A COMPARATIVE STUDY OF NOVICE AND EXPERIENCED TEACHERS' SELF-EFFICACY TOWARD TECHNOLOGY INTEGRATION AND LEVEL OF TECHNOLOGY INTEGRATION IN THE CLASSROOM

by

Tonya Renee Coffey

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements of for the Degree

Doctor of Education

Liberty University

2021

A COMPARATIVE STUDY OF NOVICE AND EXPERIENCED TEACHERS' SELF-EFFICACY TOWARD TECHNOLOGY INTEGRATION AND LEVEL OF TECHNOLOGY INTEGRATION IN THE CLASSROOM

by Tonya Renee Coffey

A Dissertation Presented in Partial Fulfillment

Of the Requirements of for the Degree

Doctor of Education

Liberty University, Lynchburg, VA

2021

APPROVED BY:

Committee Chair, Joanne Gilbreath, Ed.D.

Committee Member, D.J. Mattson, Ed.D.

ABSTRACT

This study investigated novice and experienced teachers' self-efficacy toward technology integration and level of technology integration in the classroom. The purpose of this study was to determine if there is a difference between novice and experienced teachers' self-efficacy toward technology integration and technology integration. A quantitative, nonexperimental casual-comparative study was performed. The sample included a convenience sample of 100 K-12 teachers in two rural Virginia school districts. The teachers were surveyed in January 2021 using the Teachers' Integration of Self-Efficacy Scale (TISS) and the Teacher Technology Integration Survey (TTIS). The data was analyzed using a *t*-test. The *t*-test analysis process included multiple assumptions. The assumption of normality was tested using a histogram. A Kolmogorov-Smirnov test was conducted to test the assumption of normality. The assumption of equal variance tested using Levene's Test of Equality of Error Variance. Following analysis for outliers, sample assumption testing, and the independent means analysis, Cohen's D was used to capture effect size. The study determined that there was not statistically significant relationship between novice and experienced teacher's self-efficacy toward technology integration and technology integration. Future research that involve novice and experienced technology self-efficacy and level of technology integration include: (a) replicating this studying in other Virginia school districts, (b) replicating this study in other states, (c) extending the study to include quality of technology integration, (d) extending the study to include pre-service teachers and (e) conducting a similar study that looked at the skills, knowledge, attributes, behaviors, and experience to integrate technology meaningfully and purposefully into instruction.

Keywords: novice, experienced, teachers, technology integration, self-efficacy

Dedication

This dissertation is dedicated to my husband, Chris, and my daughter, Jade for their constant support to throughout this journey.

TABLE OF CONTENTS

List of Tables

List of Figures

List of Abbreviations

Chinese Digital Native Assessment Scale (C-DNAS)

Collaborative Professional development (CPD)

Digital Natives Assessment Scale (DNAS)

Information and Communication Technologies (ICT)

Institutional Review Board (IRB)

International Society for Technology in Education (ISTE)

Leading Education by Advancing Digital (LEAD)

National Council for Accreditation of Teacher Education (NCATE)

National Educational Technology Standards (NETS)

Ohio State Teacher Efficacy Scale (OSTTES)

Professional Development (PD)

Student-Centered Learning (SCL)

Substitution, Augmentation, Modification, Redefinition (SAMR)

Teacher Technology Integration Survey (TTIS)

Teachers' Integration of Self-Efficacy Scale (TISS)

Technology Acceptance Model (TAM)

Technology Integration Matrix (TIM)

Technological Pedagogical Content Knowledge (TPACK)

CHAPTER ONE: INTRODUCTION

Overview

Integrating technology into teaching and learning is one of the greatest challenges that face teachers today (Kent, & Giles, 2017). According to Oliver and Shapiro (1993), teachers' self-efficacy beliefs have been found to be useful indicators of one's ability to successfully integrate technology. This chapter presents an overview of the study, including background information, statement of the problem, the significance of the study, and the research questions. This study investigated novice and experienced teachers' self-efficacy toward technology integration and level of technology integration in the classroom.

Background

Integrating technology continues to remain a challenge for many teachers. Integrating technology is a goal many strive for; however, some still struggle to overcome the numerous technological barriers that they face each day (Ertmer, 1999; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Francom, 2016; Harper & Milman, 2016; Levin & Schrum, 2013; Thoma, Hutchison, Johnson, Johnson, & Stromer, 2017). Although teachers are aware of the importance of integrating technology into instruction, they are confronted with many barriers in their pursuit of integration. Ertmer (1999) described these barriers as first and second order barriers. First order barriers are external to teachers and include lack of time to plan, lack of software and hardware, and inadequate support and/or training. Without adequate access to resources, teachers are limited to how and when technology integration occurs in their classrooms. Second order barriers are internal and include knowledge and skills on how to use, evaluate, and teach with technology (Ertmer, 1999). Overcoming second order barriers requires a change in beliefs and practices. Research has shown that both first and second order barriers need to be addressed before teachers have the skills, knowledge, resources, and the belief that they are capable of successfully integrating technology into their classroom (Ertmer, 1999; Francom, 2016; Harper & Milman, 2016; Levin & Schrum, 2013; Thoma, Hutchison, Johnson, Johnson, & Stromer, 2017).

The literature identified that self-efficacy or one's belief in their ability to achieve one's goals continues to hinder technology integration (Kim, Kim, Lee, Spector, & DeMeestter, 2013). Bandura (1997) defines self-efficacy as one's belief in how successful he/she can perform a certain task. Wang, Ertmer, and Newby (2004) found that although self-efficacy beliefs do not automatically translate into actual technology use by teachers, it is a necessary condition for technology integration. By building and supporting teachers' self-efficacy belief toward technology integration, meaningful and purposeful technology use can become the norm, rather than the exception (Wang et al., 2004).

Problem Statement

From the time the first personal computers surfaced almost half a century ago, information and communication technologies (ICT) have strongly influenced many aspects of our society, particularly education (Liu, Ritzhaupt, Dawson, & Barron, 2017). Federal and state governments have invested significant amounts of money in educational technology in the last four decades. However, the results of this technology integration in K-12 school settings have been mixed (Lim, Zhao, Tondeur, Chai, & Chin-Chung, 2013). There have been many success stories to show that when used properly, technology can and does lead to enhanced teaching and learning outcomes (Harper & Milman, 2016; Lim et al., 2013). However, oftentimes, technology is used infrequently and sporadically, used in limited ways due to curricular constraints, or used progressively less as initiatives are not supported over time (Lim et al., 2013).

Okojie and Okojie (2006) describes technology integration "as a process of using existing tools, equipment, and materials, including the use of electronic media, for the purpose of enhancing learning" (p, 67). According to Kolb (2017), "technology integration is much more complex than simply using a technology tool; pedagogical and instructional strategies around the tool are essential for successful learning outcomes" (p. 10). Research continuously supports that teachers play a significant role in technology integration process (Ertmer, 2005; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Kolb, 2017). Yet, integrating technology remains a challenge for most teachers (Kent & Giles, 2017; Kiili, Kauppinen, Coiro, & Utriainen, 2016; Kwon, Ottenbreit-Leftwich, Sari, Khlaif, Zhu, Nadir, & Gok, 2019). Research has provided substantial evidence that there are many barriers to successful technology integration (Ertmer, 1999; Francom, 2016; Harper & Milman, 2016; Levin & Schrum, 2013; Thoma, Hutchison, Johnson, Johnson, & Stromer, 2017).

Schools continue to provide teachers with many different instructional technologies for the classroom. However, teachers still express concern that they do not know how to integrate these instructional technologies into the classroom (Francom, 2016; Hickson, 2017; Li, Worch, Zhou, & Aguiton, 2015). In the past 20 years, education has seen an increase of younger teachers entering the field (Kini & Podolsky, 2016; Ladd & Sorensen, 2017). Many of these novice teachers are considered digital native - a concept introduced by Prensky (2001) to refer to individuals that are native speakers of the digital language of computers, mobile phones, video gaming, and the Internet.

Research has shown that these novice teachers experience rapid gains in effectiveness early in their teaching careers (Kini & Podolsky, 2016; Kraft & Papay, 2014; Ladd & Sorensen, 2017; Papay & Kraft, 2015; Rice, 2010). To encapsulate this rapid gain, understanding their beliefs toward technology integration is critical. The problem is that the literature has not fully addressed novice teachers' self-efficacy toward technology integration. Additional training, professional development, and support that focuses on technology integration may increase the effectiveness of these novice teachers, as such, increase student achievement outcomes.

Purpose Statement

The purpose of this quantitative, nonexperimental casual-comparative study was to test Bandura's (1977) self-efficacy theory by examining and determining if there is a difference between the number of years teaching and teachers' self-efficacy toward technology integration and to determine the level of technology integration in the classroom of 100 certified K-12 teachers in two rural Virginia school districts. Participants of the study were asked to complete an online survey to determine their level of self-efficacy toward technology integration and their level of technology integration in the classroom.

In Research Question One, the independent variable is number of years teaching and is defined as individual variables for teaching experience for each of the years 1-12, with the higher experience levels grouped into bins (Ladd & Sorenson, 2017). Novice teachers are categorized as 0-5 years of teaching, and experienced teachers are categorized as teaching more than six years. The dependent variable is teacher's self-efficacy toward technology integration defined as one's belief about his/her ability to integrate technology into the classroom (Enochs, Riggs, & Ellis, 1993). In Research Question Two, the independent variable is number of years teaching (novice teachers 0-5 years of teaching, experienced teachers more than six), and the dependent variable is technology integration defined as the use of technology for teaching and support of student learning (Peeraer & Van Petegem, 2012).

Significance of the Study

In 2001, Prensky introduced the term "digital natives" to refer to individuals born after 1980 and are competent users of technologies. He argued that there is a cultural divide between digital native children and digital immigrant teachers. This divide can pose significant problems and should be addressed when training future teachers (Ekiaka, Feng, & Reyna, 2014). These "digital natives" are now adults, some of whom comprise the new generation of early career teachers (novices, less than five years of teaching) (Orlando & Attard, 2016). The level of technology integration in any classroom is ultimately decided by the teacher (Han, Shin, & Ko, 2017). Technology self-efficacy has come to play a crucial role in the preparation and implementation of educators who can successfully use educational technology to enhance learning (Han et al., 2017). In conducting this study, the goal was to gain information about the differences between novice and experienced teachers' self-efficacy toward technology integration and level of technology integration of novice and experienced teachers and its effects on teachers' pedagogical practices.

Research Questions

The study addresses the following questions:

RQ1: Is there a difference in technology integration self-efficacy between novice and experienced teachers?

RQ2: Is there a difference in the level of technology integration between novice and experienced teachers?

Definitions

Key terms used in the study are defined below:

1. *Digital Native* – those that grew up with technology, comfortable with multitasking, reliant on graphics to communicate, and thrive on instant gratification (Teo, 2013).

2. *Novice Teacher* – teachers in their first three to five years of their teaching careers (Kraft & Papay, 2014).
3. *Self-efficacy* – personal beliefs about one's ability to learn or perform activities at desired levels (Hsu, 2016).
4. *Technology Integration* – the use of hardware, software, and the Internet in the classroom for enhancing learning (Hsu, 2016).
5. *Technology Self-efficacy* – personal beliefs about what one is capable of doing with technology in the classroom as opposed to the knowledge they possess (Hsu, 2016).

Summary

The problem of integrating technology into teaching and learning is not a new issue among school divisions. Integrating technology in the classroom still poses many challenges for teachers. Although access to technology has increased over the years, other barriers remain in place, specifically teachers' beliefs about their ability to integrate technology into their instruction. This study investigated novice and experienced teacher's self-efficacy beliefs toward technology integration and their level of technology integration in the classroom. Findings from this study may enhance understanding of how novice and experienced teachers feel about how they currently integrate technology. This information in turn will provide insight on how best to provide guidance, support, and assistant in removing any barriers that teachers face in their attempts to integrate technology meaningfully and purposefully in their classroom.

CHAPTER TWO: LITERATURE REVIEW

Overview

Many challenges continue to face today's teachers when it comes to purposefully and intentionally integrating technology into teaching and learning. According to Oliver and Shapiro (1993), teachers' self-efficacy beliefs have been found to be useful indicators of one's ability to successfully integrate technology. After a thorough review of the research to identify studies that explore novice teachers' self-efficacy toward technology integration and level of technology integration, the literature to date, is limited. This chapter will provide an overview of the existing literature pertaining to the study. The first section will discuss Bandura's Social Cognitive (1991) and Self-Efficacy Theory (1977, 1997). The second section will synthesize recent literature pertaining to educational technology, self-efficacy, teaching experience, and digital natives. Finally, a summary of the literature will be provided identifying a gap in the literature. This gap will be the focused area of need for this study.

Theoretical Framework

Developed over 50 years ago by Albert Bandura, Social Cognitive Theory proposed that people do not simply respond to environmental influences, but are contributors to their own motivation, behavior, and development or what it truly means to be human; in other words, what Bandura calls the quality of human agency (Betz, 2008). There are four functions through which human agency is exercised: intentionality, forethought, self-reactiveness, and self-reflectiveness. Intentionality is the process of goal setting, forethought is the anticipation of goals, self-reactiveness is the ability to monitor and modify one's behavior to reach their goals, and self-reflectiveness is the ability to self-observe and self-examines one's journey to their goal and requires changes in behavior based on their self-observations (Betz, 2008). All four components are interrelated and have an effect on goal attainment and motivation.

Among the types of agency that affect action, none is more pervasive than self-efficacy. Self-efficacy is the foundation for human agency. Bandura (1977) defines self-efficacy as one's beliefs about his/her capabilities; it is not objective, but subjective on what one feels that he/she can accomplish. Higher levels of self-efficacy may lead to "approach" rather than "avoidance" behavior (Betz, 2008). Self-efficacy is domain specific, meaning a high self-efficacy in one area, does not mean high efficacy in another area (Kwon et al., 2019). Bandura's Theory of Self-efficacy identifies four sources of efficacy information that may lead to the development of efficacy expectations and can be used to increase them: mastery experiences, vicarious experiences, verbal and social persuasion, and physiological and affective state (Betz, 2008).

The concept of self-efficacy expectations is now widely used in educational research to examine teacher's beliefs, which includes their belief about technology integration (Abbitt & Klett, 2007; Hsu, 2016; Ken & Giles, 2017; Kiili et al., 2016; Kwon et al., 2019; Wang et al., 2004). Although knowledge of technology is necessary, it is not enough; teachers also need to feel confident in their ability to use that knowledge to support student learning (Ertmer & Ottenbreit-Leftwich, 2010). According to Ertmer and Ottenbreit-Leftwich (2010), this seems to be particularly true for novice teachers. Several studies have shown that self-efficacy plays an important role in technology use in the classroom (Bauer & Kenton, 2005; Piper, 2003; Wozney, 2006). Based on findings from these studies, it is suggested that time and effort should be devoted to increasing teachers' self-efficacy for using technology. To ensure that this occurs, preservice and in-service teachers need ample learning experiences with technology that are successful (e.g., mastery experience, vicarious experience, persuasion).

Related Literature

Technology Integration

Educational technology has been around since the 1920s (Delgado et al., 2015). Educators at that time used film and radios in their classrooms for teaching and learning (Delgado et al., 2015). It was not until the 1980s and 1990s that computers were used to teach students (Delgado et al., 2015). Since that time, technology integration has been an important topic in education. Thousands of articles have been published, many of those studies have focused on eliminating barriers to technology integration in the classroom (Ertmer, 1999; Ertmer et al., 2012; Francom, 2016; Harper & Milman, 2016; Kopcha, 2012; Levin & Schrum, 2013; Thoma et al., 2017). In addition to articles, several conceptual models and matrices have been created to assist educators with integrating technology into their classrooms. Integrating technology is a goal many teachers strive for; however, few teachers actually achieve integrating technology with purpose and intention due to the numerous barriers they encounter (Ertmer et al., 2012). By providing novice and experienced teachers the necessary tools, skills, support, and knowledge to eliminate barriers to technology integration, educational technology would be more widely used to enhance learning and teaching for all.

Technology Integration Frameworks. The complex and dynamic nature of educational technology complicates the already challenging task of teaching with technology (Hamilton et al., 2016). In an effort to guide educators in their quest to integrate technology purposefully and meaningfully into their instruction, researchers have developed several standards, frameworks, models, and theories (Hamilton et al., 2016). The purpose of these resources is to inform research and practice around integrating technology into teaching and learning (Hamilton et al., 2016). Several frameworks are evident in the literature (Aldosemani, 2019). Among the most frequently referenced technology integration models are The Technological Pedagogical Content Knowledge (TPACK), the Substitution, Augmentation Modification, Redefinition (SAMR), the Technology Integration Matrix (TIM), and the Technology Acceptance Model (TAM) (Aldosemani, 2019; Scherer et al., 2019).

The Technological Pedagogical Content Knowledge (TPACK) framework has become an effective model for evaluating teachers' level of technology integration proficiency in their classrooms (Aldosemani, 2019; Joo et al., 2018; Martin, 2018; Voithofer et al., 2019). Joo et al. (2018) defined TPACK as "a theoretical framework for describing and understanding the interaction and integration of technology, pedagogy, and content knowledge needed to successfully integrate technology use into teaching" (p. 49). The purpose of the TPACK framework is to maintain the interconnectedness between the three key content areas of teacher education – content, pedagogy, and technology when planning for technology integration (Harvey & Caro, 2017). TPACK describes the use of technology to support specific pedagogies with a particular content area, the use of technology as an instructional technique, and the use of technology to help teachers improve student learning (Joo et al., 2018). The integration of all three areas produces TPACK. According to Joo et al. (2018), teachers that develop TPACK proficiencies are more confident in their ability to select and use technology in a meaningful and purposeful manner.

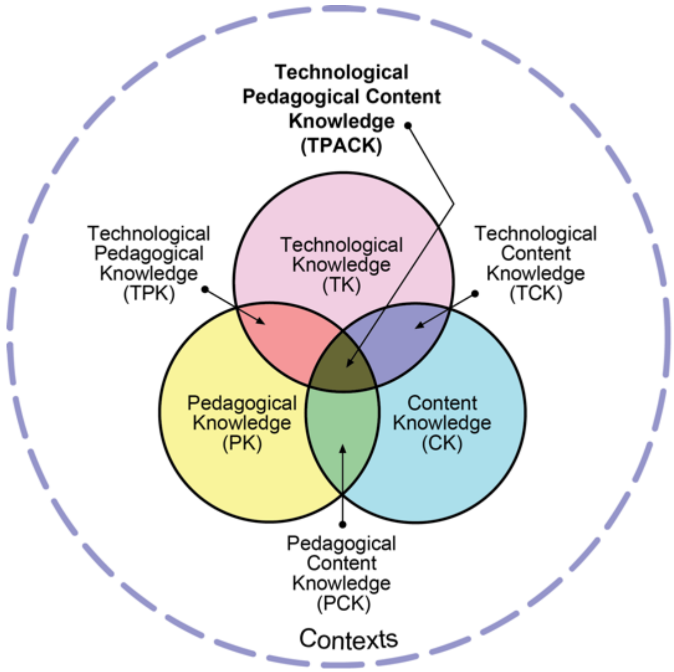


Figure 1. Graphic representation of technological pedagogical content knowledge (TPACK). Reprinted from *Using the TPACK Image*, 2011, Retrieved May 21, 2020, from tpack.org. Copyright 2011 by Koehler. Reprinted with permission.

The Substitution, Augmentation, Modification, and Redefinition (SAMR) provides a framework for teachers to enhance technology integration in their classrooms (Aldosemani, 2019). SAMR is a four-level model used for selecting, using, and evaluating technology in K-12 settings (Hamilton et al., 2016). Learning activities that fall within the substitution and augment levels are considered to enhance learning and learning activities that fall within modification redefinition are said to transform learning. Gaining popularity in late 2012, the SAMR model provides teachers with a roadmap to gradually enhance their instruction with technology and their teaching and learning classroom strategies (Aldosemani, 2019). However, despite its increasing popularity, very limited theoretical explanations of the SAMR model are found in peer-reviewed literature (Hamilton et al., 2016).

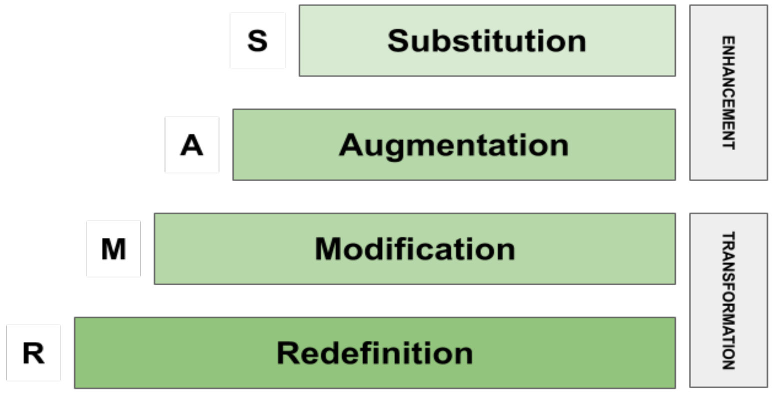
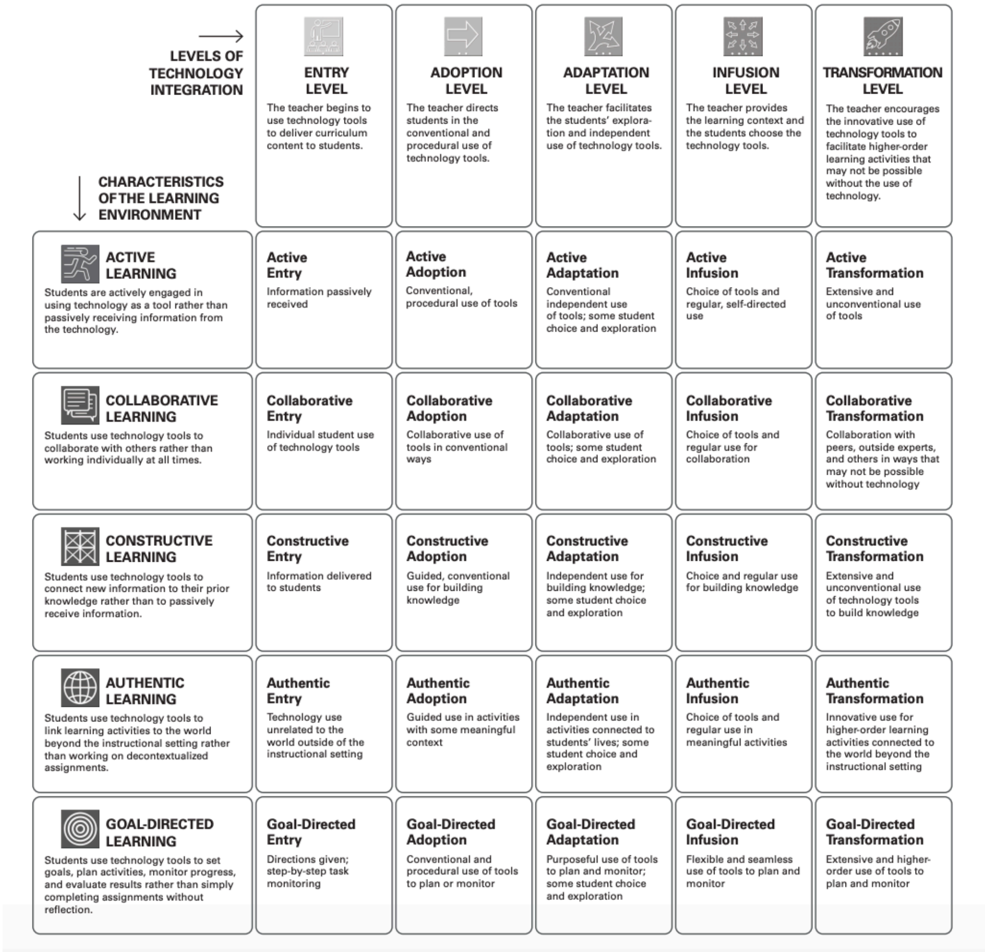


Figure 2. Graphic representation of the Substitution, Augmentation, Modification, and Redefinition (SAMR) framework created by Dr. Ruben Puentedura.

Created in 2006, the Technology Integration Matrices (TIM) is a framework for describing and targeting the use of technology to enhance learning (Welsh, Harmes, & Winkelman, 2011). TIM assesses teachers' levels of technology integration toward transformation teaching (Aldosemani, 2019). TIM begins at the entry level and moves through adoption, adaptation, infusion, and transformation. The TIM model matrix involves 25 interactive cells and five levels of technology integration.



LEVELS OF TECHNOLOGY INTEGRATION → / CHARACTERISTICS OF THE LEARNING ENVIRONMENT ↓	ENTRY LEVEL The teacher begins to use technology tools to deliver curriculum content to students.	ADOPTION LEVEL The teacher directs students in the conventional and procedural use of technology tools.	ADAPTATION LEVEL The teacher facilitates the students' exploration and independent use of technology tools.	INFUSION LEVEL The teacher provides the learning context and the students choose the technology tools.	TRANSFORMATION LEVEL The teacher encourages the innovative use of technology tools to facilitate higher-order learning activities that may not be possible without the use of technology.
ACTIVE LEARNING Students are actively engaged in using technology as a tool rather than passively receiving information from the technology.	**Active Entry** Information passively received	**Active Adoption** Conventional, procedural use of tools	**Active Adaptation** Conventional independent use of tools; some student choice and exploration	**Active Infusion** Choice of tools and regular, self-directed use	**Active Transformation** Extensive and unconventional use of tools
COLLABORATIVE LEARNING Students use technology tools to collaborate with others rather than working individually at all times.	**Collaborative Entry** Individual student use of technology tools	**Collaborative Adoption** Collaborative use of tools in conventional ways	**Collaborative Adaptation** Collaborative use of tools; some student choice and exploration	**Collaborative Infusion** Choice of tools and regular use for collaboration	**Collaborative Transformation** Collaboration with peers, outside experts, and others in ways that may not be possible without technology
CONSTRUCTIVE LEARNING Students use technology tools to connect new information to their prior knowledge rather than to passively receive information.	**Constructive Entry** Information delivered to students	**Constructive Adoption** Guided, conventional use for building knowledge	**Constructive Adaptation** Independent use for building knowledge; some student choice and exploration	**Constructive Infusion** Choice and regular use for building knowledge	**Constructive Transformation** Extensive and unconventional use of technology tools to build knowledge
AUTHENTIC LEARNING Students use technology tools to link learning activities to the world beyond the instructional setting rather than working on decontextualized assignments.	**Authentic Entry** Technology use unrelated to the world outside of the instructional setting	**Authentic Adoption** Guided use in activities with some meaningful context	**Authentic Adaptation** Independent use in activities connected to students' lives; some student choice and exploration	**Authentic Infusion** Choice of tools and regular use in meaningful activities	**Authentic Transformation** Innovative use for higher-order learning activities connected to the world beyond the instructional setting
GOAL-DIRECTED LEARNING Students use technology tools to set goals, plan activities, monitor progress, and evaluate results rather than simply completing assignments without reflection.	**Goal-Directed Entry** Directions given; step-by-step task monitoring	**Goal-Directed Adoption** Conventional and procedural use of tools to plan or monitor	**Goal-Directed Adaptation** Purposeful use of tools to plan and monitor; some student choice and exploration	**Goal-Directed Infusion** Flexible and seamless use of tools to plan and monitor	**Goal-Directed Transformation** Extensive and higher-order use of tools to plan and monitor

Figure 3. Graphic representation of Technology Integration Matrices (TIM). Reprinted from *Technology Integration Matrix*, In Florida Center for Instruction Technology, 2019, Retrieved May 21, 2020, from https://fcit.usf.edu/matrix/wpcontent/uploads/2019/05/2019_TIM_Summary_Descriptors_Portrait_BW-US.pdf. Reprinted with permission

The Technology Acceptance Model (TAM) is utilized to understand users' adoption and use of technology. The TAM contains several variables: perceived ease of use, perceived usefulness, and attitude toward technology. Scherer (2019) provided a thorough definition of each of the core, outcome, and external variables. The perceived ease of use is defined as the degree in which people believe that using technology would be free from effort. Perceived usefulness is defined as the degree to which a person believes that using technology would enhance his or her job performance. The last core variable, attitudes toward technology, is defined as a person's subjective evaluation of technology.

The TAM also consists of two outcome variables: behavioral intention and technology use. Behavioral intention is defined as a person's intention to use technology and technology use is defined as a person's actual use of technology. The TAM consists of three external variables: subjective norm, computer self-efficacy, and facilitation conditions. Subjective norms are defined as the degree that a person feels that he or she should perform or not the behavior in question. Computer self-efficacy is defined as the degree to which a person believes that they can do a certain task using a computer. The last external variable in the TAM model is facilitating conditions. Facilitating conditions is defined as the degree to which a person believes in the resources and support for the use of technology. The two most important factors of the TAM are the perceived ease of use and perceived usefulness (Scherer, 2019). Perceived ease of use and perceived usefulness directly influence the intention to use technology (Joo et al., 2018).

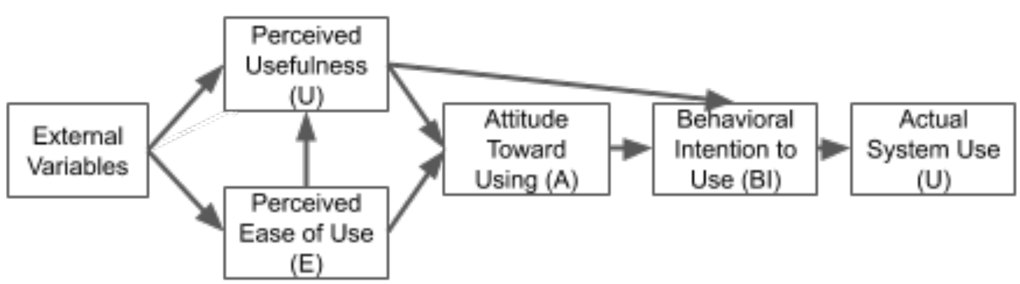


Figure 4. Graphic representation of Technology Acceptance Model (TAM) developed by Fred Davis and Richard Bagozzi.

The TPACK and SAMR framework have greater diffusion than TIM and TAM (Kimmons & Hall, 2017). TPACK is popular among educational researchers and SAMR is popular among practitioners (Kimmons & Hall, 2017). There is currently an abundance of technology integration models, frameworks, theories, and standards for stakeholders to choose from. The problem arises when deciding on which one to use. No single model exists that may be universally valuable, understandable, or useful to all shareholders (Kimmons & Hall, 2017).

Barriers to Technology Integration. Research has provided substantial evidence that there are many barriers to successful technology integration (Ertmer, 1999; Francom, 2016; Harper & Milman, 2016; Levin & Schrum, 2013; Thoma et al., 2017). Although today's teachers are aware of the importance of integrating technology into their classroom, they are often limited by both external (first-order) and internal (second-order) barriers (Ertmer, 1999). According to Kopcha (2012), there is a definitive connection between the degree to which teachers experience these barriers and their decision to use technology. These barriers must be addressed for teachers to successfully integrate technology for teaching and learning. "By arming our current and future teachers with knowledge of barriers, as well as effective strategies to overcome them, it is expected that they will be prepared to both initiate and sustain effective technology integration practice" (Ertmer, 1999, p. 59).

First-order Barriers. Ertmer (1999) referred to first-order barriers as obstacles that are external to teachers. Typically, these barriers include resources, training, and support. More recently, additional specific categories have been identified in the literature and now include technology tools and resources, technology training and support, administrative support, and time to plan and prepare for technology (Francom, 2016). Ertmer (1999) stated that "because these barriers are easy to eliminate, the majority of schools' and districts' efforts have focused on eliminating these first-order barriers with the underlying assumption that once adequate resources are obtained, technology integration will follow" (p. 50). As teachers gain more access to technological tools and resources, first-order barriers will continue to decline. This decline has increased the focus on other barriers, especially lack of time to plan and second-order barriers (Francom, 2016).

Second-order Barriers. Second-order barriers are intrinsic and include knowledge and skills of how to operate technology, to evaluate technology resources, to teach with technology, and to manage student activities with technology (Vongkulluksn et al., 2018; Xie, 2018). These barriers are harder to measure as they focus on things that inhibits or impedes fundamental change, such as personal confidence, beliefs about learning, and beliefs about the importance of technology for learning, and self-efficacy toward technology integration (Ertmer, 1999; Francom, 2016; Wang et al., 2004). Second-order barriers are also thought to cause more difficulties for teachers than first-order barriers. Ertmer (1999) noted that this may be because "second-order barriers are less tangible than first-order barriers and are more personal and deeply ingrained" (p. 51).

Even if teachers can overcome first-order barriers, second-order barriers may still affect successful technology integration in the classroom (Ertmer, 1999; Francom, 2016; Kim et al., 2013). Teachers' beliefs regarding the importance of technology integration play an important role when deciding to use technology in the classroom for instruction. The more confident teachers are in their ability to integrate technology, the more likely they will include technology into their instruction (Vongkulluksn et al., 2018). In combating second order barriers, research has shown that when teachers have a positive attitude toward technology integration, they feel more confident in taking risks and trying new technological tools for teaching and learning in their classrooms (Abbitt, 2011; Hsu, 2016; Kim et al., 2013; Lee & Lee, 2014; Vongkulluksn et at., 2018). Thus, for teachers' to effectively integrate technology into their classroom, second-order barriers to technology integration need to be identified and eliminated, especially improving teachers' self-efficacy beliefs toward technology integration (Kim et al., 2013).

Preparing Preservice Teachers for Technology Integration. The National Council for Accreditation of Teacher Education (NCATE) stipulates that accredited institutions should prepare teaching candidates to integrate technology into instruction to enhance student learning. Although technology courses have been added to teacher education programs, such courses do not necessarily prepare preservice teachers for successful technology integration in their future classrooms (Sun et al.,2017; Strobel, & Newby, 2017). Many preservice teachers are only required to take one education technology class during their teacher preparation program and those courses vary considerably (Liu et al., 2015; Ottenbreit-Leftwich et al., 2018). Ottenbreeit (2018), stated that one required class may not be enough to build the internal factors (e.g., knowledge, beliefs, and attitudes) that preservice teachers need in order to support technology integration. Beginning teachers need a variety of internal and external tools to overcome the barriers to technology integration in their first few years of teaching.

Technology skills alone do not prepare preservice teachers for technology integration (Sun et al., 2017). Although most preservice teachers appear to have a basic understanding of technology, they struggle with integrating that understanding with pedagogical practice (Harvey & Caro, 2016; Liu et al., 2015; Ottenbreit, 2016). Research has shown that uniting technological, pedagogical, and content knowledge, which are the core domains in the TPACK framework better prepares preservice teachers for the meaningful and purposeful use of technology in their future classrooms (Harvey & Caro, 2016; Liu et al., 2015; Martin, 2016).

In a study completed by Harvey and Caro (2016), it was found that when preservice teachers explicitly used the TPACK framework, it gave them unique opportunities to enhance their TPACK knowledge and skills with technology integration. In a different study that examined preservice teachers and the TPACK framework, Liu et al. (2016) found that preservice teachers that were a part of a Collaborative Professional Development (CPD) that utilized the TPACK framework, benefited more than those who only had mentor teachers. Both studies contributed to the use of TPACK as a metric for measuring technology integration of preservice teachers (Harvey & Caro, 2016).

Professional Development for K-12 Technology Integration. Teachers worldwide are expected to integrate technology into their teaching and learning. However, without proper training and support, teachers do not have the skills and knowledge to use technology to enhance student learning. Technology integration professional development (PD) should be aimed at overcoming first and second order barriers that may prevent teachers from being able to fully integrate technology into their classrooms (Hutchison, & Woodward, 2018). According to Williams (2017), teachers have had varying professional development with technology integration.

Research has shown that for professional development to be effective at least five features need to be present (Desimone & Garet, 2017). In their paper, Desimone and Garet (2017) listed five features that make professional development effective: content focus, active learning, coherence, sustained duration, and collective participation. Content focus activities emphasize subject matter and how students learn that content. Active learning provides teachers opportunities to observe and receive feedback. Active learning activities are activities that are active rather than passive. Coherence activities are consistent with the school's curriculum and goals, beliefs, and needs of students. Sustained duration is activities that are ongoing throughout the school year. The last feature is collective participation. Collective participation activities allow groups of teachers to work together forming an interactive learning community.

Most technology integration professional development is provided by schools or districts. Traditional technology integration professional development consists of a one size fits all workshop. Teachers are provided a scheduled time to come and learn about the technology resource with the assumption that they will integrate into their teaching and learning. Teachers are also provided corporate training in their schools (Woodward & Hutchison, 2018). This type of professional development has not been empirically useful (Woodward & Hutchison, 2018). Quality and effective technology integration professional development remain a barrier for many school divisions across the United States (Woodward & Hutchison, 2018). Woodward and Hutchison (2018) recommend that additional research is needed regarding how best to provide teachers the support and training they need in order to integrate technology meaningfully and purposefully in their instruction.

Use of Technology in Teaching and Learning

Educational technologies are a fundamental part of K-12 education. In 2013, the Leading Education by Advancing Digital (LEAD) Commission released a five-point blueprint with recommendations to accelerate the expansion of digital learning in K-12. To accelerate the expansion of digital learning in K-12, the LEAD Commission recommended that schools' infrastructure be upgraded, and they also recommended that a national initiative be developed in order to provide a computing device for all students by 2020. The LEAD commission also asked for the adoption of digital curriculums and encouraged school divisions across the country to embrace innovation as well to create model schools. Finally, the LEAD commission recommended that an investment in human capital to train teachers must be made (LEAD, 2013).

As a result of the policies, school systems across the United States rushed to incorporate technology into teaching and learning. However, according to the LEAD Commission (2013), ensuring that schools have the necessary infrastructure in place is by far the most important first step. Schools also need to ensure that they have access to high quality educational content and access to devices. According to the LEAD commission, infrastructure, high-quality content, and devices are needed to expand digital learning to all K-12 schools across the nation to support teaching and learning.

The use of educational technology has the power to transform classrooms. Used to support both teaching and learning, educational technologies provide educators digital learning tools and learning materials to increase student engagement and motivation and expand student learning outcomes. McKnight et al. (2016) found six common digital instructional strategies and identified five roles that technology plays in enhancing K-12 teaching and learning. The multisite case study surveyed teachers' familiarity, use, and comfort with teaching as well as conducted focus groups and interviews, and also observed classrooms in seven exemplary schools across the United States (McKnight et al., 2016). According to the results of the study, the researchers found that technology improves access, enhances communication and feedback, restructures teachers' time, extends purpose and audience for student work, and shifts teacher and student roles (McKnight et al., 2016). The findings from their study indicate that the use of technology can play an important role in teaching and learning.

Improves Access. According to McKnight et al. (2016), technology improves access for teachers as well as students. Employing flipped or blended learning provides students a much wider selection of resources for them to develop a deeper and better understanding of the topic. Fisher et al. (2018) shared that a flipped classroom consists of students engaging in content via prerecorded lectures, prescribed readings, study guides, interactive videos, simulations, and cases. A common feature in a flipped classroom is digital technology. Teachers deliver content using technology and this enables teachers to provide additional opportunities for in-class discussions and other active learning. Blended learning fuses face to face with technology mediated learning (Fisher et al., 2018). Flipped and blended learning is increasingly being adopted by schools (Fisher et al., 2018).

Enhanced Communication. Technology enhances communication (McKnight et al., 2016). Utilizing digital learning tools such as email, texting, online forums, websites, online polling, and virtual classrooms provides opportunities to enhance communication and feedback between students, teachers, and parents (McKnight et al., 2016). Teachers utilize this feedback to drive their instruction. Technology also provides students with the means to communicate and collaborate with their peers (McKnight et al., 2016). Digital learning tools such as Google Docs, virtual classrooms and labs, chat rooms, file sharing, and blogs allow students to interact, engage, and support one another (McKnight et al., 2016). According to Tarun (2019), digital collaboration tools are an important aspect of 21st learning. Digital collaboration tools enable students to become more engaged with their learning without time and place constraints (Tarun, 2019). Digital learning tools that enhance communication provide ongoing, immediate, and just-in-time support, feedback, and interaction (McKnight et al., 2016).

Enhanced Efficiency. Technology enables teachers to spend more time providing feedback, one-on-one support, and coaching (McKnight et al., 2016). The time teachers spend on a variety of tasks has the potential to change when utilizing technology (McKnight et al., 2016). A good portion of teachers' time is spent on tasks such as whole-class instruction, grading, and locating missing student work (McKnight et al., 2016). McKnight et al. (2016) iterated that as technology decreases the amount of time teachers spend on such tasks as whole-class instruction and grading papers are reduced and additional time can be spent on providing more support and feedback to students increases. Digital learning tools such as learning management systems and digital grade books provide teachers a user-friendly platform to quickly accomplish these tasks.

Extends Purpose and Audience. Technology extends learning and provides an audience for students' work (McKnight et al., 2016). With the use of digital learning tools, students have access to information beyond their classroom teachers. Learning becomes active rather than passive and is guided by the learner (McKnight et al., 2016). Digital learning tools provide students ample opportunities to develop critical thinking and questioning skills (McKnight et al., 2016). Technology such as virtual learning labs and classrooms, discussion boards, online video conferencing, chat, and blogs extend learning beyond the classroom (McKnight et al., 2016). Through blogging and online work, students are more prepared because they know they have an audience that will be looking at their work (McKnight et al., 2016). McKnight et al. (2016) emphasized that technology is a tool that can support students during the learning process by providing them additional opportunities, information, resources, and audiences in which to share their work.

Shifting of Roles. Lee and Hannafin (2016) defined student-centered learning (SCL) as a learning approach in which students generate learning opportunities and/or construct knowledge in an open-ended environment. As students take more responsibility for their learning, the role of the teacher is to support and guide them through the learning process. This transformation from teacher-centered to student-centered requires a paradigm shift from both teachers and students (Lee & Hannafin, 2016). In a teacher-centered environment, teachers function as the lecturer, while students passively receive the information. In a student-centered environment, students take more control over their learning. In order to move toward a student-centered environment, both teachers and students must be supported during the transition (Lee & Hannafin, 2016). There is still debate about the effectiveness of a student-centered environment (Lee & Hannafin, 2016).

Technology supports teachers and students in student-centered environments (McKnight et al., 2016). McKnight et al. (2016) posited that the most profound use of technology is the ability to shift the environment of a classroom from teacher-centered to student-centered. In their research, McKnight et al. (2016) describe that technology decreases the reliance on teachers for knowledge and shifts the role of a teacher toward a guide for students to assist them in managing their own learning. McKnight et al. (2016) refers to this as the transformative use of technology for learning. This shift allows for teaching and learning that is more in depth and provides additional opportunities for students to be actively engaged in their learning (McKnight et al., 2016).

Guidelines and Standards for Technology Integration.

Standards exist to create consistency and accountability (Lewis, 2015). To support the integration of technology many scientific associations have produced educational technology standards. The most prominent of these associations is The International Society for Technology in Education (ISTE). Formerly knowns as the National Educational Technology Standards (NETS), the International Society for Technology standards provides a framework for the use of technology for teaching, learning, and leading (Ayad & Ajrami, 2017; DeSantis, 2016; Lewis, 2015). ISTE first developed its educational technology standards in 1998; largely due to the lack of technological competence as a necessary skill of K-12 students (Lewis, 2015). At that time, ISTE issued five types of standards; standards for administrators, standards for coaches, standards for computer science educators, standards for teachers, and standards for students (Ayad & Ajrami, 2017; DeSantis, 2016; Lewis, 2015). The ISTE standards were revised in 2008, and again in 2017.

The current ISTE standards incorporate the input from 2,200 educators and administrators around the world. The focus of the standards was to empower learning through technology (Smith, 2017). In this regard, ISTE issued seven new standards for educators with the purpose of maximizing learning for all through the use of technology (Smith, 2017). The current literature review will only focus on the educator standards. There are seven standards for educators. To ensure that educators successfully implement digital strategies to positively impact teaching and learning, each of the seven standards need to be included in the teaching and learning process; learner, leader, citizen, collaborator, designer, facilitator, and analyst (International Society for Technology, n.d.; Smith, 2017).

Smith (2017) provided a brief description of each of the seven standards. As a learner, educators need to be continually learning and exploring technology to improve student learning. As a leader, educators must seek out opportunities to lead and support students in order to improve teaching and learning. As a citizen, educators must inspire students to contribute and participate in the digital world responsibly and respectfully. As a collaborator, educators must work with both their peers and students to improve their practice. As a designer, educators must design authentic learning activities. As a facilitator, educators must facilitate learning with technology to support achievement. Finally, as an analyst, educators must be able to utilize data to drive instruction and support students.

A seven-year longitudinal study completed by Friedman et al. (2009) found that teachers and students that were familiar with the NETS standards had higher use of technology. The study also found that teachers had higher use of discipline specific technology (Friedman et al, 2009; Lewis, 2015). According to Lewis (2015), these findings support the benefit that educators and students receive when they use ISTE technology standards in the integration of technology for teaching and learning. Lewis (2015) posited that the use of the standards may enhance a teacher's curricula and better prepare preservice teachers to integrate technology in their future classrooms.

The Virginia Department of Education developed educational technology standards in 1997 for both students and instructional personnel. The standards for instructional personnel certified that teachers and other educators were able to integrate technology into teaching and learning (Virginia Department of Education, n.d.). In 1999, the General Assembly declared that all teachers must meet the educational technology standards to qualify for teacher licensure.

There are currently eight technology standards for instructional personnel; effective use of computer systems, apply knowledge and terms associated with computer and technology, use of computer productivity tools for professional use, use of technology to access and exchange information, be able to identify, locate, evaluate, and use appropriate instructional hardware and software, use of technology for data collection, be able to plan and implement lessons that integrate technology, and demonstrate knowledge of ethical and legal issues relating to technology use (Virginia Department of Education, n.d.). Each school division and higher education institution were required to incorporate the technology standards for instructional personnel and approved teacher education programs by December 1998. They were also required to develop implementation plans for preservice and in-service training. The VDOE has yet to release revised standards. There are plans for new updated standards that are aligned with the ISTE standards to be released in late 2020.

Self-Efficacy

Self-efficacy is a person's beliefs in his/her capabilities to successfully perform certain tasks. According to Bandura (2011), self-efficacy is only one factor operating in concert with many other factors of social cognitive theory and is constructed by interpreting information from four principal sources: mastery experience, vicarious experiences, verbal and social persuasion, and psychological and effective states (Kiili et al., 2016). Mastery experiences are successes in challenging situations towards a goal and are considered the most effective way to develop high self-efficacy (Odle, 2019). Vicarious experiences come from the observation of other people who succeed in their efforts towards their goal; observing others' successful performance can raise observers' self-efficacy (Killi et al., 2016). Verbal and social persuasions are the expressed positive and realistic beliefs of influential people in one's life (Odle, 2019). Positive feedback about performance may increase one's confidence in completing a task, thus increasing one's self-efficacy (Killi et al., 2016). The last of the four self-efficacy principal sources is psychological and affective states. Physiological and affective states affect what one believes in self-efficacy or how one approaches self-efficacy (Odle, 2019). Negative emotional states may lower self-efficacy such as stress and anxiety, and positive emotional states such as being in a good mood may raise self-efficacy beliefs (Killi et al., 2016). According to Odle (2019), "recognizing and improving self-efficacy can help people have confident and realistic beliefs in their abilities and potential success" (p. 1454).

Teachers' Self-Efficacy. The foundational tenets of teachers' self-efficacy fall between two theorists, Rotter's Locus of Control Theory (1966) and Bandura's Social Cognitive Theory (1977). Rotter (1966) defined teacher efficacy as a teacher's competence beliefs over the learning situation. Bandura (1997) referred to teacher self-efficacy as the belief a teacher holds about their capacity to teach that results in improved student outcomes (Lemon & Garvis, 2016). The ideas behind these theories are that teachers are able to exercise control over their actions that affect their lives (Zee & Koomen, 2016). As such, teacher self-efficacy is the motivational construct of their self-perceived level of competence as a teacher; therefore, teachers' behaviors do not change without change in beliefs (Lemon & Garvis, 2016). A teacher with high self-efficacy will choose to perform more challenging tasks, sets higher goals and commit to them, and persist longer than teachers with low self-efficacy (Lemon & Garvis, 2016). Both theories have had enormous impacts on teachers' self-efficacy.

Rotter's theory laid the groundwork for many self-efficacy studies and scales, including the first measure of teachers' self-efficacy for preservice and in-service teachers that was developed by Tschannen-Moran and Hoy (Zee & Koomen, 2016). The Ohio State Teacher Efficacy Scale (OSTES) was examined in three different studies and resulted in two forms, a long form with 24 items and a short form with 12 items that were both reliable and a valid measure of both preservice and in-service teacher self-efficacy (Tschannen-Moran & Hoy, 2001). To this day, it is the most widely used efficacy measurement scale administered to preservice teachers; within the scale, there are three subscales relating to classroom management, instruction, and engagement (Lemon & Garvis, 2016).

In another study on teacher self-efficacy, Lemon and Garvis (2016) provided valuable insight into the effects of teacher self-efficacy which linked self-efficacy to student achievement, student motivation, student attitudes toward schools and teachers, and students' own sense of efficacy. Teacher self-efficacy has also been linked to a decrease in teacher burnout, an increase in commitment to teaching, greater levels of planning and organization, and the use of a wider variety of teaching material with the desire to search for new teaching methods and to use innovative teaching methods (Lemon & Garvis, 2016). However, Zee and Koomen's (2016) study on teacher self-efficacy found that although evidence tended to corroborate that teacher self-efficacy is relevant for the quality of classroom processes, students' adjustment, and teachers' well-being, the authors shared that further theoretical and empirical research was needed to move the field forward.

Preservice Teachers' Technology Self-Efficacy. In order to integrate educational technology meaningfully and purposefully into teaching and learning, teachers and preservice teachers must have the appropriate knowledge, beliefs, and skills (Birisci & Kul, 2019). However, there are many barriers to successful technology integration (Ertmer, 1999; Francom, 2016; Harper & Milman, 2016; Levin & Schrum, 2013; Thoma et al., 2017). Birisci and Kul (2019), stated that successful integration "will not be obtained when the technology integration process is not well conceptualized or assimilated by teachers" (p. 76). As such, preparing future teachers for successful technology integration is an important element of teacher training programs (Birisci & Kul, 2019).

An early step to prepare preservice teachers for the intentional integration of technology into their teaching and learning is the addition of introductory instructional technology courses to teacher education programs (Perkmen & Pamuk, 2011). According to Perkmen and Pamuk (2011), these courses were designed to teach preservice teachers about computer programs used for teaching and learning and how best to integrate them into their instruction. However, the courses failed to help preservice teachers develop the necessary skills and knowledge to successfully integrate the technology into their classrooms (Birisci & Kul, 2019; Perkmen & Pamuk, 2011). It was also noted that the courses internal (i.e., knowledge and skills, expectations, and self-efficacy) and external (i.e., resources, training, and support) barriers played an important role in preservice teachers' ability to integrate technology into their instruction (Perkmen & Pamuk, 2011).

Preservice teachers come into their educational training programs with established beliefs about the role of educational technology for teaching and learning. These beliefs are deeply held and span from their K-12 educational lifespan (Funkhouser & Mouza, 2013). Unfortunately, many teachers did not experience a technology rich curriculum, as such, preservice teachers do not recognize the undervalue they place on educational technology (Funkhouser & Mouza, 2013). Thus, it is up to teacher education programs to create meaningful contexts that enable preservice teachers to examine their beliefs and explore the integration of technology for teaching and learning (Funkhouser & Mouza, 2013).

Previous research shows that preservice teachers' self-efficacy toward technology integration can be enhanced (Abbitt, 2011; Birisci & Kul, 2019; Funkhouser & Mouza, 2013; Han et al., 2017; Kent & Giles, 2017; Kiili et al., 2016). Abbitt (2011) found that the TPACK framework provides a valuable structure for preservice teachers to prepare learning opportunities that integrate technology. Funkhouser and Mouza (2013) found that preservice teachers enter their teacher training programs with traditional, teacher-centered beliefs about the use of technology. Funkhouser and Mouza (2013) posited that changes in beliefs can occur with practical experiences that help preservice teachers see the value of technology for teaching and learning. Teachers' beliefs are continually being shaped by their ongoing teaching experiences (Funkhouser & Mouza, 2013).

A study by Han et al. (2017) found that technology-centered student teaching experiences increased preservice teachers' self-efficacy toward technology integration. Birisci and Kul (2019) found similar results in their study. They found that a lack of teaching experience that included the integration of technology may be a barrier for preservice teachers (Birisci & Kul, 2019). The researchers suggested that gaining technology integration self-efficacy beliefs along with the TPACK competencies would overcome the lack of technology rich student teaching experience barriers (Birisci & Kul, 2019). Kent and Giles (2017) posited that successful experiences with instructional technology as a preservice teacher may lead to positive self-efficacy (Kent & Giles, 2017). This, in turn, would likely increase the probability that technology would be used as a teaching and learning tool (Kent & Giles, 2017). For preservice teachers to be fully prepared to integrate technology into their teaching and learning, they must believe that they are capable of doing so.

Technology Integration Self-Efficacy. Among the earliest studies on technology integration self-efficacy was a study completed by Enochs et al. (1993). The purpose of the study was to develop and partially validate an instrument to measure teachers' self-efficacy beliefs as they use computers for science instruction (Enochs et al., 1993). The instrument contained two subscales: personal self-efficacy and outcome expectancy. Items in the personal self-efficacy scale assessed teachers' beliefs in their ability to utilize the computer for effective instruction and items on the outcome expectancy were created to evaluate teachers' beliefs with regard to teacher responsibility for students' ability to use computers for classroom instruction (Enochs et al., 1993).

Both scales were consistent with Bandura's (1977) self-efficacy theory, which theorized that positive beliefs promote positive behavior (Enochs et al., 1993). Enoch et al. (1993) posited that teachers that have high self-efficacy toward technology integration would continually utilize technology for teaching and learning, and teachers with low self-efficacy would avoid technology in the classroom and/or have negative feelings toward technology. According to Enochs et al. (1993), through the use of both scales, a better understanding as to why some teachers resist the use of computers for teaching and learning is possible. To improve technology integration in the classroom, teachers' beliefs must be considered.

A similar study was conducted by Wang et al. (2004), this study examined the impact of vicarious learning experience and goal setting on preservice teachers' self-efficacy for technology integration. The study provided evidence that when preservice teachers were exposed to successful vicarious technology integration learning experiences with and without goal setting, they experienced significantly increased technology integration self-efficacy (Wang et al., 2004). The results suggest that teachers need support in building and enhancing their self-efficacy beliefs toward technology integration in order to be effective at integrating technology into their instruction, regardless of the number of years taught (Han, Shin, & Ko, 2017; Kent & Giles, 2017; Kiili et al., 2016; Lemon & Garvis, 2016). According to Wang et al.'s (2004) study, experience does not necessarily dictate technology self-efficacy or technology integration in the classroom.

Teachers' beliefs and values greatly influence their technology usage and technology integration in the classroom (Kimmons & Hall, 2017). According to Kimmons and Hall (2017), teachers' beliefs may have more influence on technology integration than does their technology knowledge and skills. Teachers that are able to define what makes technology integration meaningful to them on an individual level will more than likely be able to utilize technology to enhance instruction (Kimmons & Hall, 2017). Though beliefs and values may change over time Kimmons and Hall (2017) suggested that teacher experience and age do not impact their willingness to adopt new technology. Thus, understanding teacher beliefs and values is an important part of guiding and supporting them through the integration process (Kimmons & Hall, 2017).

Teaching Experience

In the late 1980s, most teachers had considerable teaching experience – 15 years of teaching or more, however, by 2008, more than one in four teachers had five or fewer years of teaching experience (Ingersoll & Merrill, 2010; Kini & Podolsky, 2016; Ladd & Sorensen, 2017). Kini and Podolsky (2016) noted that the public had mixed reviews about this “greening” of the teacher workforce. Some felt that it was of little consequence, on the other hand, some felt that effective teaching is a complex process and takes time to master. There is no doubt that teachers improve and become more effective over time (Clotfelter et al., 2007; Harris & Sass, 2011; Kini & Podolsky, 2016; Kraft & Papay, 2014; Ladd & Sorensen, 2017; Rice, 2010).

On the other hand, several studies suggest that teacher quality does not improve throughout a teacher’s career except for the first few years of teaching (Clotfelter et al., 2007; Harris & Sass, 2011; Rice, 2010; Wiswall, 2013). The changes in effectiveness of teachers over time are referred to as “return to teaching experience.” Studies on returns on teaching found that on average, teachers make rapid gains in effectiveness early in their careers, after, more modest improvements (Kini & Podolsky, 2016; Kraft & Papay, 2014; Ladd & Sorensen, 2017; Papay & Kraft, 2015; Rice, 2010). Not all teachers are equally effective, nor would anyone expect the returns on experience to be the same for all teachers in all school environments (Kini &

Podolsky, 2016). According to Kini and Podolsy (2016), the passage of time will not necessarily make all teachers better, nonetheless, for most teachers, experience increases effectiveness.

Measuring Teaching Experience. Teaching experience is typically measured as the number of years used by the state to determine a teachers' salary (Clotfelter et al., 2007; Kraft & Papay, 2014; Papay & Kraft, 2015). Novice teachers are typically defined as teachers who have not completed three years of teaching, and experienced teachers are those teachers who have completed three or more years of teaching (Melnick & Meister, 2008). In the past, researchers have adopted a plethora of methods for specifying teaching experience in their analyses; focusing on the early years only, later years were capped, using indicator variables to groups teachers into ranges of experience, and applying individual indicators by years of experience (Kini & Podolsky, 2016). Researchers who utilize the cut-off method only look at returns to experience during the first few years of a teacher's career (Kini & Podolsky, 2016). According to Kini and Podolsky (2016), "this method assumes that teachers do not improve their effectiveness after the cut-off year of experience" (p. 9). This limits the ability to infer about experience past the cut-off year due to the fact that it might conflate the effects of teacher experience through the period of time (Kini & Podolsky, 2016).

Another popular method to specifying teaching experience is the use of indicator variables that combine a wide range of experience (e.g., 1-5, 6-10, 11 and above years) or in bins (e.g., 1-2, 3-5, 6-10, > 10 years). Both methods are limited and may likely lead to severe underestimates of returns to experience (Ladd & Sorensen, 2017). A more apt method was developed by Ladd and Sorenson (2017). The researchers shared their preferred approach which includes "individual's variables for experience for each of the years 1-12, with the higher experience levels grouped into bins" (p. 14). Prior evidence from Ladd and Sorenson (2017) indicated that teachers improve at a more rapid rate during the early years, as such, using bins for the latter years than early years is preferable.

Teaching Experience and Technology Integration. In a study completed by Sahin et al. (2016), the researchers surveyed 553 Mathematics and English teachers in grades 6-12 from 30 schools in the southwest, United States. This study evaluated the relationship between the number of years taught and the number of tech devices teachers had and their comfort level for technology use for instruction. This was the first year these schools had access to laptops for teachers and students. The researchers wanted to compare if the number of years teaching, and the number of technological tools had an effect on teachers' comfort of teaching with technology. The researchers found that number of years teaching was not related to teachers' comfort of teaching with technology ($r = .003$). Sahin et al. (2016) also found that the number of technological devices that each teacher had access to was significantly correlated with their comfort level of teaching with technology ($r = .110$, $p = .012$). These results are similar to the results in the study conducted by Lin et al. (2016). In Lin et al.'s (2016) study, the researchers found that both gender and teaching experience had negative influences on classroom technology integration.

Sahin et al. (2016) speculated that the reason the number of years teaching did not correlate with the comfort level of technology integration was due to teachers with more years of teaching experience possibly being resistant to change. Thus, teachers with additional teaching experience may be more unwilling to try new technology tools and resources or learn new ways of teaching using technology. The researchers stated that "although teachers' experience is an important variable in teachers' teaching and students' learning, it may not be a positive contributor when it comes to technology integration in education" (Sahin et al., 2016, p. 372).

On the other hand, a study completed by O'bannon and Thomas (2014), focused on age rather than experience and its relationship between the type of mobile phones teachers owned, their support for the use of phones in their classrooms, their perception of the benefits of using phones for schoolwork, and their perceptions of instructional barriers regarding mobile phones in the classroom. A 50-item survey was developed to gather data on the types of phones teachers owned, their support of using mobile phones in the classroom, their mobile phone usage, their perceptions of useful mobile phone features, and barriers to mobile phones in the classroom (O'bannon & Thomas, 2014).

A convenience sample of teachers (N =7,486) from 12 school systems in two states produced 1,095 (14%) self-reported surveys. The results indicated that the age of teachers does matter. According to O'bannon and Thomas (2014), there was no significant difference in the finding for teachers who were less than 32 and 33-49, however, the results did indicate that teachers over 50 were less likely to own, use, or support the use of mobile phones for instruction. The results of this study indicate that the age of teachers does matter when it comes to technology integration. One reason for this may be the growing number of digital natives entering the classroom as teachers (O'bannon & Thomas, 2014).

Digital Native

Almost two decades ago, Marc Prensky introduced the term “digital native” to refer to students that were competent users of technologies such as computers, mobile phones, video gaming devices, and the Internet. Prensky (2001) argued that people born in or after 1980, are digital natives in which they have grown up in a technology-rich environment and process information differently from their predecessors and those who were born before 1980. Those who were born before digital technology tools were available for instructional use in K-12 classrooms are considered digital immigrants. Based on his assumptions, Prensky (2001) believed that digital natives have different preferences in learning, tools, and ways of learning. According to Prensky (2001), digital natives prefer social learning, multitasking, and the use of technology for learning. Another distinction among digital natives according to Prensky (2001) is that they use information in a way that no longer fits within the traditional classroom, thus, pedagogies at that time needed to change to meet the rapidly shifting student population (Helsper & Eynon, 2010).

Prensky (2001) posited that the defining characteristics of a digital native are that they grew up with technology; they were surrounded by technology; they interacted with technology daily; and technology became an intrinsic way of life (Teo, 2016). Prensky (2001) also claimed that digital natives preferred to multitask, especially media multitasking, the act of using one or move devices at a time and they preferred visual over text based. Lastly, Prensky (2001) asserted that digital natives expected immediate gratification for their efforts. According to Yurdakul (2018), a digital native can be summarized as followed:

> reaching a series of new technologies; carrying out multiple tasks and processes simultaneously; using technologies with ease; using the Internet as their primary source of information; accessing information quickly through multiple media sources; and using the Internet for learning as well as more general activities (p. 268).

In 2013, Teo postulated that digital natives share more than just their age, he believed that they also shared similar attributes and experiences when it comes to how they interact with technology, information, one another, and other people and institutions. Drawing on past studies and Prensky's (2001) original study, Teo (2013, 2016) developed a framework to describe digital natives using a list of behaviors. Digital natives grew up with technology, they are comfortable with multitasking, they are reliant on graphics for communication, and they thrive on instant gratifications and rewards. Based on these behaviors, Teo (2013) created and tested the Digital Natives Assessment Scale (DNAS). The DNAS was developed to measure students' perception of the degree to which they are digital natives (Teo, 2013). The four-factor scale consisted of 21-items using a 7-point Likert scale and was validated with a total of 1018 students from three secondary schools.

In 2016, Teo conducted a study to validate a Chinese translation of the Digital Native Assessment Scale (C-DNAS). Participants of this study consisted of 402 university students in China. The results indicated that the C-DNAS supported the four-factor multidimensional construct that Leo previously developed. Interestingly, the study revealed that digital natives are not necessarily more technologically proficient (Teo, 2016). Nonetheless, the study did show that there was a significant difference in computer experience; participants who reported longer use of technology gave higher scores in the C-DNAS indicating that computer experience influenced the extent to which the participants were digital natives (Teo, 2016). Teo (2016) iterated that given the dynamics of technology, it is assumed that it will continue to evolve and change over time, thus, how technology is utilized will change too.

Given the aforementioned description of digital natives, it is reasonable to regard current pre-service teachers and novice teachers as digital natives. Yurdakul (2018) conducted a study to build a model that would predict the relationship between Technological Pedagogical Content Knowledge (TPACK) competencies and digital nativity. TPACK is a framework created to assess technology integration practices. Participants of the study included 1493 Turkish preservice teachers.

Two instruments were utilized to collect data: A TPACK scale and a Turkish adaptation of the DNAS scale. The study provided evidence that preservice teachers considered themselves as having ability in both digital nativity and TPACK competency, most importantly, the study found that digital nativity was a predictor of TPACK competency. However, other studies suggest that digital native pre-service teachers are not as comfortable with technology integration (Li et al., 2015). Since digital natives have now entered into teaching, additional studies are needed to determine if they have the necessary skills, knowledge, attributes, behaviors, and experience to integrate technology meaningfully and purposefully into their instruction.

Summary

Technology continues to remain a challenge for many teachers. As society has become more digitized, the demand for technological component teachers has increased (Instefjord & Munthe, 2017). Integrating technology is a goal that many teachers strive for, however, some still struggle to overcome the numerous technological barriers that they face each day. Research has shown that these first and second order barriers need to be addressed before teachers have the skills, knowledge, resources, and the belief that they are capable of successfully integrating technology into their classroom. Previous literature identified that self-efficacy or one’s belief in their ability to achieve one’s goals continues to hinder technology integration. Wang et al. (2004), found that although self-efficacy beliefs do not automatically translate into actual technology use by teachers, it is a necessary condition for technology integration. A gap in the literature was found due to no study being conducted that investigated novice teachers’ self-efficacy toward technology integration and the level of technology integration in the classroom. This lack of literature creates a need to fill in the research gaps that exist between technology integration self-efficacy and the level of technology integration in the novice teachers' classrooms.

CHAPTER THREE: METHODS

Overview

The level of technology integration in any classroom is ultimately decided by the teacher (Insook, Won, & Yujung, 2017). Research indicates that technology self-efficacy plays a crucial role in the preparation and implementation of educators who can successfully use educational technology to enhance learning (Insook et al., 2017). Due to limited research that examines teachers' self-efficacy toward technology integration and the number of years taught, this study investigated if there was a difference in novice and experienced teachers' self-efficacy toward technology integration. In addition to assessing self-efficacy toward technology integration, the study also sought to measure novice and experienced teachers' technology integration within the classroom. This quantitative, nonexperimental casual-comparative design study was conducted using a convenience sample of certified K-12 classroom teachers within two rural Virginia school districts. Due to the fact that the researcher works for one of the districts a convenience sample is the preferred population. After the approval was granted from the Institutional Review Board (IRB), the authors of both instruments, and the district, teachers were asked to participate in one survey. The survey was an attempt to determine if there is any statistically significant relationship between novice and experienced teachers' self-efficacy toward technology integration and level of technology integration in the classroom.

Design

This research study employed a quantitative causal-comparative design. The rationale for using this design is that it explores the possible causes or consequences of differences that already exist between groups (Rovai, Baker & Ponton, 2013). There is no random assignment of participants to the groups and individuals are selected because they belong to a specific population (Rovai et al., 2013). In a quantitative causal-comparative design, the researcher seeks to determine if there is a difference between the independent variable and dependent variable after an action or event has occurred (Rovai et al., 2013).

Warner (2013) indicated that nonexperimental studies typically have weak validity, that is, merely observing that two variables are correlated is not a sufficient basis for causal inferences. Furthermore, when a researcher finds a strong correlation between X and Y variables in a nonexperimental study, the researcher typically cannot rule out rival explanation (Warner, 2013). Warner (2013) posited that "the problem with nonexperimental research design is that any potential independent variable is usually correlated or confounded with other possible independent variables; therefore, it is not possible to determine which, if any, of the variables have a causal impact of the dependent variable" (p. 19).

Teaching experience is the independent variable for both research questions. According to Ladd and Sorenson (2017), the preferred approach for measuring teaching experience includes individual variables for experience for each of the years 1-12, with the higher experience levels grouped into bins. Prior evidence from Ladd and Sorenson (2017) indicated that teachers improve at a more rapid rate during the early years, as such, using bins for the latter years than early years is the preferred approach. Researchers typically define novice teachers as teachers in their first- and second year of teaching (Gatbonton, 2008). For this study, any teacher with 0-5 years of teaching experience is considered a novice, and 6 and up years of teaching experience is considered experienced (Clotfelter et al., 2007; Kraft & Papay, 2014; Melnick & Meister, 2008; Papay & Kraft, 2015). In Research Question One, the dependent variable is teacher's self-efficacy toward technology integration as defined as one's beliefs about his/her ability to integrate technology into the classroom (Enochs, Riggs, & Ellis, 1993). In Research Question

Two, the dependent variable is technology integration defined as the use of technology for teaching and support of student learning (Peeraer & Van Petegem, 2012).

Research Questions

RQ1: Is there a difference in technology integration self-efficacy between novice and experienced teachers?

RQ2: Is there a difference in the level of technology integration between novice and experienced teachers?

Hypotheses

The null hypotheses for this study are:

$H_0$1: There is no statistically significant difference in the level of technology integration self-efficacy between novice and experienced teachers as measured by the Teachers' Integration of Self-Efficacy Scale (TISS).

$H_0$2: There is no statistically significant difference in the level of technology integration between novice and experienced teachers as measured by the Teacher Technology Integration Survey (TTIS).

Participants and Setting

The participants for the study were drawn from a convenience sample of K-12 teachers located in two rural central Virginia school districts during the spring semester of the 2020-2021 school year. While this is a convenience method of sampling, it does pose a major risk in generalizability. Utilizing a convenience sample limits the potential generalizability of the results; results might not be representative of the target population (Warner, 2013). Gall et al. (2007) stated that if a convenience sample is utilized in a study, the researchers and readers of their report must infer a population to which the results might generalize. Researchers can assist the inference by providing a careful description of the sample.

The first school district is composed of a student population that is 49% free and reduced lunch. There are nine elementary schools within the district, four middle schools, and five high schools. The county in which the study will take place is home to 75,500 people. The demographics of the county are reported as white (93.3%), Black or African American (4.4%), Asian (0.2%), Hispanics or Latino (2.7%), and two or more races (1.4%) (U.S. Census Bureau, 2019).

The second school district has 15 elementary schools, four middle schools, and four high schools. The county in which the study will take place is home to 81,948 people. The demographics of the county are reported as white (94.5%), Black or African American (2.4%), Asian (0.9%), Hispanics or Latino (7.3%), and two or more races (1.6%) (U.S. Census Bureau, 2020).

The convenience sample included 182 K-12 teachers, novice teachers (n = 50), and experienced teachers (n = 132). A random sample was completed to select 50 experienced teachers. Equal groups of novice and experienced teachers were used for data analysis. This meets the minimum required sample size of 100 participates for a medium effect at the 0.05 alpha with a statistical power of 0.7. The sample will consist of all schools in two rural Virginia school districts that serve around 20,000 students.

Demographic data was also collected.

Table 1 lists the descriptive statistics for the gender of the participants in the study.

Table 1

Gender

	N	%
male	16	16.0%
female	84	84.0%

Table 2 lists the descriptive statistics for the age of the participants in the study.

Table 2

Age

	N	%
18-24	15	15.0%
25-34	36	36.0%
35-44	13	13.0%
45-54	25	25.0%
55-64	10	10.0%
65 and older	1	1.0%

Table 3 lists the descriptive statistics for the grades taught of the participants in the study.

Table 3

Grades taught

	N	%
K-2	19	19.0%
3-5	25	25.0%
6-8	19	19.0%
9-12	37	37.0%

The sample population will remain anonymous, no identifiers of the participants will be collected. In addition to the demographic questions, teachers were asked to rate their self-efficacy toward technology integration using the TISS and measure their level of technology integration using the TTIS. An email with a link to a Google form was sent to each building administrator to be forwarded to all K-12 classroom teachers. The survey did not take longer than 30 minutes to complete and submit. Due to low turnout for novice teachers' participation, an incentive of two $10 coffee gift cards was given to encourage additional novice teachers to participate.

Instrumentation

For the purpose of this study, two surveys were utilized; Teachers' Integration of Self-Efficacy Scale (TISS) and the for a total of 82 questions, five of which will be demographic questions and Teacher Technology Integration Survey (TTIS),

Teachers' Integration of Self-Efficacy Scale (TISS)

The TISS is valid (Wang, 2004) and reliable (Wang, 2004). To determine if vicarious learning experiences and goal setting influences preservice teachers' self-efficacy for integrating technology into the classroom, Wang, Ertmer, and Newby (2004) developed a 21-item, Likert survey. This survey was later reduced to 16 positively worded statements regarding participant's confidence for technology use. Participants in the Wang et al. (2004) study responded to a survey regarding their perceptions of the value of preservice computer experience to their professional preparation. Results from the 133 education graduates indicated that observing other teachers using computers with students was one of the most important factors that influence their feeling toward computer integration (Wang et al., 2004).

Internal consistency of the TISS was evaluated using a Cronbach's alpha coefficient with values of .94 and .96 calculated for the pre-survey and post-survey, respectively (Wang et al., 2004). Construct validity is primarily empirical in nature (Wang et al., 2004). This instrument has been used in numerous studies to measure teacher's perceptions of their ability to integrate technology into instruction (Abbitt, 2011; Abbitt & Klett, 2007; Lee & Lee, 2014).

The purpose of this instrument is to measure classroom teachers' technology integration self-efficacy. Technology integration has been defined in a variety of ways over the years (Liu, Ritzhaupt, Dawson, & Barron, 2017). According to Liu et al. (2017), some definitions involved a distinction between whether the technology is used to support traditional instructional practices or innovative practices not possible with technology, however, Wang et al. (2004) chose to define technology integration as:

> "using computers to support students as they construct their own knowledge through the completion of authentic, meaningful task (e.g., student working on research projects, obtaining information from the Internet, student using application software to create student products, such as composing music, development multimedia presentation.)" (p. 245).

Technology integration self-efficacy is defined as one's beliefs about his/her ability to integrate technology into instruction for student learning.

The participants were required to use a Likert scale to determine their beliefs about technology use, the role technology plays, the way he/she organizes technology-based activities, and the way students are assessed. Participants rated each item on a 5-point Likert scale (5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2= Disagree, 1 = Strongly Disagree). Higher scores on the TISS scale indicate that the teacher has a higher perceived sense of self-efficacy toward the integration of technology into their teaching.

The TISS was used to return an overall self-reported technology integration self-efficacy for each teacher. The TISS score was calculated by adding the numeric value for each response, such as one for strongly disagree up to five for strongly agree. The total number score will be then divided by that total number of responses for each group, thus providing an overall average score ranging from one to five, whereas the higher the TISS score, the higher the level for technology integration self-efficacy. The combined possible scores on the TISS range from 16 to 80 points, and a score of 80 points is the highest mean; thus, the teacher is perceived to have a high level of technology integration self-efficacy.

Teacher Technology Integration Survey (TTIS)

The TTIS is valid (Vannatta & Banister, 2009) and reliable (Vannatta & Banister, 2009). Technology integration is much more complex than just using technology in the classroom. According to Bebbel et al. (2004), to measure technology integration a multi-dimensional approach must be used. In an attempt to measure teachers' technology integration Vannatta and Banister (2008) created the Teacher Technology Integration Survey (TTIS) (see Appendix F). This instrument was developed to measure technology integration through a holistic approach, which encompasses risk-taking behaviors and comfort of technology; perceived benefits of using classroom technology; beliefs and behaviors about classroom technology use; technology support and access; teacher technology uses for administrative, communication, and instructional purposes; and facilitation of student technology use. The survey consists of 61 items and takes about 15 minutes to complete. With the use of this survey, technology integration in the classroom can be measured, and supporting perceptions, beliefs, behaviors that are present or lacking among teachers when it comes to technology integration can be determined (Vannatta & Banister, 2008).

The TTIS consists of eight factors which include ten subscale scores (eight subscales along with two overall scales for teacher and student use); Risk-taking Behaviors and Comfort with Technology, Perceived Benefits of Technology Use, Beliefs and Behaviors about Classroom Technology Use, Technology Support and Access, Teacher Administrative and Instructional Technology Use, Teacher Communication Use, Student General Use, Student Specific Use. The range of subscales means along with moderate correlations among the subscales support the use of multiple scales in measuring technology integration (Vannatta & Banister, 2008). Content validity was evaluated by an expert panel of five educators; the panel examined items with respect to: content, instrument, language, and readability (Vannatta & Banister, 2008). A correlation matrix was constructed to examine the Pearson correlation coefficient among the subscales; all relationships were positive and produced low to strong correction (Vannatta & Banister, 2008).

Internal reliability was evaluated by calculating Cronbach's alpha for the overall score and for each generated factor. The overall reliability is .8950. Reliability for each generated factor ranged from .4760 to .9140 with most of the subscales above .70. Reliability for Risk-taking Behaviors and Comfort with technology was (α = .8540), Perceived Benefits in using Technology in the classroom was (α = .8490), Beliefs and Behaviors about Classroom

Technology Use was (α = .8790), Technology Support and Access was (α = .6600), Administrative and Instructional Use (α = .7350), Communication Use (α = .4760), General Student Use (α = .9140), and Student use of Specific Software was (α = .5750). According to Vannatta and Banister (2008), the content of each item was valid and remained important with respect to technology integration. Factor analysis confirmed that the six subscales are reliable (Vannatta & Banister, 2008). As such, this instrument has been used in numerous studies to measure teachers' technology integration (Cho & Littenberg-Tobias, 2016; Lambert, Cioc, Cioc, & Sandt, 2018; Messina, & Tabone, 2013).

The participants were required to use a Likert scale to determine risk-taking behaviors and comfort with technology, perceived benefits in using technology in the classroom, and beliefs and behaviors about classroom technology use. Participants rated each item on a 4-point Likert scale (4 = Strongly Agree, 3 = Agree, 2 = Disagree, 1 = Strongly Disagree). A higher score indicates a teacher's beliefs and behaviors are favorable to risk-taking, comfort with technology, perceived benefits of technology in the classroom. Access and availability were measured using the following scale: 1 = Not available/present in my building; 2 = Available but not accessible; 3 = Available but have limited access; 4 = Available and have easy access, a higher score indicates a teacher has access and availability of technology for classroom use (Vannatta & Banister, 2008). The overall score of teacher technology was calculated as the average of items 30-42.

Procedures

The researcher sought permission to use the appropriate instrument for the study (see Appendix B, C, D, E) and contact the districts for approval. Once approval was granted from both school districts, the authors of both instruments and the Institutional Review Board (IRB), school administrators in both divisions were contacted via email to request participation in the blind study. Prior to administering the TISS and the TTIS, a consent form was prepared instructing the participants of the intent of the study (Appendix I). Each participating school building administrator was asked to forward an email to each of their classroom teachers that contained a request for participation in the blind study, a consent form, and the link to the survey indicating under no circumstance will anyone, but the researcher will have their answers and no individual data will be reported back to the school and/or district. The teachers were informed that this is a voluntary, blind study and they have a right to withdrawal from it at any time. For those teachers that agree to participate in the study, they were asked to read the consent form before completing the survey. At the request of the participants, results will be provided at a future time. To ensure that all information remains private, no identifying information will be reported in the survey. Each participant was assigned a code to ensure anonymity. The researcher was the only person in contact with all information and will keep the information safe and secured for three years, at which time, the data will be destroyed.

After two weeks of the initial email to school building administrators, an additional email was sent requesting building administrators to forward a reminder email to their staff about the survey. An additional two weeks was provided for teachers to complete the survey. After the provided time had expired to complete the survey, the completed survey was analyzed, and results were disseminated. All information and data will be held in a secured location for at least three years.

Data Analysis

Data was analyzed using two independent samples *t* tests. The *t* test is appropriate to use for data analysis in this proposed study as this study will examine the statistical significance of differences between two independent groups (Gall et al., 2007).

According to Gall et al. (2007), in order to analyze data from a casual-comparative study, the researcher must first explore descriptive statistics for each group in the study. Typically, this is group means and standard deviation. The next step is to screen for outliers using visual analysis for missing data points followed by a box and whisker plots to identify any extreme outliers. The next step is to do a statistical significance test (Gall et al., 2007). From the data acquired for the RQ1 and RQ2, two independent *t* tests were utilized to test RQ1 and RQ2. This test is appropriate because it will compare the amount of between-groups variance individual scores with the amount of with-in group variance using continuous data. (Gall et al., 2007). This study consisted of two groups: novice teachers and experienced teachers.

Data was entered into the Statistical Package for the Social Sciences (SPSS) software system, version 25 or comparable version. Two independent *t* tests were conducted to analyze the data for the null hypotheses. To limit Type I error, a Bonferroni correction was used since there are 2 tests of significance being conducted (Warner, 2013). The calculation for a Bonferroni correction typically uses an alpha level of .05 and then divides by the number of hypothesis tests run. For that reason, the alpha level for this study is calculated thus: .05/2 = .025 rounded to .03. Therefore, the alpha level was set at $p < .03$.

The assumptions for *t* tests consist of scores that are quantitative, continuous data, scores should be normally distributed, with no extreme outliers, and observations should be independent of each other (Warner, 2013). Kolmogorov-Smirnov test was conducted to test the assumption of normality because the sample size ($n = 100$) is greater than 50 (Warner, 2013).

The Levene's Test was utilized to test for homogeneity of variance (Warner, 2013). Following analysis for outliers, sample assumption testing, and independent means analysis, Cohen's D was used to capture effect size.

CHAPTER FOUR: FINDINGS

Overview

This chapter reports the statistical analysis of the data collected throughout the study. The purpose of this study was to determine if there was a difference in self-efficacy toward technology integration and technology integration between novice and experienced teachers. In Research Question One, the independent variable is number of years teaching and the dependent variable is teacher's self-efficacy toward technology integration. In Research Question Two, the independent variable is number of years teaching and the dependent variable is technology integration. For this study, two instruments were used to measure teachers' self-efficacy toward technology integration and technology integration.

Research Questions

The research questions for this study were:

RQ1: Is there a difference in technology integration self-efficacy between novice and experienced teachers?

RQ2: Is there a difference in the level of technology integration between novice and experienced teachers?

Null Hypotheses

The null hypotheses for this study were:

$H_0$1: There is no statistically significant difference in the level of technology integration self-efficacy between novice and experienced teachers as measured by the Teachers' Integration of Self-Efficacy Scale (TISS).

H_02: There is no statistically significant difference in the level of technology integration between novice and experienced teachers as measured by the Teacher Technology Integration Survey (TTIS).

Descriptive Statistics

The participants for this study were novice and experienced K-12 certified classroom teachers in two rural Virginia school districts. A total of 50 novice teachers and 132 experienced teachers participated. A random sample was collected from the experienced group.

Table 4 lists the descriptive statistics for the Overall Self-efficacy and Teacher Technology Use by group.

Table 4

Descriptive Statistics

	Teacher Group	N	Mean	Std. Deviation	Std. Error Mean
Overall Self-Efficacy	novice	50	4.20	.508	.072
	experienced	50	4.02	.630	.089
Overall Teacher Technology Use	novice	50	3.95	.470	.067
	experienced	50	3.78	.454	.064

The means and standard deviation for overall self-efficacy were slightly higher for novice teachers (M = 4.20, SD = .508) than experienced teachers (M = 4.02, SD = .630). The means and standard deviation of overall teacher technology use for novice teachers were also higher (M = 3.95, SD = .470) than experienced teachers (M = 3.78, SD = .454).

Results

Null Hypothesis One

$H_0$1: There is no statistically significant difference in the level of technology integration self-efficacy between novice and experienced teachers as measured by the Teachers' Integration of Self-Efficacy Scale (TISS).

Data screening was conducted on the level of technology integration self-efficacy between novice and experienced teachers. Histograms were used to check visually for normality of distribution of overall self-efficacy. Box-and-whiskers plots were used to test for extreme outliers of the overall self-efficacy. There were not any extreme outliers.

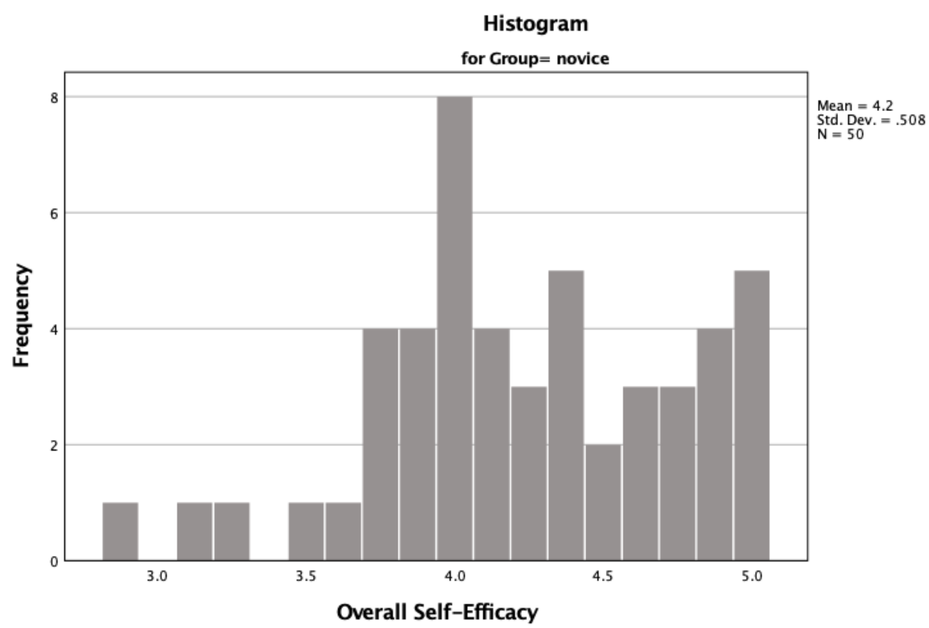


Figure 5. Histogram of Overall Self-Efficacy for Novice Teachers

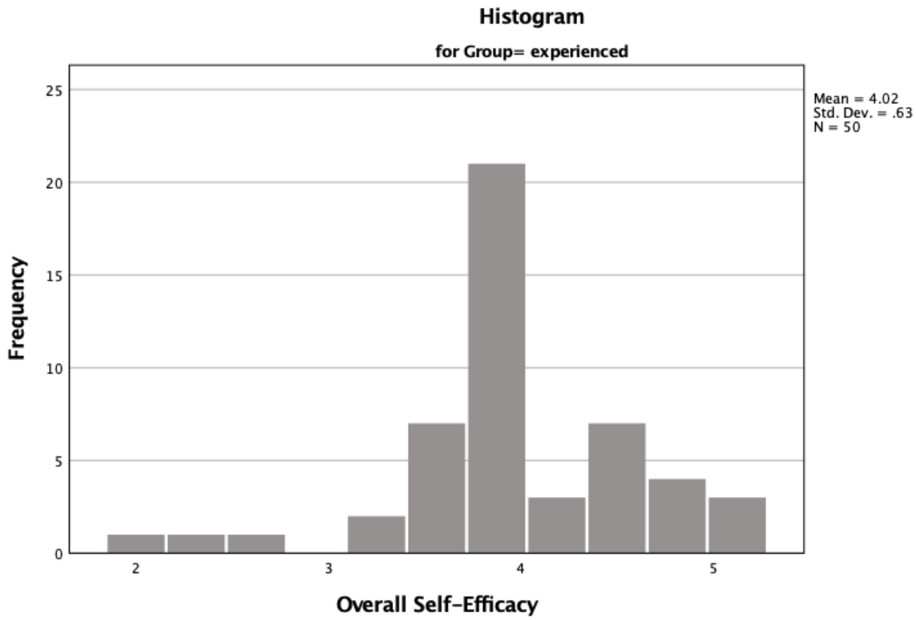


Figure 6. Histogram of Overall Self-Efficacy for Experienced Teachers

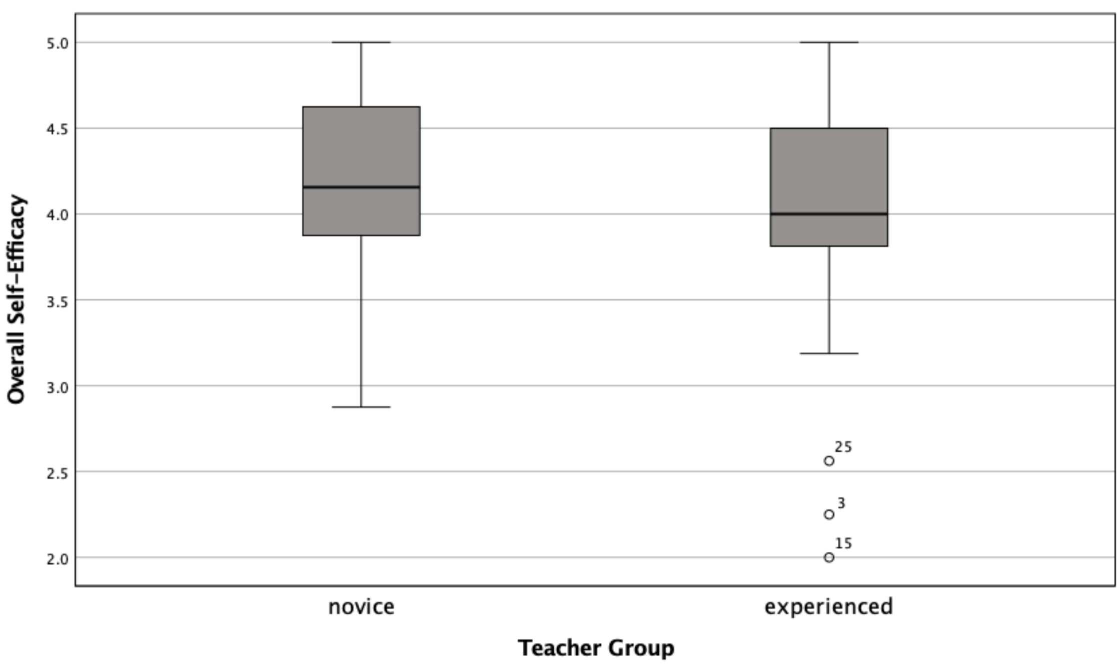


Figure 7. Box-and-whiskers plot of Overall Self-Efficacy

An independent sample *t* test was conducted to evaluate the hypotheses that there is no difference between the level of teacher technology self-efficacy between novice and experienced teachers. An independent sample *t* test requires the assumption of normal distribution, with no extreme outliers. Figures 5 and 6 overall self-efficacy scores show a nearly normal distribution for both groups. The Kolmogorov-Smirnov results revealed a good fit with results greater than $p < .05$.

Further, Levene's test for equality of error variance ($p = .852$) confirmed homogeneity of variance (see Table 3). There was no violation of assumption.

Table 5

Independent Samples Test for Overall Teacher Self-Efficacy

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Overall Self-Efficacy	Equal variances assumed	.035	.852	1.616	98	.109	.185	.114	-.042	.412
	Equal variances not assumed			1.616	93.843	.109	.185	.144	-.042	.412

In order to limit Type 1 error, a Bonferroni post hoc analysis divides the alpha level by the number of tests that were run. The calculation for a Bonferroni correction uses an alpha level of .05 and then divides by the number of hypothesis tests run. The alpha level was set at $p < .03$, the test was not statistically significant, $t\ (98) = 1.616$, $p = .109$. Therefore, the alpha level for this hypothesis is $p < .03$. The null was not rejected.

Null Hypothesis Two

H_02: There is no statistically significant difference in the level of technology integration between novice and experienced teachers as measured by the Teacher Technology Integration Survey (TTIS).

Data screening was conducted on the level of technology integration between novice and experienced teachers. Histograms were used to check visually for normality of distribution of overall teacher technology use. Box-and-whiskers plots were used to test for extreme outliers of the overall teacher technology use. There were no extreme outliers.

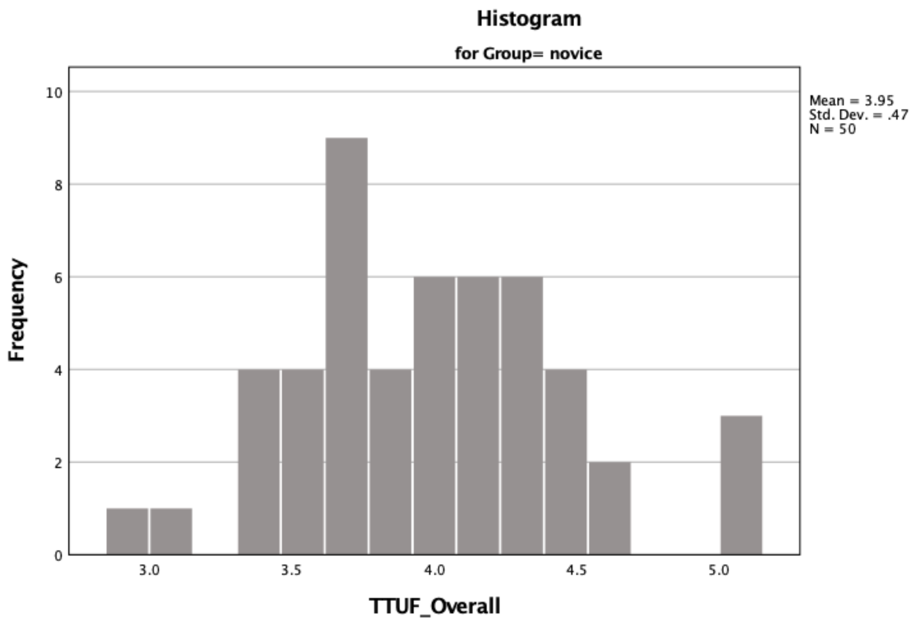


Figure 8. Histogram of Overall Teacher Technology Use for Novice Teachers

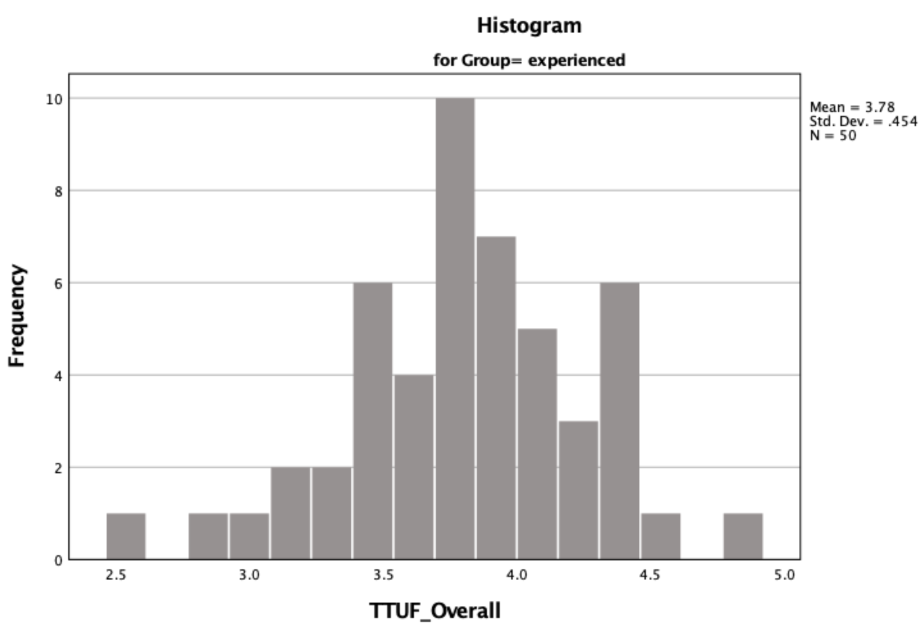


Figure 9. Histogram of Overall Teacher Technology Use for Experienced Teachers

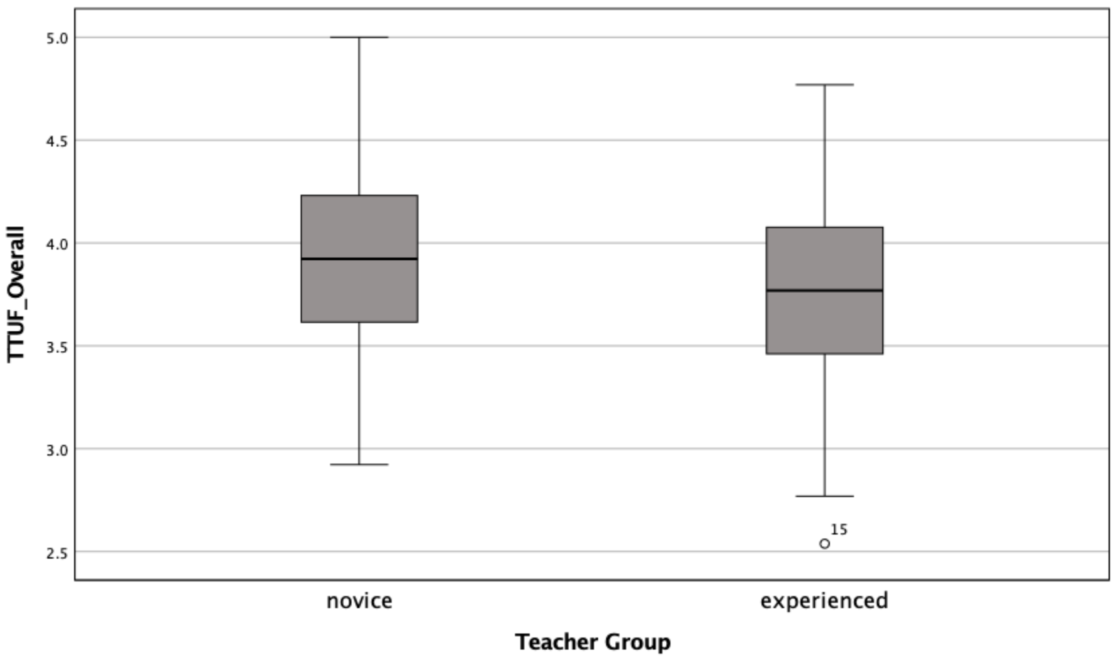


Figure 10. Box-and-whiskers plot of Overall Teacher Technology Use

An independent sample *t* test was conducted to evaluate the hypotheses that there is no difference between the level of technology integration between novice and experienced teaches. An independent sample *t* test requires the assumption of normal distribution, with no extreme outliers. Figures 9 and 10 show that the overall self-efficacy was normally distributed for both groups. Further, Levene's test for equality of error variance (p = .663) confirmed homogeneity of variance (see Table 3).

Table 6

Independent Samples Test for Overall Teacher Technology Use

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Teacher Technology Use	Equal variances assumed	.191	.663	1.880	98	.063	.174	.092	-.010	.357
	Equal variances not assumed			1.880	97.884	.063	.174	.092	-.010	.357

In order to limit Type 1 error, a Bonferroni post hoc analysis divides the alpha level by the number of tests that were run. The calculation for a Bonferroni correction uses an alpha level of .05 and then divides by the number of hypothesis tests run. The alpha level is set at $p < .03$, the test was not significant, $t\ (98) = 1.880$, $p = .063$. Therefore, the alpha level for this hypothesis is $p < .03$. The null was not rejected.

CHAPTER FIVE: CONCLUSIONS

Overview

This chapter reviews the purpose of the study, a thorough discussion of the findings, implications, limitations, and recommendations for future research.

Discussion

The purpose of this nonexperimental, causal-comparative study was to understand the difference in self-efficacy toward technology integration and the level of technology integration between novice and experienced teachers. In Research Question One, the independent variable is number of years teaching and the dependent variable is teacher's self-efficacy toward technology integration. In Research Question Two, the independent variable is number of years teaching and the dependent variable is technology integration. The goal of the study was to gain information about the differences between novice and experienced teachers' self-efficacy toward technology integration and level of technology integration.

The findings from this study showed that there was not a statistically significant difference between the of years teaching and teachers' self-efficacy toward technology and technology integration.

RQ1: Is there a difference in technology integration self-efficacy between novice and experienced teachers?

$H_0$1: There is no statistically significant difference in the level of technology integration self-efficacy between novice and experienced teachers as measured by the Teachers' Integration of Self-Efficacy Scale (TISS).

An independent sample *t* test was conducted to determine if there was a difference in technology integration self-efficacy between novice and experienced teachers. Because there was not a statistically significant difference between novice and experienced technology integration self-efficacy overall mean (*p* = .109) the null hypothesis was not rejected.

Teacher self-efficacy has been linked to several student and teacher outcomes. Teachers with high self-efficacy have been linked to increase student achievement, student motivation, student attitudes (Lemon & Garvis). In addition to the link to positive student outcomes, teachers with high self-efficacy have also been linked to the following positive teacher outcomes decrease teacher burnout, increase in commitment to teaching, greater levels of planning and organization, and the increased desire to find and utilizes new and innovate teaching (Lemon & Garvis, 201,6).

In regard to teachers' technology integration self-efficacy, a study conducted by Enochs et al. (1993), found that to improve classroom technology integration teachers' beliefs must be considered. Several studies suggest that teachers need support in building and enhancing their self-efficacy toward technology integration in order to meaningfully and purposefully integrate it to support student learning regardless of the numbers of years taught (Han, Shin, & Ko, 2017; Kent & Giles, 2017; Kiili et al., 2016; Lemon & Garvis, 2016). Wang et al. (2004), found that experience does not dictate technology self-efficacy or technology integration in the classroom. According to Kimmons and Hall (2017), teachers' beliefs and values greatly influence their technology usage and technology integration in the classroom not their teaching experiencing and age.

This study supports the theories of Rotter's Locus of Control (1966) and Bandura's Social Cognitive Theory (1977). Teachers do have control over their actions that affect their lives (Zee & Zoomen, 2016). As such, a teacher with high self-efficacy will choose to perform more challenging tasks, set high goals and commit to them and persist longer than teachers with low self-efficacy (Lemon & Garvis, 2016). This study supports that regardless of age and teaching experience, teachers with high self-efficacy toward technology integration utilizes technology for teaching and learning more than teachers with low technology integration self-efficacy. Further, the independent sample *t* test, the statistical test that was run to test the null hypothesis showed that there was no difference between novice and experienced teachers' self-efficacy toward technology integration.

RQ2: Is there a difference in the level of technology integration between novice and experienced teachers?

$H_0$2: There is no statistically significant difference in the level of technology integration between novice and experienced teachers as measured by the Teacher Technology Integration Survey (TTIS).

An independent sample *t* test was conducted to determine if there was a difference in the level of technology integration between novice and experienced teachers. Because there was not a statistically significant difference between novice and experienced technology integration overall mean (p = .063) the null hypothesis was accepted.

In a study completed by Sahin et al. (2016), the researchers found that the number of years teaching did not relate to teachers' comfort level with teaching with technology. The study did find that the number of technological devices that teachers had access to did correlate with their comfort level (Sahin et al., 2016). In another study, Lin et al., (2016), found that both gender and teaching experience had a negative influence on classroom technology integration. However, in a study completed by O'bannon and Thomas (2014), the results indicated that age does matter when it comes to technology integration.

This study examined if there was a difference in the level of technology integration between novice and experienced teachers. The study found that there was not a statistically significant difference between novice and experienced teachers technology integration overall score.

Implications

The purpose of this study is to understand the difference in self-efficacy toward technology integration between novice and experienced teachers. This study used the TISS to measure teachers' technology self-efficacy and the TTIS to measure the level of teachers' technology integration. Regarding teachers' technology self-efficacy, this study found that there was not a statistically significant difference between novice and experienced teachers and concluded that novice and experienced have about the same level of technology self-efficacy.

The researcher was surprised to see that there was not a statistically significant difference between the groups and the null was not rejected. The researcher thought that novice teachers would have scored much higher when it came to their beliefs about their use of technology in the classroom compared to experienced. The reason is that many novice teachers are considered "digital native." Research shows that "digital natives" have more experience with technology growing up and may be more comfortable utilizing technology for instruction in the classroom. The results from the study indicated that there was very little difference between novice and experienced teacher technology self-efficacy. This may be the result of the timing of the study. As the COVID-19 pandemic forced many experienced teachers to explore and use technology regularly that they previously had not may be one explanation for the lack of difference in technology self-efficacy. Bandura (1977) posited that to increase the level of self-efficacy, one must have positive experiences, verbal encouragement, and the ability to watch another perform and then compare their own competence with the other individual's competence. Thinking back to 2020, teachers engaged regularly in each of these areas.

Regarding the level of technology integration, this study found that there was not a statistically significant difference between novice and experienced teachers. The researcher concluded that novice and experienced have about the same level of technology integration. Again, the researcher was surprised to see that there was not a statistically significant difference between the groups. Each group scored much higher than the researcher thought, indicating that technology integration is occurring much more frequently in the classroom than originally thought. Previous literature identified that self-efficacy or one's belief in their ability to achieve one's goals continues to hinder technology integration. Could it be that in 2020, teachers were "forced" to utilize technology, thus increasing their self-efficacy?

Limitations

This study was limited to two rural school districts in Virginia, one in which the researcher is employed. Further, the study evaluated only teachers' technology self-efficacy and level of technology integration not the quality of integration. Another limitation is that while the researcher paid careful attention to data entry, there is a possibility that some data was not entered correctly. Assessment limitation includes the number of questions and the time it took to complete the survey. A final limitation is the topic. Those that are interested in technology may have completed the survey than those that are not.

Recommendations for Future Research

Recommendation for future research that involve novice and experienced technology self-efficacy and level of technology integration include:

(1) Replicating this studying in other Virginia school districts.

(2) Replicating this study in other states.

(3) Extending the study to include quality of technology integration.

(4) Extending the study to include pre-service teachers.

and

(5) Conducting a similar study that looked at the skills, knowledge, attributes, behaviors, and experience to integrate technology meaningfully and purposefully into instruction.

REFERENCES

Abbitt, J. T. (2011). An investigation of the relationship between self-efficacy beliefs about technology integration and technological pedagogical content knowledge (TPACK) among preservice teachers. *Journal of Digital Learning in Teacher Education*, *27*(4), 134-143.

Abbitt, J. T., & Klett, M. D. (2007). Identifying influences on attitudes and self-efficacy beliefs towards technology integration among pre-service educators. *Electronic Journal for the integration of technology in Education*, *6*(1), 28-42.

Aldosemani, T. (2019). Inservice teachers' perceptions of a professional development plan based on SAMR model: A case study. *Turkish Online Journal of Educational Technology-TOJET*, *18*(3), 46-53.

Ayad, F. I., & Ajrami, S. J. (2017). The degree of implementing ISTE standards in technical education colleges of Palestine. *Turkish Online Journal of Educational Technology-TOJET*, *16*(2), 107-118.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, *84*(2), 191.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational behavior and human decision processes*, *50*(2), 248-287.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. Macmillan.

Bebell, D., Russell, M., & O'Dwyer, L. (2004). Measuring teachers' technology uses: Why multiple-measures are more revealing. *Journal of Research on Technology in Education*, *37*(1), 45-63.

Beschorner, B., & Kruse, J. (2016). Pre-service teachers' use of a technology integration planning cycle: A case study. *International Journal of Education in Mathematics, Science and Technology*, *4*(4), 258–271.

Betz, N. E. (2008). Bandura, Albert (1925–). In F. T. L. Leong, E. M. Altmaier, & B. D. Johnson (Eds.), *Encyclopedia of Counseling* (Vol. 2, pp. 467-469). Thousand Oaks, CA: SAGE Publications. Retrieved from http://link.galegroup.com.ezproxy.liberty.edu/apps/doc/CX3074200166/GVRL?u=vic_liberty&sid=GVRL&xid=78ebf229

Birisci, S., & Kul, E. (2019). Predictors of technology integration self-efficacy beliefs of preservice teachers. *Contemporary Educational Technology*, *10*(1), 75-93.

Cho, V., & Littenberg-Tobias, J. (2016). Digital devices and teaching the whole student: Developing and validating an instrument to measure educators' attitudes and beliefs. *Educational Technology Research and Development*, *64*(4), 643-659.

Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2007). Teacher credentials and student achievement: Longitudinal analysis with student fixed effects. *Economics of Education Review*, *26*(6), 673-682.

Delgado, A. J., Wardlow, L., McKnight, K., & O'Malley, K. (2015). Educational technology: A review of the integration, resources, and effectiveness of technology in k-12 classrooms. *Journal of Information Technology Education*, *14*.

DeSantis, J. (2016). Investigating the relationship between TPACK and the ISTE standards for teachers. *Issues and Trends in Educational Technology*, *4*(1).

Desimone, L., & Garet, M. (2017). Best Practices in Teachers' Professional Development in the United States. *Psychology, Society & Education.*, *7*(3). https://doi.org/10.25115/psye.v7i3.515

Ekiaka Nzai, V., Feng, Y. L., & Reyna, C. (2014). Preparing Net Gen pre-service teachers for digital native classrooms. *Colombian Applied Linguistics Journal, 16*(2), 185-200.

Enochs, L. G., Riggs, I. M., & Sc Ellis, J. D. (1993). The development and partial validation of microcomputer utilization in teaching efficacy beliefs instrument in a science setting. *School Science and Mathematics*, *93*, 257-263.

Ertmer, P. A. (1999). Addressing first-and second-order barriers to change: Strategies for technology integration. *Educational technology research and development*, *47*(4), 47-61.

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration?. *Educational technology research and development*, *53*(4), 25-39.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of research on Technology in Education*, *42*(3), 255-284.

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & education*, *59*(2), 423-435.

Funkhouser, B. J., & Mouza, C. (2013). Drawing on technology: An investigation of preservice teacher beliefs in the context of an introductory educational technology course. *Computers & Education*, *62*, 271-285.

Fisher, R., Perényi, Á., & Birdthistle, N. (2018). The positive relationship between flipped and blended learning and student engagement, performance and satisfaction. *Active Learning in Higher Education*, 1469787418801702.

Florida Center for Instructional Technology. (2019, June 1). Technology Integration Matrix. Retrieved from https://fcit.usf.edu/matrix/matrix/

Francom, G. M. (2016). Barriers to technology use in large and small school districts. *Journal of Information Technology Education: Research*, *15*(1), 577-591.

Friedman, A., Bolick, C., Berson, M., & Porfeli, E. (2009). National educational technology standards and technology beliefs and practices of social studies faculty: Results from a seven-year longitudinal study. *Contemporary Issues in Technology and Teacher Education*, *9*(4), 476-487.

Gall, M., Gall, J., & Borg, W. (2007). *Educational research: an introduction* (Eighth edition.). Boston: Pearson/Allyn & Bacon.

Gao, P., Wong, A. F., Choy, D., & Wu, J. (2011). Beginning teachers' understanding performances of technology integration. *Asia Pacific Journal of Education*, *31*(2), 211-223.

Gatbonton, E. (2008). Looking beyond teachers' classroom behaviour: Novice and experienced ESL teachers' pedagogical knowledge. *Language Teaching Research, 12*(2), 161-182. doi:http://dx.doi.org.ezproxy.liberty.edu/10.1177/1362168807086286

Hamilton, E. R., Rosenberg, J. M., & Akcaoglu, M. (2016). The substitution augmentation modification redefinition (SAMR) model: A critical review and suggestions for its use. *TechTrends*, *60*(5), 433-441.

Han, I., Shin, W. S., & Ko, Y. (2017). The effect of student teaching experience and teacher beliefs on pre-service teachers' self-efficacy and intention to use technology in teaching. *Teachers and Teaching*, *23*(7), 829-842.

Harper, B., & Milman, N. B. (2016). One-to-one technology in K–12 classrooms: A review of the literature from 2004 through 2014. *Journal of Research on Technology in Education*, *48*(2), 129-142.

Harris, D. N., & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of public economics*, *95*(7-8), 798-812.

Harvey, D. M., & Caro, R. (2017). Building TPACK in preservice teachers through explicit course design. *TechTrends*, *61*(2), 106-114.

Helsper, E. J., & Eynon, R. (2010). Digital natives: where is the evidence?. *British educational research journal*, *36*(3), 503-520.

Hsu, P. S. (2016). Examining current beliefs, practices and barriers about technology integration: A case study. *TechTrends*, *60*(1), 30-40.

Hutchison, A. C., & Woodward, L. (2018). Examining the technology integration planning cycle model of professional development to support teachers' instructional practices. *Teachers College Record*, *120*(10), 1-44.

Ingersoll, R., & Merrill, L. (2010). Who's Teaching Our Children?. *Educational Leadership*, *67*(8), 14-20.

Ingersoll, Richard M.; Merrill, Elizabeth; Stuckey, Daniel; and Collins, Gregory. (2018). Seven Trends: The Transformation of the Teaching Force – Updated October 2018. CPRE Research Reports. Retrieved from https://repository.upenn.edu/cpre_researchreports/108

Insook Han, Won Sug Shin & Yujung K. (2017). The effect of student teaching experience and teacher beliefs on pre-service teachers' self-efficacy and intention to use technology in teaching. *Teachers and Teaching, 23*(7), 829-842, DOI: 10.1080/13540602.2017.1322057

Instefjord, E. J., & Munthe, E. (2017). Educating digitally competent teachers: A study of integration of professional digital competence in teacher education. *Teaching and teacher education*, *67*, 37-45.

International Society for Technology. (n.d.). Standards. Retrieved April 23, 2020, from https://www.iste.org/standards/for-educators

Joo, Y. J., Park, S., & Lim, E. (2018). Factors influencing preservice teachers' intention to use technology: TPACK, teacher self-efficacy, and technology acceptance model. *Journal of Educational Technology & Society*, *21*(3), 48-59.

Kent, A. M., & Giles, R. M. (2017). Preservice Teachers' Technology Self-Efficacy. *SRATE Journal*, *26*(1), 9-20.

Kiili, C., Kauppinen, M., Coiro, J., & Utriainen, J. (2016). Measuring and supporting pre-service teachers' self-efficacy towards computers, teaching, and technology integration. *Journal of Technology and Teacher Education*, *24*(4), 443-469.

Kim, C., Kim, M. K., Lee, C., Spector, J. M., & DeMeester, K. (2013). Teacher beliefs and technology integration. *Teaching and teacher education*, *29*, 76-85.

Kimmons, R., & Hall, C. (2018). How useful are our models? Pre-service and practicing teacher evaluations of technology integration models. *TechTrends*, *62*(1), 29-36.

Kini, T., & Podolsky, A. (2016). Does teaching experience increase teacher effectiveness. *A Review of the Research*.

Kirschner, P. A., & De Bruyckere, P. (2017). The myths of the digital native and the multitasker. *Teaching and Teacher Education*, *67*, 135-142.

Koehler, M. (n.d.). *Using the tpack image.* http://tpack.org/

Kolb, L. (2017). *Learning First, Technology Second: The Educator's Guide to Designing Authentic Lessons*. ISTE

Kopcha, T. J. (2012). Teachers' perceptions of the barriers to technology integration and practices with technology under situated professional development. *Computers & Education*, *59*(4), 1109-1121.

Kraft, M. A., & Papay, J. P. (2014). Can professional environments in schools promote teacher development? Explaining heterogeneity in returns to teaching experience. *Educational evaluation and policy analysis*, *36*(4), 476-500.

Kwon, K., Ottenbreit-Leftwich, A. T., Sari, A. R., Khlaif, Z., Zhu, M., Nadir, H., & Gok, F. (2019). Teachers’ self-efficacy matters: Exploring the integration of mobile computing devices in middle schools. *TechTrends*, 1-11.

Ladd, H. F., & Sorensen, L. C. (2017). Returns to teacher experience: Student achievement and motivation in middle school. *Education Finance and Policy*, *12*(2), 241-279.

Lambert, J., Cioc, C., Cioc, S., & Sandt, D. (2018). Making connections: Evaluation of a professional development program for teachers focused on STEM integration. *Journal of STEM Teacher Education*, *53*(1), 2.

Leading Education by Advancing Digital Commission (LEAD). (2013). Paving a path forward for digital learning in the United States. Retrieved from: http://www.leadcommission.org

Lee, E., & Hannafin, M. J. (2016). A design framework for enhancing engagement in student-centered learning: Own it, learn it, and share it. *Educational Technology, Research and*

Development, 64(4), 707-734. doi:http://dx.doi.org.ezproxy.liberty.edu/10.1007/s11423-015-9422-5

Lee, Y., & Lee, J. (2014). Enhancing pre-service teachers' self-efficacy beliefs for technology integration through lesson planning practice. *Computers & Education*, *73*, 121-128.

Lefflerd (2016). “Wikimedia Commons.” *The SAMR Model*, commons.wikimedia.org/wiki/File:The_SAMR_Model.jpg.

Lemon, N., & Garvis, S. (2016). Pre-service teacher self-efficacy in digital technology. *Teachers and Teaching*, *22*(3), 387-408.

Levin, B. B., & Schrum, L. (2013). Using systems thinking to leverage technology for school improvement: Lessons learned from award-winning secondary schools/districts. *Journal of Research on Technology in Education*, *46*(1), 29-51.

Lewis, C. (2015). Preservice teachers’ ability to identify technology standards: Does curriculum matter?. *Contemporary Issues in Technology and Teacher Education*, *15*(2), 235-254.

Li, L., Worch, E., Zhou, Y., & Aguiton, R. (2015). How and why digital generation teachers use technology in the classroom: An explanatory sequential mixed methods study. *International Journal for the Scholarship of Teaching and Learning, 9*(2), 9.

Lim, C. P., Zhao, Y., Tondeur, J., Chai, C. S., & Chin-Chung, T. (2013). Bridging the gap: Technology trends and use of technology in schools. *Journal of Educational Technology & Society, 16*(2), 59-68. Retrieved from http://ezproxy.liberty.edu/login?url=https://search-proquest-com.ezproxy.liberty.edu/docview/1355669531?accountid=12085

Liu, F., Ritzhaupt, A. D., Dawson, K., & Barron, A. E. (2017). Explaining technology integration in K-12 classrooms: A multilevel path analysis model. *Educational Technology Research and Development, 65*(4), 795-813.

Liu, S. H., Tsai, H. C., & Huang, Y. T. (2015). Collaborative professional development of mentor teachers and pre-service teachers in relation to technology integration. *Journal of Educational Technology & Society*, *18*(3), 161-172.

McKnight, K., O'Malley, K., Ruzic, R., Horsley, M. K., Franey, J. J., & Bassett, K. (2016). Teaching in a digital age: How educators use technology to improve student learning. *Journal of research on technology in education*, *48*(3), 194-211.

Martin, B. (2018). Faculty technology beliefs and practices in teacher preparation through a TPaCK lens. *Education and Information Technologies*, *23*(5), 1775-1788.

Messina, L., & Tabone, S. (2013). Technology proficiency, TPACK and beliefs about technology: A survey with primary school student teachers. *Research Education Media*, *5*(1), 11-29.

Melnick, S. A., & Meister, D. G. (2008). A comparison of beginning and experienced teachers' concerns. *Educational Research Quarterly*, *31*(3), 39-56.

O'bannon, B. W., & Thomas, K. (2014). Teacher perceptions of using mobile phones in the classroom: Age matters!. *Computers & Education*, *74*, 15-25.

Odle, T. G. (2019). Self-efficacy. In B. Narins (Ed.), *The Gale Encyclopedia of Mental Health* (4th ed., Vol. 4, pp. 1452-1455). Farmington Hills, MI: Gale. Retrieved from http://link.galegroup.com.ezproxy.liberty.edu/apps/doc/CX2491200446/GVRL?u=vic_liberty&sid=GVRL&xid=43d5a750

Okojie, M. C., Olinzock, A. A., & Okojie-Boulder, T. C. (2006). The pedagogy of technology integration. *Journal of Technology Studies*, *32*(2), 66-71.

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

Orlando, J., & Attard, C. (2016). Digital natives come of age: The reality of today's early career teachers using mobile devices to teach mathematics. Mathematics Education Research Journal, 28(1), 107-121.

Ottenbreit-Leftwich, A., Liao, J. Y. C., Sadik, O., & Ertmer, P. (2018). Evolution of teachers' technology integration knowledge, beliefs, and practices: How can we support beginning teachers use of technology?. *Journal of Research on Technology in Education*, *50*(4), 282-304.

Papay, J. P., & Kraft, M. A. (2015). Productivity returns to experience in the teacher labor market: Methodological challenges and new evidence on long-term career improvement. *Journal of Public Economics*, *130*, 105-119.

Peeraer, J., & Van Petegem, P. (2012). Measuring integration of information and communication technology in education: An item response modeling approach. Computers & Education, 58(4), 1247-1259.

Perkmen, S., & Pamuk, S. (2011). Social cognitive predictors of pre-service teachers' technology integration performance. *Asia Pacific Education Review*, *12*(1), 45-58.

Prensky, M. (2001). Digital natives, digital immigrants part 1. On the horizon, 9(5), 1-6.

Rice, J. K. (2010). The Impact of Teacher Experience: Examining the Evidence and Policy Implications. Brief No. 11. *National center for analysis of longitudinal data in education research*.

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological monographs: General and applied*, *80*(1), 1.

Rovai, A. P., Baker, J. D., & Ponton, M. K. (2013). *Social science research design and statistics: A practitioner's guide to research methods and IBM SPSS*. Watertree Press LLC.

Sahin, A., Top, N., & Delen, E. (2016). Teachers' first-year experience with chromebook laptops and their attitudes towards technology integration. *Technology, Knowledge and Learning*, *21*(3), 361-378.

Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education. *Computers & Education*, *128*, 13-35.

Smith, R. (2017). ISTE releases new standards for educators to maximize learning for all students using technology. *International Society for Technology in Education*.

Sun, Y., Strobel, J., & Newby, T. J. (2017). The impact of student teaching experience on pre-service teachers' readiness for technology integration: A mixed methods study with growth curve modeling. *Educational Technology Research and Development*, *65*(3), 597-629.

Tarun, I. M. (2019). The effectiveness of a customized online collaboration tool for teaching and learning. *Journal of Information Technology Education, 18.*

Technology acceptance model. (n.d.). In *Wikipedia.* Retrieved May 21, 2020, from https://en.wikipedia.org/wiki/Technology_acceptance_model

Teo, T. (2013). An initial development and validation of a Digital Natives Assessment Scale (DNAS). *Computers & Education, 67,* 51-57.

Teo, T. (2016). Do digital natives differ by computer self-efficacy and experience? An empirical study. *Interactive Learning Environments*, *24*(7), 1725-1739.

Thoma, J., Hutchison, A., Johnson, D., Johnson, K., & Stromer, E. (2017). Planning for technology integration in a professional learning community. *The Reading Teacher*, *71*(2), 167-175.

Tondeur, J., Van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: a systematic review of qualitative evidence. *Educational Technology Research and Development*, *65*(3), 555-575.

Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and teacher education*, *17*(7), 783-805.

U.S. Census Bureau. (2019, April 26). QuickFacts Augusta County, Virginia. Retrieved from https://www.census.gov/quickfacts/augustacountyvirginia

U.S. Census Bureau. (2020, May 21). QuickFacts Rockingham County, Virginia. Retrieved from https://www.census.gov/quickfacts/fact/table/rockinghamcountyvirginia/PST045219

Vannatta, R. A., & Banister, S. (2008). Measuring teacher technology integration: Going beyond teacher use.

Vannatta, R., & Banister, S. (2009, March). Validating a measure of teacher technology integration. In *Society for Information Technology & Teacher Education International Conference* (pp. 1134-1140). Association for the Advancement of Computing in Education (AACE).

Virginia Department of Education. (n.d.). Technology Standards. Retrieved April 2, 2020, from http://www.doe.virginia.gov/support/technology/standards/index.shtml

Voithofer, R., Nelson, M. J., Han, G., & Caines, A. (2019). Factors that influence TPACK adoption by teacher educators in the US. *Educational Technology Research and Development*, *67*(6), 1427-1453.

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

Wang, L., Ertmer, P. A., & Newby, T. J. (2004). Increasing preservice teachers’ self-efficacy beliefs for technology integration. *Journal of research on technology in education*, *36*(3), 231-250.

Warner, R. M. (2013). Applied statistics: from bivariate through multivariate techniques: from bivariate through multivariate techniques. Sage.

Welsh, J., Harmes, J. C., & Winkelman, R. (2011). Florida's technology integration matrix. *Principal Leadership, 12*(2), 69-71. Retrieved from http://ezproxy.liberty.edu/login?qurl=https%3A%2F%2Fsearch.proquest.com%2Fdocview%2F892247007%3Faccountid%3D12085

Williams, M. E. (2017). Technology integration support levels for in-service teachers. *Journal of Education and Practice*, *8*(7), 76-81.

Wiswall, M. (2013). The dynamics of teacher quality. *Journal of Public Economics*, *100*, 61-78.

Woodward, L., & Hutchison, A. (2018). The STAK model: Exploring personalized professional development for technology integration into instruction. *Journal of Technology and Teacher Education*, *26*(4), 613–644.

Yurdakul, I. K. (2018). Modeling the relationship between pre-service teachers' TPACK and digital nativity. *Educational Technology Research and Development*, *66*(2), 267-281.

Zee, M., & Koomen, H. M. Y. (2016). Teacher self-Efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being: A synthesis of 40 years of research. *Review of Educational Research*, *86*(4), 981–1015. https://doi.org/10.3102/0034654315626801

APPENDIX A: Institutional Review Board Approval to Conduct Research

LIBERTY UNIVERSITY
INSTITUTIONAL REVIEW BOARD

December 8, 2020

Tonya Coffey

Re: IRB Exemption - IRB-FY20-21-244 A COMPARATIVE STUDY OF NOVICE AND EXPERIENCED TEACHERS' SELF-EFFICACY TOWARD TECHNOLOGY INTEGRATION AND LEVEL OF TECHNOLOGY INTEGRATION IN THE CLASSROOM

Dear Tonya Coffey,

The Liberty University Institutional Review Board (IRB) 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 the following exemption category, which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:
101(b):

Category 2.(i). Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording).
The information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects.

Your stamped consent form can be found under the Attachments tab within the Submission Details section of your study on Cayuse IRB. 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 modifications to your protocol must be reported to the Liberty University IRB for verification of continued exemption status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this exemption or need assistance in determining whether possible modifications 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
Research Ethics Office

APPENDIX B: Request to Use Teachers' Integration of Self-Efficacy Scale (TISS)

Dear

I am a doctoral candidate at Liberty University in Virginia. I am in the process of conducting a study that will compare novice and experienced teachers' self-efficacy toward technology integration and teacher technology integration. My initial research has provided me numerous studies that site your self-efficacy scale of technology usage instrument. I would like to formally request permission to use your instrument for my study. I believe that your survey is the most comprehensive survey that I have found to date.

Thank you for your time and consideration.

Sincerely,

Tonya Coffey

APPENDIX C: Author's Permission to Use Teachers' Integration of Self-Efficacy Scale (TISS)

Ms. Coffey,

Thank you for your interest in the CTI survey.

Please feel free to use it in your research study.

I wish you all the best in your research!

APPENDIX D: Author's Permission to Publish Teachers' Integration of Self-Efficacy Scale (TISS)

Tonya,

Yes, you may include the survey in the appendix of your study.

APPENDIX E: Request to Use Teacher Technology Integration Survey (TTIS)

Good morning,

My name is Tonya Coffey, and I am a doctoral student at Liberty University in Virginia. I am working on my dissertation and would like to request permission to use your survey. I plan to study the difference between a novice and experienced teachers' self-efficacy toward technology integration and level of technology integration and feel that your survey would be the best fit to measure the level of technology integration as it provides a more holistic approach to technology integration.

Thanks in advance for your consideration!

APPENDIX F: Author's Permission to Use Teacher Technology Integration Survey (TTIS)

Definitely you have our permission.

APPENDIX G: Author's Permission to Publish Teacher Technology Integration Survey (TTIS)

You have my permission. Rachel

APPENDIX H: Teachers' Integration of Self-Efficacy Scale (TISS)

Direction:
The purpose of this survey is to determine how you feel about integrating technology into classroom teaching. For each statement below, indicate the strength of your agreement or disagreement by circling one of the five scales.

Below is a definition of technology integration with accompanying examples:

Technology integration:
Using computers to support students as they construct their own knowledge through the completion of authentic, meaningful tasks.

Examples:
Students working on research projects, obtaining information from the Internet.
Students constructing Web pages to show their projects to others.
Students using application software to create student products (such as composing music, developing PowerPoint presentations, developing HyperStudio stacks).

Using the above as a baseline, please circle one response for each of the statements in the table:

SD = Strongly Disagree, D = Disagree, NA/ND = Neither Agree nor Disagree,
A= Agree, SA= Strongly Agree

1. I feel confident that I understand computer capabilities well enough to maximize them in my classroom.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

2. I feel confident that I have the skills necessary to use the computer for instruction.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

3. I feel confident that I can successfully teach relevant subject content with appropriate use of technology.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

4. I feel confident in my ability to evaluate software for teaching and learning.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

5. I feel confident that I can use correct computer terminology when directing students' computer use.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

6. I feel confident I can help students when they have difficulty with the computer.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

7. I feel confident I can effectively monitor students' computer use for project development in my classroom.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

8. I feel confident that I can motivate my students to participate in technology-based projects.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

9. I feel confident I can mentor students in appropriate uses of technology.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

10. I feel confident I can consistently use educational technology in effective ways.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

11. I feel confident that I can provide individual feedback to students during technology use.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

12. I feel confident that I can regularly incorporate technology into my lesson, when appropriate to student learning.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

13. I feel confident about selecting appropriate technology for instruction based on curriculum standards.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

14. I feel confident about assigning and grading technology-based projects.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

15. I feel confident about using technology resources (such as spreadsheets, electronic portfolios, etc.) to collect and analyze data from student tests and products to improve instructional practices.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

16. I feel confident that I can be responsive to students' needs during computer use.

SD) Strongly Disagree, (D) Disagree, (NA/ND) Neither Agree nor Disagree, (SA) Strongly Agree

APPENDIX I: Teacher Technology Integration Survey (TTIS)

Direction: The purpose of this survey is to measure teacher technology integration. For each statement, indicate your opinion about each of the statements below. Your answers are confidential.

Risk-taking Behaviors and Comfort with Technology

I feel comfortable about my ability to work with computer technologies.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

Learning new technologies is confusing for me.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

I get anxious when using new technologies because I don’t know what to do if something goes wrong.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

I am confident with my ability to troubleshoot when problems arise while using technology.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

I get anxious when using technology with my students.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

I get excited when I am able to show my students a new technology application or tool.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

I am confident in trying to learn new technologies on my own.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

I enjoy finding new ways that my students and I can use technology in the classroom.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

Learning new technologies that I can use in the classroom is important to me.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

Perceived Benefits of Technology

Using technology to communicate with others allows me to be more effective in my job.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

Computer technology allows me to create materials that enhance my teaching.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

Computer technologies help me be better organized in my classroom.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

Technology can be an effective learning tool for students.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

My students get excited when they use technology in the learning process.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

Beliefs and Behaviors about Classroom Technology Use

Teaching students how to use technology is a part of my job.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

Using technology in the classroom is a priority for me.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

When planning instruction, I think about how technology could be used to enhance student learning.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

When planning instruction, I consider state and national technology standards.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

I regularly plan learning activities/lessons in which students use technology.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

I try to model effective technology use for my students.

(SD) Strongly Disagree, (D) Disagree, (A) Agree, (SA) Strongly Agree

Technology Support and Access

My building principal encourages faculty to integrate technology in the classroom.

1 Not available/present in my building; 2=Available but not accessible; 3=Available but have limited access; 4=Available and have easy access

Technology support is available in my building to assist with troubleshooting.

1 Not available/present in my building; 2=Available but not accessible; 3=Available but have limited access; 4=Available and have easy access

A vision for technology use in our school is clearly communicated to faculty.

1 Not available/present in my building; 2=Available but not accessible; 3=Available but have limited access; 4=Available and have easy access

My colleagues are committed to integrating technology in the classroom.

1 Not available/present in my building; 2=Available but not accessible; 3=Available but have limited access; 4=Available and have easy access

Curriculum support is available in my building to assist with technology integration ideas.

1 Not available/present in my building; 2=Available but not accessible; 3=Available but have limited access; 4=Available and have easy access

Instructor computer

1 Not available/present in my building; 2=Available but not accessible; 3=Available but have limited access; 4=Available and have easy access

Set of computers (2-5) in classroom

1 Not available/present in my building; 2=Available but not accessible; 3=Available but have limited access; 4=Available and have easy access

Mobile computer lab (cart of computers)

1 Not available/present in my building; 2=Available but not accessible; 3=Available but have limited access; 4=Available and have easy access

Computer lab (10-30 computers)

1 Not available/present in my building; 2=Available but not accessible; 3=Available but have limited access; 4=Available and have easy access

Teacher Administrative and Instructional Use

Use the computer to create instructional handouts or assessments for students

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use the Internet to gather information for lesson planning

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Create electronic templates to guide student computer use

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Prepare or maintain IEPs on the computer

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use a handheld device (Palm Pilot) to organize information

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use spreadsheet (or grading program) to maintain grade book and/or attendance

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use technology to present information to students

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Demonstrate computer applications

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Provide/create electronic learning centers

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use technology to adapt an activity to students' individual needs

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Teacher Communication Use

Use Email to communicate with colleagues and administrators in your school/district

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use Email to communicate with students or parents

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Post class information (homework, products) on an electronic bulletin board, website, or blog

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Student General Use

Use Internet to research topics and gather information

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use spreadsheets or tables to organize and analyze data

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use spreadsheets to create graphs or charts

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use email to communicate and collaborate with peers

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use word processor for writing assignments

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use writing tools in word processor (such thesaurus, spell-check) to improve writing quality

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use presentation software to present information

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use technology to produce pictures/artwork

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use technology to produce paper-based products (newsletters, brochures)

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use technology to produce multimedia projects that use digital images, video, audio

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use technology to produce web pages or websites

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use technology to solve problems

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Student Specific Use

Use a handheld device to gather and/or organize data, create concepts maps, write

Use content-specific software for concept reinforcement

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use Inspiration (or other) to create concept maps or graphic organizer

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Use simulation/gaming software (Timeliner, Hollywood High) to learn and apply information

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Configuration of Student Use (not a subscale)

Work individually on the computer in the classroom

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Work individually on the computer in a computer lab

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

Work in pairs or small groups on the computer

Never, Once or twice a year, Several times a year, Several times a month, Several times in a week

APPENDIX J: Recruitment Email

EMAIL

Dear Educators:

As a graduate student in the School of Education at Liberty University, I am conducting research as part of the requirements for a doctoral degree. The title of my research project is *A Comparative Study of Novice and Experienced Teachers' Self-Efficacy Toward Technology Integration and level of Technology Integration in the Classroom* and the purpose of my research is to determine if there is a difference between novice and experienced teachers' self-efficacy toward technology integration and technology integration. I am writing to invite eligible participants to join my study.

Participants must be K-12 Virginia certified educators. Participants, if willing, will be asked to complete an online 81 question survey. It should take approximately 30 minutes to complete the survey. Participation will be completely anonymous, and no personal, identifying information will be collected.

In order to participate, please click here to complete the online survey.

A consent statement is provided at the beginning of the survey. The consent document contains additional information about my research. After you have read the consent form and you wish to participate, please click yes to proceed to the survey. Doing so will indicate that you have read the consent information and would like to take part in the survey.

Sincerely,

Tonya Coffey
Researcher
tcoffey4@liberty.edu

APPENDIX K: Participant Consent Letter

CONSENT
Title of the Project: A Comparative Study of Novice and Experienced Teachers' Self-Efficacy Toward Technology Integration and level of Technology Integration in the Classroom
Principal Investigator: Tonya Coffey, Liberty University

INVITATION TO BE PART OF A RESEARCH STUDY
You are invited to participate in a research study. In order to participate, you must be a K-12 Virginia certified educator. Taking part in this research project is voluntary.

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

WHAT IS THE STUDY ABOUT AND WHY IS IT BEING DONE?
The purpose of this quantitative, nonexperimental causal-comparative study is to examine and determine if there is a difference between number of years teaching and teachers' self-efficacy toward technology integration and the level of technology integration in K-12 classrooms.

WHAT WILL HAPPEN IF YOU TAKE PART IN THIS STUDY?
If you agree to be in this study, I would ask you to do the following things:
1. Complete an online, 81-question survey. The survey should take approximately 30 minutes to complete.

HOW COULD YOU OR OTHERS BENEFIT FROM THIS STUDY?
Participants should not expect to receive a direct benefit from taking part in this study. Benefits to society include increasing public knowledge on the topic.

WHAT RISKS MIGHT YOU EXPERIENCE FROM BEING IN THIS STUDY?
The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

HOW WILL PERSONAL INFORMATION BE PROTECTED?
The records of this study will be kept private. Research records will be stored securely, and only the researcher will have access to the records.
• Participant responses will be anonymous.
• Data will be stored on a password-locked computer and may be used in future presentations. After three years, all electronic records will be deleted.

IS STUDY PARTICIPATION VOLUNTARY?
Participation in this study is voluntary. Your decision whether to participate will not affect your current or future relations with Liberty University or the school in which you teach. If you decide to participate, you are free to withdraw at any time prior to submitting the survey without affecting those relationships.

WHAT SHOULD YOU DO IF YOU DECIDE TO WITHDRAW FROM THE STUDY?

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

WHOM DO YOU CONTACT IF YOU HAVE QUESTIONS OR CONCERNS ABOUT THE STUDY?
The researcher conducting this study is Tonya Coffey. You may ask any questions you have now. If you have questions later, you are encouraged to contact her at tcoffey4@liberty.edu. You may also contact the researcher's faculty sponsor,

WHOM DO YOU CONTACT IF YOU HAVE QUESTIONS ABOUT YOUR RIGHTS AS A RESEARCH PARTICIPANT?
If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515 or email at irb@liberty.edu