIF was greater than 10, one of the offending predictor variables would need to be dropped. This was not the case in this study as the VIF for the variables tested between 1.00 and 1.02. Post-hoc checks were performed using t - and r - statistics to test for sub nulls.

When all assumptions were met, a test of multiple regression attempted to determine if the criterion variable could be predicted by any combination of the predictor variables. If the F statistic for any of the predictor variables was $p < 0.05$, the null hypothesis could be rejected.

CHAPTER FOUR: FINDINGS

Overview

In this chapter the data, screening and assumption testing is explained. Results of statistical testing are presented. The research question is examined, and the data provided a clear direction in the results of the study.

Research Question

The research question that guided this study was:

RQ1: Can overall use of technology be predicted by examining openness to change, amount of technology training, and hours of work beyond the contractual work week for Christian K-12 teachers?

Null Hypothesis

The null hypothesis for this study was:

H₀: There will be no statistically significant predictive relationship in overall use of technology, when compared with openness to change, amount of technology training, and hours of work beyond the contractual work week for Christian K-12 teachers.

Descriptive Statistics

There was a total of 70 participants in this study. The sample consisted of 56 females and 14 males with teaching experience ranging from one to 46 years. The survey instrument asked participants to qualify themselves to verify they were teachers working at least a half time schedule in an ACSI accredited K-12 school. Four of the participants responded negative and were removed from statistical calculation, reducing the sample to 66 ($n = 66$). Participants represented 17 different states within the United States. This study did not collect information regarding ethnicity, age, subject, grade level taught or specific location as such demographic

information as this was not required for accurate measurement of correlation and could be used to identify individual participants.

This study did not separate participants by gender when performing correlational testing. The differences between gender groups did not present enough evidence to justify separating the groups for this study. Table 2 presents the mean and standard deviation by gender for each of the variables.

Table 2

Descriptive Statistics

Variable		<i>M</i>	<i>SD</i>	<i>N</i>
Openness to Change	Male	4.04	.59	13
	Female	4.22	.40	53
	Total	4.19	.44	66
Overall Use of Technology	Male	2.07	.40	13
	Female	2.22	.59	53
	Total	2.19	.56	66
Work beyond the Contractual Workweek	Male	3.30	1.03	13
	Female	3.39	1.04	53
	Total	3.37	1.03	66
Technology-related Training	Male	8.08	13.58	13
	Female	6.32	10.34	53
	Total	6.67	10.95	66

Results**Data Screening**

Data was collected using the Teacher Attribute Survey (TAS) (see Appendix E). Initial data revealed 70 ($n = 70$) participants that completed the survey. Four of those were removed as they self-reported they were not teachers working at least a half time schedule, reducing the sample size to 66 ($n = 66$). Gall et al. (2007) stated that 66 is the required minimum number for a medium effect size with a statistical power of 0.7 at the 0.05 alpha level.

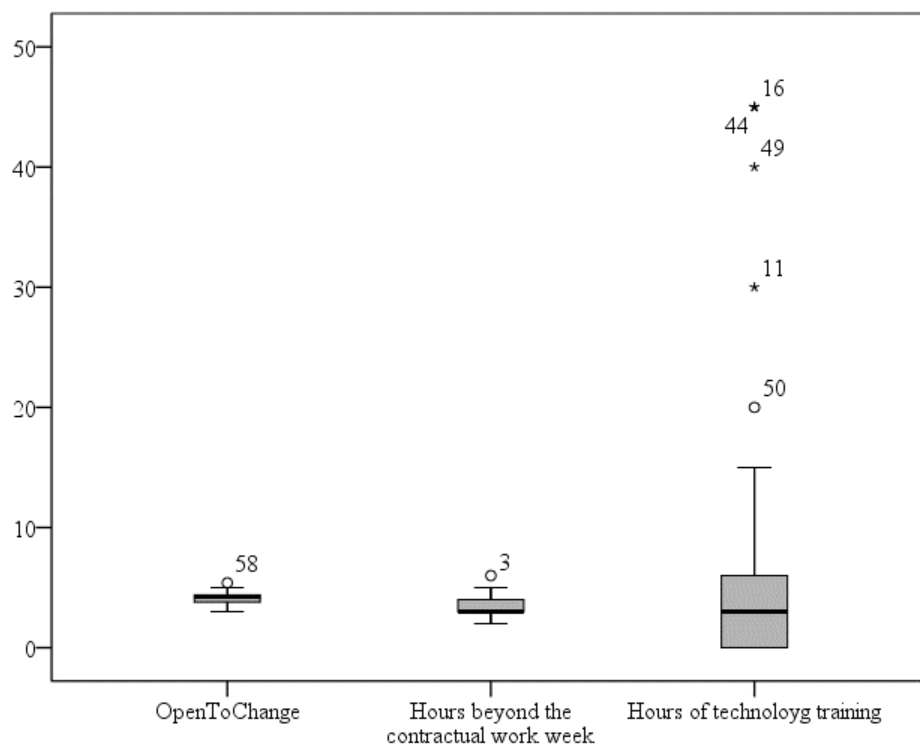


Figure 1. Box and Whisker Plot for openness to change, hours worked beyond the contractual work week and hours of technology training.

Next data was screened for inconsistencies using a box and whisker plot shown in Figure 1. The box and whisker plot did show several participants with high scores in the number of hours of technology related training over the last two years, but these scores are within a reasonable range of expectation for teachers in degree, or other specific training programs. Schools will often use a train the trainer model (Attard & Bugeja, 2018) to pay to train one or two teachers and ask those teachers to train the remaining teachers. These larger participant scores were included in data analysis due to that range of reasonable expectation.

The data was screened for errors. An analysis for bivariate outliers and multivariate normal distribution was conducted. No indication of extreme bivariate outliers was found, and the assumption of multivariate normal distribution was found tenable. See Figure 1 for a scatter plot between each pair of predictor variables.

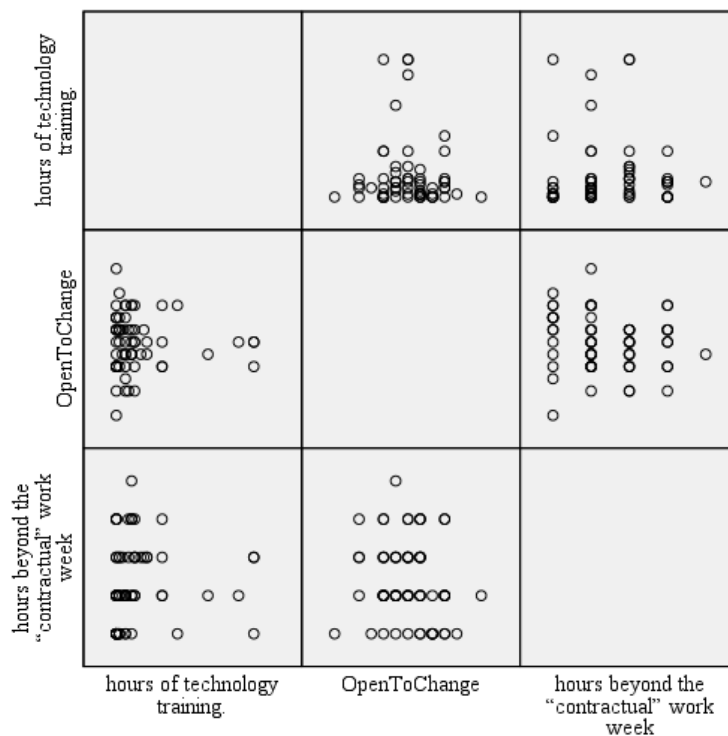


Figure 2. Scatterplot for hours of technology training, openness to change and hours worked beyond the contractual work week.

While some variance was noted for hours of technology training, this variance is within tolerance and accurately reflects the larger population. Many participants in the study also noted higher hours of professional development over the last two years as recorded by the Teacher Attribute Survey (TAS), but that score was not used in the correlation calculation based on recommendations from Vannatta and Fordham (2004) in the results of their study which recommended removal of that score in future research.

Assumptions

The assumption of non-multicollinearity among the predictor variables was checked using the variance inflation factor (VIF). The VIF for the variables tested between 1.00 and 1.02 as shown in Table 3 was within the lower normal range between one and five.

Table 3

Collinearity Diagnostics

Variable	VIF
Openness to Change	1.02
Hours of technology Training	1.00
Work beyond the contractual work week	1.02

Results for Null Hypothesis One

The research question this study focused on was if a predictive correlational relationship could be found between any of the predictor variables (openness to change, work beyond the contractual work week, and amount of technology training) and the criterion variable, overall use of technology.

Once all the assumptions had been met, a test of multiple regression was performed to determine if a significant relationship could be found between the criterion and any of the predictor variables. In this test the value of $p = 0.007$ which is less than 0.05. This presented enough of a significant correlational relationship to reject the null hypothesis, $F(3,62) = 4.427$, $p=.007$. This value tested the overall statistical significance of a correlational relationship between the criterion variable and the combined effect of all three predictor variables. ANOVA data can be found in Table 4.

Table 4

ANOVA Statistics

	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	Sig.
Regression	3.598	3	1.199	4.427	.007
Residual	16.794	62	.271		
Total	20.392	65			

Notes. Dependent variable = Overall Use of Technology. Predictors = Hours worked per weeks beyond the contractual teacher work week, openness to change, and hours of training related to technology. One graduate credit is equivalent to 15 hours of contact time.

To better understand the individual contributions each predictor variable made to the analysis, the standardized coefficients Beta score was investigated. This score represents the contribution an individual variable had to the overall model. As noted in Table 5 all three variables had some positive correlation with the criterion variable (overall use of technology). The predictor variable with the highest contribution was hours of technology related training with a standardized coefficients beta value of 0.328.

Further investigation of the information in Table 5 also shows the statistical significance scores for each of the predictor variables. The table notes that only hours of technology related training had a statistically significant effect on the criterion variable (overall use of technology) with a value of $p = 0.006$. Values below 0.05 are considered statistically significant. The predictor variable hours of work beyond the contractual work week had the next strongest effect on the overall model, but with a significance value of only $p = .065$ it was above the level to be considered statistically significant. While the value of this predictor variable was not statistically significant its effect should not be ignored in consideration. The predictor variable openness to

change also had an impact on the overall model, but with a higher significance value $p = .117$, it was well above the level for individual significance.

Table 5

Correlational Statistics by Variable

Predictor Variable	Standardized Coefficients Beta	Sig.
Openness to change	.185	.117
Hours of training related to technology in the last two years	.328	.006
Hours of work beyond the contractual work week	.219	.065

The data suggested the most significant predictor of overall use of technology is the hours of technology related training a teacher participates in. The data presented significant evidence in the overall model and in the predictor variable hours of technology training and the null hypothesis was rejected.

CHAPTER FIVE: CONCLUSIONS

Overview

This chapter discusses the conclusions drawn from the data and its relationship with previous research. The chapter continues with a discussion of research and the findings. Then the implications these findings could have for practice in education and technology integration are discussed. Next, the chapter presents limitations of the study to be considered. Finally, the chapter completes with recommendations for expanded or future study.

Discussion

The purpose of this predictive correlational study was to explore a gap in current research regarding in-service training, teacher attitudes and commitment, and the prediction of a teachers' overall use of technology in the Christian K-12 classroom. The research question for this study was: Can overall use of technology be predicted by examining openness to change, amount of technology training, and hours of work beyond the contractual work week for Christian K-12 teachers?

Analysis of the data did confirm a hypothesis proposed in previous research (Vannatta & Fordham, 2004) that found the three predictor variables do have a positive correlation with teacher's overall use of technology when examined together. Vannatta and Fordham (2004) sought to answer this question in a broader sense 14 years ago. This study used the foundations of Vannatta and Fordham (2004) to discover the data still shows a significant correlational relationship between overall use of technology (criterion variable), openness to change, hours worked beyond the contractual work week and hours of technology related training over the last two years (predictor variables), despite significant changes in education and technology as more than a decade has passed. The participants in this study were all self-qualified as teachers

working at least a half time schedule in a Christian K-12 school accredited by the Association of Christian Schools International (ACSI) inside the United States. The data in this study indicated similar results to Vannatta and Fordham's (2004) study in the public educational environment. The data in this study provided evidence that educators in the Christian K-12 environment concerned with technology integration can use previous research based in the public-school environment with relative accuracy. Since previous studies focused in the Christian K-12 environment seem difficult to locate, this realization alone is a significant statement.

Technology in various forms has been a fascination of educational research since the first calculator became usable to the general population. In this modern world filled with advances in technology humans adopt or reject new technologies based on relevance or association with their lives. Kolb (1984) insisted human impulse and experience are what drive learning. His idea of forming connections to new ideas with previous experience form the foundation of modern education in the classroom. Kolb (1984) continued the development of modern educational theory with the argument for personal learning styles. This idea that each person prefers to learn a certain way, is a simple model used to explain the complex and individual nature of the learning process (Kolb, 1984).

The data in this study agrees with previous research (Kolb, 1984; Miller 2002) that indicated that learning styles have a positive impact on technology use in education when considered in training. With a significant positive correlation between technology related training and overall use of technology the data in this study suggested, the more training teachers receive specific to their environment and the tools they use, the more they will make technology part of the learning process. The data also indicated this positive correlation is not exclusive to the

public K-12 environment, but also occurs in the Christian K-12 environment with similar relationship.

Educational leaders and teachers in the K-12 environment have been seeking key components to the success of technology programs. Previous research in the public K-12 environment has suggested (Mitchell et al., 2014; Reyhav, et al, 2016; Teo, 2014) that teachers are the key to effective use of technology in the classroom. In addition to this knowledge, Güven and Gül (2016) found that many teachers are reluctant to adopt technology into their practice. Data from Vannatta and Fordham (2004) suggested teachers needed pedagogically relevant technology training for technology integration to occur. The data in this study confirms those findings in the modern Christian K-12 environment. This study showed the most significant predictor of overall use of technology in the classroom was the hours of technology related training a teacher received. The results of this data suggest targeted and specific technology related training as a key component to the success of technology integration programs in K-12 education.

The path forward must effect change in schools. Winslow et al. (2014) cited multiple reasons why schools do not innovate with technology. Among those reasons were lack of in-service training for the teachers and budget cuts that seem to reduce training. The evidence in this study and in previous research urges K-12 schools to change their behavior if they expect teachers to make meaningful change with technology.

When visiting a typical K-12 school observation would show that each classroom environment is slightly different from the next. These differences in each classroom are the result of a combination of factors presented in the theoretical framework of this study. The best explanation can be found in research on individual learning styles. Kolb (1984) documented

these styles simplistically by outlining them as an individual's preferences in learning new information. Teacher learning style tends to drive how that teacher delivers curriculum and sets the tone of learning for each classroom. That teacher driven tone does not always compliment student learning styles.

The data in this study supports the need for schools to find ways to provide technology related training to teachers that complement their learning style and pedagogy. This training must help teachers learn to step outside of their own learning style and adopt a more student-centered learning practice (Chiu & Churchill, 2016). Blackwell et al. (2016) found positive teacher attitudes toward technology and higher technology use in schools that provided high levels of support and training.

Voogt and McKenney (2017) examined barriers to the use of technology only to find teachers in their study noted the main reason for the lack of technologies use was their own limited knowledge. The study found a dilemma where some educators knew how to use technology but did not know the specifics of technology for a given teacher's topic. On the opposite end of the spectrum many teachers knew their topic areas well but did not know enough about technology to make meaningful use of it. Larosiliere et al. (2016) argued that training should focus on direct pedagogical application for educators and not general use of technology for true effectiveness. Pierce and Cleary (2016), suggested adequate pedagogical training as the key to the success or failure of productive technology integration.

Teachers often feel overwhelmed in the management of their time and training for technology can be a perceived burden (Allen et al. 2007). Teachers must also realize the time spent in training is not wasted, but an investment in time saved when technology enhancements begin to save time once they are developed (Allen et al., 2007). Teachers often experience a

feeling of freedom with enhanced ability to access student work from home or empowering students with feedback beyond classroom time (McKnight et al., 2016). McKnight et al. (2016) discovered teachers who experienced technology training completely restructured their time. Such teachers spent less time on administrative tasks and more time coaching students or on direct support in the classroom. Ruggiero and Mong (2015) found teachers adjusting to the use of technology by collaborating more with other teachers and adjusting the use of digital content in their classrooms. Teachers who made use of technology after relevant training felt more effective in their teaching (Ruggiero & Mong, 2015).

Modern technology methods not only provide a multitude of tools for teachers, but also aide teachers in addressing the needs of the students learning style and enable a more meaningful learning experience for the student and teacher. When such pedagogically relevant training occurs, the data shows an increase in a teacher's overall use of technology. McKnight et al. (2016) supported that argument by noting the importance of focusing on how technology enables teaching and learning, not just on the technology itself. McKnight et al. (2016) continued to argue that only pedagogically relevant training made a difference. The data in this study is bolstered by a body of previous research reinforcing the argument for relevant technology training as a key and critical component to encouraging overall use of technology in the classroom.

Implications

The results of this study have opened a new world for teachers and leaders in the Christian K-12 environment. With almost no previous research for the Christian K-12 environment, the results of this study show previous research tools used in public education can be used effectively in the Christian K-12 environment. Vannatta and Fordham, (2004) first used

the Teacher Attribute Survey (TAS) over 14 years ago to discover a positive correlation between overall use of technology in the classroom and the hours of technology related training a teacher participates in. While their focus was on an array of other variables in addition (Vannatta & Fordham, 2004), their research began to establish the argument for technology related training in teacher development programs.

This research has built upon that past foundation to confirm that teachers in the Christian K-12 environment have the same positive correlation between overall use of technology and hours of technology related training over a decade later. Significant change in technology has taken place since 2004. Even with technology so integrated into modern life (Agbo, 2015; Lehiste, 2015) research has still found teachers lack pedagogically relevant technology training and without it, they consider technology as an addition to education, not an integrated part.

This research makes the argument that leaders and decision makers in the Christian K-12 environment must include effective, pedagogical training as an integrated part of new and ongoing technology development plans. Haihong and Garimella (2014) discovered that varied levels of professional development may work, but only if the teachers are key stakeholders in the adoption process. Educational leaders are not always informed of the encompassing needs of their faculty members and this is especially the case when it comes to assessing what technology training is relevant. Agbo (2015) reinforced the idea that development or selection of pedagogically-relevant training must involve a symbiotic relationship between the teachers and leaders of any school. With the foundation of previous research (Vannatta & Fordham, 2004) emphasizing the importance of technology training, and the data in this research modern Christian and Public K-12 educators must realize the positive relationship between the integration of technology into the learning environment and technology related training. With

consideration for motivation and potential limitations of this study, technology-related training could be the most effective component of a technology program.

Limitations

This study relied upon the use of an Internet-based survey tool that used the self-report method to collect data from the participants without experimental modification of their environment. While the self-report method was essential for this study, it is important to note its limitations. Self-report data relies on the careful design of the survey tool and the honesty of study participants to record accurate data.

During the study approval process, an invitation to participate in the study was sent out in error, before Institutional Review Board (IRB) approval had been given. When the error was discovered, 45 participants had taken part in the study survey. In correction, survey access was immediately closed, and all participants data before IRB approval was not used in this study. Once IRB approval was obtained, the survey was re-opened, and proper invitations were sent. While this error was mitigated, the impact it may have had on the total number of participants in the study is unclear.

Recommendations for Future Research

This study did highlight several areas that justify future research to better understand the topic of technology integration in education. Two areas presented themselves in a relationship found in the data of this study and areas that would benefit from further examination.

Technology Training

Further study is recommended that investigates the effects of pedagogically relevant training on teachers in an active technology program. Such data would provide insight into more details regarding the effects of technology training on the integration of technology into the

learning environment. The Christian K-12 environment would benefit from such research based on their schools.

Openness to Change

Participants in this study with higher hours of technology training seemed to have lower scores in openness to change. While the differences were not significant, the potential for future research in this area would test if a teacher who engages in more technology related training is open to technological change, and how that effects openness to general environmental change. Further data in this area would provide valuable insight for educational leaders in the planning and implementation of technology programs.

Teacher Motivation

An area of interest that may further explain the factor of why teachers do or do not adopt technology could be an area of further study that would complete this research. The research data in this study found a positive correlation between the predictor variables and overall use of technology in the classroom. This correlation suggests that overall use of technology increases when teachers are open to change, spend additional time beyond the contractual work week, and receive technology related training. Correlation only suggests a relationship but does not examine the reason that relationship may occur. Further qualitative study in this area could expand the area of knowledge to help explain why this correlation occurs.

This area of study may present significant differences in motivation between the public and Christian K-12 environments. Study in this area would be important to note to what degree the Christian belief and practice affects teacher motivations when considering the integration of technology into the learning environment.

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APPENDICES

Appendix A – Institutional Review Board (IRB) Approval

IRB, IRB | Spetter, Troy; Lunde, Rebecca M (Doctor of Education); Matthews, Geoffrey A (School of Education); IRB, IRB | 3 | 3/9/2

IRB Exemption 3147.030918: The Prediction of Technology Integration in the Christian K12 Classroom Based on Openness to Change, Technology Traini...

Spetter_3147Exemption_03_18.pdf 46 KB | Change in Protocol_Template.docx 99 KB | Spetter_3147StampedConsent.pdf 146 KB

Dear Troy Eugene Spetter,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under exemption category 46.101(b)(2), which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:101(b):

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
 (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Please retain this letter for your records. Also, if you are conducting research as part of the requirements for a master's thesis or doctoral dissertation, this approval letter should be included as an appendix to your completed thesis or dissertation.

Your IRB-approved, stamped consent form is also attached. This form should be copied and used to gain the consent of your research participants. If you plan to provide your consent information electronically, the contents of the attached consent document should be made available without alteration.




Please note that this exemption only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued exemption status. You may report these changes by submitting a change in protocol form or a new application to the IRB and referencing the above IRB Exemption number.

If you have any questions about this exemption or need assistance in determining whether possible changes to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,

G. Michele Baker, MA, CIP
Administrative Chair of Institutional Research
 The Graduate School

LIBERTY
 UNIVERSITY.
Liberty University | Training Champions for Christ since 1971

 Reply  Reply All  Forward



Fri 3/16/2018 3:48 PM

IRB, IRB

IRB Change in Protocol Approval: IRB Exemption 3147.030918: The Prediction of Technology Integration in the Christian K12 Classroom Based on Openness to Change, Technology Training, and Work Beyond the Contractual Work Week

To: Spetter, Troy

CC: Lunde, Rebecca M (Doctor of Education); IRB, IRB

 You forwarded this message on 3/16/2018 5:37 PM.

Good Afternoon Troy,

This email is to inform you that your request to utilize a single email that contains your survey link to contact school administrators that they can then forward to their teachers has been approved. Thank you for submitting your revised permission request document for our review and documentation.

Thank you for complying with the IRB's requirements for making changes to your approved study. Please do not hesitate to contact us with any questions.

We wish you well as you continue with your research.

Best,

G. Michele Baker, MA, CIP
Administrative Chair of Institutional Research
The Graduate School

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UNIVERSITY

Liberty University | Training Champions for Christ since 1971

Appendix B – Association of Christian Schools International (ACSI) Approval



Headquarters
Phone 719.528.6906 | Fax 719.531.0631 | www.acsi.org
731 Chapel Hills Drive, Colorado Springs CO, 80920

March 8, 2018

Liberty University
Institutional Review Board
1971 University Blvd.
Lynchburg, VA 24515

Re: ACSI Graduate Student Research Proposal for Troy Spetter

We received Troy Spetter's application for conducting his doctoral research through ACSI on December 15, 2017. We have conditionally approved his research application; however, our research protocol requires all students to submit a signed copy of their Institutional Review Board (IRB) application prior to final approval.

All approved dissertation research projects must be conducted through ACSI communication channels, i.e. securing the appropriate sample list and all communications to member schools.

Please let us know if you have any questions, or if you wish to discuss this further.

Thank you,

SHERI TESAR, MA
Research Coordinator | ACSI

Association of Christian Schools International
731 Chapel Hills Dr., Colorado Springs, CO 80920
Office: 719.867.5267 | Fax: 719.531.0716
ACSI.org

Appendix C – School Leaders Letter/Email

[Insert Date]

[Recipient]

[Title]

[Company]

[Address 1]

[Address 2]

[Address 3]

Dear [School Leader]

As a graduate student in the School of Education at Liberty University, I am conducting research as part of the requirements for a Doctorate in Educational Leadership. The purpose of my research is to better predict the integration of technology into the Christian K-12 classroom by examining teacher's openness to change, technology training and work beyond the contractual work week. I am writing to request permission for your teachers to participate in my study.

Teachers who work at least a half time schedule, and are willing to participate, will be asked to complete an online survey about their habits and preferences. It should take approximately 15 to 20 minutes for your teachers to complete the survey. Their participation will be completely anonymous, and no personal, identifying information will be collected.

Should you agree please send your teachers this survey link <https://www.surveymonkey.com/r/TeacherAttributeSurvey>, to allow them to complete the survey online. On the website teachers will be asked to consent to participate and complete the survey. The survey can be completed on computers or mobile devices for their convenience.

A consent document is provided as the first page they will see after clicking on the survey link. The consent document contains detailed information about my research. Teachers simply select the consent box at the bottom of the page to continue to the survey questions.

Sincerely,

Troy E. Spetter
tspetter@liberty.edu
Doctoral Candidate
Liberty University

Appendix D – Participant Informed Consent

The Liberty University Institutional
Review Board has approved
this document for use from
3/9/2018 to --
Protocol # 3147.030918

CONSENT FORM

THE PREDICTION OF TECHNOLOGY INTEGRATION IN THE CHRISTIAN K12 CLASSROOM BASED ON OPENNESS TO CHANGE, TECHNOLOGY TRAINING, AND WORK BEYOND THE CONTRACTUAL WORK WEEK

Troy Eugene Spetter
Liberty University
School of Education

You are invited to be in a research study on technology integration in the Christian K-12 classroom. You were selected as a possible participant because you are an adult teacher serving at least a half-time schedule in an ACSI accredited K-12 school. Please read this form and ask any questions you may have before agreeing to be in the study.

Troy E. Spetter, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Background Information: The purpose of this study is to better understand in-service training, teacher attitudes, and commitment, and if those attributes affect the prediction of a teachers' overall use of technology in the Christian K-12 classroom.

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

1. Complete the Teacher Attribute Survey. This 71-item survey should take approximately 15-20 minutes to complete and is anonymous.

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

Benefits: Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society include the potential for an improvement of meaningful classroom technology integration and pedagogical in-service teacher training. This study may provide information for school administrators to make critical decisions regarding budget, training, and technology more aligned with results.

Compensation: Participants will not be compensated for participating in this study.

Confidentiality: The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records.

- Data collected in this study has been carefully designed not to collect any information that can be used to identify individual participants or their individual schools.
- During data collection, a secured online account will be used to store participant responses and data. Only the researcher and research faculty advisor will have access to the data account. Any data downloaded for use will be kept by the researcher on a

The Liberty University Institutional
Review Board has approved
this document for use from
3/9/2018 to --
Protocol # 3147.030918

secured, password protected computer system. Data will be stored in an encrypted, password protected removable drive, in a locked desk drawer or cabinet when not in use. Information from this study may be used in future presentations or studies. Per federal regulations, data must be retained for three years upon completion of the study.

Voluntary Nature of the Study: Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University, the Association of Christian Schools International, or your current school. If you decide to participate, you are free to not answer any questions or withdraw at any time prior to submitting the survey without affecting those relationships.

How to Withdraw from the Study: If you choose to withdraw from the study, please exit the survey and close your internet browser. Your responses will not be recorded or included in the study.

Contacts and Questions: The researcher conducting this study is Troy E. Spetter. You may ask him any questions you have now. If you have questions later, you are encouraged to contact him at tspetter@liberty.edu. You may also contact the researcher's faculty advisor, Dr. Rebecca Lunde, at rmfitch@liberty.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 1887, Lynchburg, VA 24515 or email at irb@liberty.edu.

Please notify the researcher if you would like a copy of this information for your records.

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

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS IRB APPROVAL INFORMATION WITH CURRENT DATES HAS BEEN ADDED TO THIS DOCUMENT.)

[Consent Button Here]

Appendix E – Survey Monkey Example

Teacher Attribute Survey

Consent Form

THE PREDICTION OF TECHNOLOGY INTEGRATION IN THE CHRISTIAN K12 CLASSROOM BASED ON OPENNESS TO CHANGE, TECHNOLOGY TRAINING, AND WORK BEYOND THE CONTRACTUAL WORK WEEK

Troy Eugene Spetter

Liberty University
School of Education

You are invited to be in a research study on technology integration in the Christian K-12 classroom. You were selected as a possible participant because you are an adult teacher serving at least a half time schedule, in an ACSI accredited K-12 school. Please read this form and ask any questions you may have before agreeing to be in the study.

Troy E. Spetter, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Background Information: The purpose of this study is to better understand, in-service training, teacher attitudes and commitment, and if those attributes affect the prediction of a teachers' overall use of technology in the Christian K-12 classroom.

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

1. Identify your region. You will be asked to respond to a one question link that will identify the accreditation region you are participating from for sample purposes only
2. Complete the Teacher Attribute Survey. This 71-item survey should take approximately 15-20 mins to complete.

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

Benefits:

Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society include the potential for an improvement of meaningful classroom technology integration and pedagogical in-service teacher training. This study may provide proven information for school administrators to make critical decisions regarding, budget, training and technology more aligned with results.

Compensation: Participants will not be compensated for participating in this study.

Confidentiality: The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records.

- Data collected in this study has been carefully designed not to collect any information that can be used to identify individual participants or their individual schools. When completing the study each participant is assigned a number that is used to record responses that does not contain any personally identifiable information.
- During data collection a secured online account will be used to store participant responses and data. Only the researcher and research faculty adviser will have access to the data account. Any data downloaded for use will be kept by the researcher on a secured, password protected computer system. Data will be stored in an encrypted, password protected removable drive, in a locked desk drawer or cabinet when not in use. Information from this study may be used in future presentations or studies. Per federal regulations, data must be retained for three years upon completion of the study.

Voluntary Nature of the Study: Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University, the Association of Christian Schools International, or your current school. If you decide to participate, you are free to not answer any questions or withdraw at any time prior to submitting the survey without affecting those relationships.

How to Withdraw from the Study:

If you choose to withdraw from the study, please exit the survey and close your internet browser. Your responses will not be recorded or included in the study.

Contacts and Questions: The researcher conducting this study is Troy E. Spetter. You may ask him any questions you have now. If you have questions later, **you are encouraged** to contact him at tspetter@liberty.edu. You may also contact the researcher's faculty advisor, Dr. Rebecca Lunde, at rmfitch@liberty.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 1887, Lynchburg, VA 24515 or email at irb@liberty.edu.

The Liberty University Institutional Review Board has approved this document for use from 3/9/2018 to -- Protocol # 3147.030918

Please notify the researcher if you would like a copy of this information for your records.

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

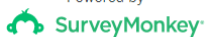
(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS IRB APPROVAL INFORMATION WITH CURRENT DATES HAS BEEN ADDED TO THIS DOCUMENT.)

I consent to participate in this survey

Agree

Next

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Appendix F – Teacher Attribute Survey (TAS)

The first three questions are not part of the original TAS survey. They are added to the study solely to qualify the participants for the study and identify the participants region. Each state in the United States is assigned a value of one through six based on its U.S. Department of Education accreditation region.

Are you a teacher working at least a half time (or more) schedule? Yes <input type="checkbox"/> No <input type="checkbox"/>
Do you work in an ACSI accredited K-12 school? Yes <input type="checkbox"/> No <input type="checkbox"/>
To identify your region, please select the state you are teaching in Choose an item.

Teacher Attribute Survey							
Part A: Indicate how much you disagree or agree with the following statements by circling the appropriate number to the right of each statement.							
1. Strongly Disagree (SD)							
2. Moderately Disagree (MD)							
3. Slightly Disagree (SLD)							
4. Slightly Agree (SLA)							
5. Moderately Agree (MA)							
6. Strongly Agree (SA)							
	SD	MD	SLD	SLA	MA	SA	
1. When a student does better than usual, many times it is because I exerted a little extra effort.	1	2	3	4	5	6	
2. If one of my students could not do a class assignment, I would be able to accurately assess whether the assignment was at the correct difficulty.	1	2	3	4	5	6	
3. If parents would do more with their children, I could do more.	1	2	3	4	5	6	
4. If students are not disciplined at home, they aren't likely to accept any discipline.	1	2	3	4	5	6	
5. If a student masters a new concept quickly, it is probably because I know the necessary	1	2	3	4	5	6	

steps in teaching that concept.							
6. If a student did not remember the information I gave in the previous lesson, I would know how to increase his/her retention in the next lesson.	1	2	3	4	5	6	
7. The influence of a student's home experience can be overcome by good teaching.	1	2	3	4	5	6	
8. The amount that a student can learn is primarily related to family background.	1	2	3	4	5	6	
9. When I really try, I can get through to the most difficult students.	1	2	3	4	5	6	
10. Even a teacher with good teaching abilities may not reach many students.	1	2	3	4	5	6	
11. A teacher is very limited in what he/she can achieve because a student's home environment is a large influence on his/her achievement.	1	2	3	4	5	6	
12. The hours in my class have little influence on students compared to the influence of their home environment.	1	2	3	4	5	6	
13. If a student in my class becomes disruptive and noisy, I feel assured that I know some techniques to redirect him/her quickly.	1	2	3	4	5	6	
14. When a student gets a better grade than he/she usually gets, it is probably because I found better ways of teaching that student.	1	2	3	4	5	6	
15. When a student is having difficulty with an assignment, I am usually able to adjust to his/her level.	1	2	3	4	5	6	
16. When the grades of my students improve it is usually because I found more effective teaching approaches.	1	2	3	4	5	6	
17. Students are not ready for "meaningful" learning until they have acquired basic reading and math skills.	1	2	3	4	5	6	
18. Students projects often result in students learning all sorts of wrong "knowledge."	1	2	3	4	5	6	
19. Students will take more initiative to learn when they feel free to move around the room during class.	1	2	3	4	5	6	
20. Instructions should be built around problems with clear, correct answers, and around ideas that most students can grasp quickly.	1	2	3	4	5	6	
21. A quiet classroom is generally needed for effective learning.	1	2	3	4	5	6	
22. It is better when the teacher – not the students	1	2	3	4	5	6	

– decide what activities are to be done.							
23. Homework is a good setting for having students answer questions posed in their textbooks.	1	2	3	4	5	6	
24. Students should help establish criteria on which their work will be assessed.	1	2	3	4	5	6	
25. How much students learn depends in how much background knowledge they have – that is why the teaching of facts is so necessary.	1	2	3	4	5	6	
26. When exploring new instructional methods, I try to find ones that require little change.	1	2	3	4	5	6	
27. I am comfortable trying new things even when I will probably make mistakes.	1	2	3	4	5	6	
28. The instructional methods that I currently implement need little revision.	1	2	3	4	5	6	
29. I feel excited when I try new instructional techniques.	1	2	3	4	5	6	
30. I don't mind making mistakes since I can learn from them.	1	2	3	4	5	6	
31. I would continue to complete graduate courses even if they were not required for on-going licensure OR rewarded with salary increase.	1	2	3	4	5	6	

Part B: For each of the following pairs of statements, check the box that best shows how closely your own beliefs are to each of the statements in the give pair. The closer your beliefs to a particular statement, the closer the box you check. Please check only one box for each pair.

32. “I mainly see my role as a facilitator. I try to provide opportunities and resources for my students to discover or construct concepts for themselves.”	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	“That’s all nice, but students really won’t learn the subject unless you go over the material in a structured way. It’s my job to explain, to show students how to do the work, and to assign specific practice.”
33. “The most important part of instruction is the content of the curriculum. That content is the community’s judgement about what children need to be able to know and do.”	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	“The most important part of instruction in that it encourages ‘sense-making’ or thinking among students. Content is secondary.”
34. “It is useful for students to become familiar with many different ideas and skills even if their understanding, for	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	“It is better for students to master a few complex ideas and skills well, and to learn what deep understanding is

now, is limited. Later, in college, perhaps, they will learn these things in more detail.”						all about, even if the breadth of their knowledge is limited until they are older.”
35. “It is critical for students to become interested in doing academic work – interest and effort are more important than the particular subject matter they are working on.”	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	“While student motivation is certainly useful, it should not drive what students study. It is more important that students learn the history, science, math and language skills in their textbooks.”
36. “It is a good idea to have all sorts of activities going on in the classroom. Some students might produce a scene from a play they read. Others might create a miniature version of the set. It’s hard to get the logistics right, but the successes are so much more important than the failures.”	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	“It is more practical to give the whole class the same assignment, one that has clear directions, and one that can be done in short intervals that match students’ attention spans and the daily class schedule.”

Part C: Teacher Technology Use.

Indicate the frequency that you used the following tools/applications in your instruction during this last semester. Examples of teacher use are: teacher demonstration, use of tool/application during lecture presentation, etc.

- 1 = None
 2 = Rarely (once or twice per semester)
 3 = Moderate (several times per semester)
 4 = High (almost weekly per semester)

	None	Rarely	Moderate	High
37. Computer with Projection system	1	2	3	4
38. Digital camera, Camcorder	1	2	3	4
39. Scanner	1	2	3	4
40. Content-specific tools (e.g., digital microscope, graphing calculator)	1	2	3	4
41. Word Processing	1	2	3	4
42. Database	1	2	3	4
43. Spreadsheet	1	2	3	4
44. Drawing/Graphics Programs (e.g., Photoshop, AutoCAD)	1	2	3	4
45. Content-specific software (e.g., Inspiration, Accelerated Reader,	1	2	3	4

Timeliner)				
46. Presentation software (PowerPoint, AppleWorks Slideshow)	1	2	3	4
47. Multimedia (e.g., HyperStudio, KidPix, iMovie, Adobe Premier)	1	2	3	4
48. E-mail/Discussion Groups/Listserve	1	2	3	4
49. Internet (Web searches)	1	2	3	4
50. Class Web Site (communicate with students and/or parents)	1	2	3	4
51. Others, please list:	1	2	3	4
Listed Items from question 51:				

Part D: Student Technology Use.

For the following tools/applications indicate the frequency of student use (demonstration, presentation) in your classes during this last semester.

- 1 = None
 2 = Rarely (once or twice per semester)
 3 = Moderate (several times per semester)
 4 = High (almost weekly per semester)

	None	Rarely	Moderate	High
52. Computer with Projection system	1	2	3	4
53. Digital camera, Camcorder	1	2	3	4
54. Scanner	1	2	3	4
55. Content-specific tools (e.g., digital microscope, graphing calculator)	1	2	3	4
56. Word Processing	1	2	3	4
57. Database	1	2	3	4
58. Spreadsheet	1	2	3	4
59. Drawing/Graphics Programs (e.g., Photoshop, AutoCAD)	1	2	3	4
60. Content-specific software (e.g., Inspiration, Accelerated Reader, Timeliner)	1	2	3	4
61. Presentation software (PowerPoint, AppleWorks Slideshow)	1	2	3	4
62. Multimedia (e.g., HyperStudio, KidPix, iMovie, Adobe Premier)	1	2	3	4
63. E-mail/Discussion Groups/Listserve	1	2	3	4
64. Internet (Web searches)	1	2	3	4
65. Class Web Site (communicate with	1	2	3	4

students and/or parents)				
66. Others, please list:	1	2	3	4
Listed Items from question 66:				

Part E: Background						
67. In the last two years, I have completed (# of actual) hours of professional development . Note: One (1) graduate credit is equivalent to 15 hours of contact time.						#
68. In the last two years, I have completed (# of actual) hours of training related to technology . Note: One (1) graduate credit is equivalent to 15 hours of contact time.						#
69. For an average work week, how many hours do you work beyond the “contractual” teacher work week in order to adequately fulfill your teaching responsibilities?						
	<input type="checkbox"/> none	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-10	<input type="checkbox"/> 11-15	<input type="checkbox"/> 16-20	<input type="checkbox"/> 21 or more
70. Gender?					<input type="checkbox"/> Male	<input type="checkbox"/> Female
71. Number of years teaching?						#

Appendix G – TAS Permission

Spetter, Troy

From: Nancy Williams Fordham <nfordha@bgsu.edu>
Sent: Wednesday, March 15, 2017 1:24 PM
To: Spetter, Troy; Dr Rachel Vannatta Reinhart
Subject: Re: Study Instrument Question

I am fine with sharing the instrument.

~Nancy

Nancy Fordham, Ph. D.
 Associate Professor of Education
 Asst. Dean for Teacher Education;
 edTPA Coordinator

525 Education Bldg.
 BGSU
 Bowling Green, OH 43403
 419-372-9819

From: Spetter, Troy <tspetter@liberty.edu>
Sent: Wednesday, March 15, 2017 10:41:35 AM
To: Dr Rachel Vannatta Reinhart
Cc: Nancy Williams Fordham
Subject: Study Instrument Question

Dr. Reinhart and Dr. Fordham,

I am a doctoral student with Liberty University and I live in Weston Ohio just near BGSU. I am starting work on my dissertation project and I will be attempting to measure teachers attitude toward technology. Your work:

"Teacher Dispositions as Predictors of Classroom Technology Use"

Discusses an instrument that was used to measure similar attitudes. I would like to know if you would be willing to share the instrument for the study I am working on? I am in Virginia today working. If possible I would like to have a response as soon as you can.

Thank you

Troy Spetter
 Liberty University
 tspetter@liberty.edu
 troy@steward-design.com
 Mobile:(770)714-1260

Spetter, Troy

From: Dr Rachel Vannatta Reinhart <rvanna@bgsu.edu>
Sent: Monday, November 6, 2017 9:37 AM
To: Spetter, Troy
Subject: RE: Teacher Attribute Survey

Sure. Rachel

Rachel Vannatta Reinhart, Ph.D.
Professor, Assessment, Research & Statistics
School of Education Foundations, Leadership & Policy
Bowling Green State University
Education 556
Bowling Green, OH 43403

419-372-0451 (office)
419-378-1870 (cell)

From: Spetter, Troy [mailto:tspetter@liberty.edu]
Sent: Saturday, November 04, 2017 4:44 PM
To: Dr Rachel Vannatta Reinhart
Subject: Teacher Attribute Survey

Dr. Reinhart,

Thank you for the quick response on permission to the use the table from your study. In addition, and to clarify back in August you gave me permission to use the TAS in a new study for my dissertation project. I would like to know if you will allow me to include the TAS in the appendices of my study? I want to be sure on this, and thank you again.

Troy Spetter
Liberty University Student ID #L23493538
tspetter@liberty.edu
troy@steward-design.com
Mobile:(770)714-1260

Appendix H – Table 1 Reproduction Permission

Spetter, Troy

From: Dr Rachel Vannatta Reinhart <rvanna@bgsu.edu>
Sent: Monday, October 30, 2017 6:31 PM
To: Spetter, Troy
Cc: Nancy Williams Fordham
Subject: Re: Teacher Attribute Survey (TAS) 2004

You have our permission.

Rachel Vannatta Reinhart, Ph.D.
Professor; Assessment, Statistics & Research
School of Educational Foundations, Leadership & Policy
Bowling Green State University

Sent from my iPad

On Oct 30, 2017, at 2:06 PM, Spetter, Troy <tspetter@liberty.edu> wrote:

Good Afternoon,

We communicated back in August of this year regarding your providing me permission to use your developed Teacher Attribute Survey (TAS) in a study for my own dissertation project with Liberty University. In the process of writing I find myself in need of asking your permission to reproduce a table used in your study publication that outlines the validation scores for each section of the TAS. In this email is a screen capture of the table in a draft form of my dissertation proposal. If you approve of the tables use in this manor please respond so I may include your permission in my documentation. Thank you

Table 1

Teacher Attribute Survey Validation (Vannatta, & Fordham, 2004)

Variable	Definition	Items	Scale	Cronbach
Teacher Self-Efficacy	Beliefs of ability to affect student performance	1-16	1-6	0.7287
Teacher Philosophy 1	Teacher-centered vs. Student-centered	17-25	1-6	0.6102
Teacher Philosophy 2	Constructivist vs. Traditionalist	32-36	1-5	0.6914
Openness to Change	Willingness to take risks and learn from mistakes	26-30	1-6	0.6919
Teacher Use of Tech	Frequency of instructor use of a variety of technology tools and applications in the classroom	37-51	1-4	0.8516
Student use of Tech	Frequency of student use of a variety of technology tools and applications in the classroom	52-66	1-4	0.7966
Overall Use of Tech	Frequency of instructor and student use of a variety of technology tools and applications in the classroom	37-66	1-4	0.8878
Continue Grad Course Without Salary Incentive	Willingness to take graduate courses if no salary incentive was provided	31	1-6	
Professional Development	# of actual hours in the past two years	67	open	
Technology Training	# of actual hours in the past two years	68	open	
# Hours Beyond Work Week	# of hours, one typically works beyond the contractual work week to prepare for teaching	69	1-6	
Gender	Male (1) or Female (2)	70	1-2	
# of Years Teaching		71	open	

Troy Spetter
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