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A Correlative Study of K-12 Teacher Technology Acceptance in a Post COVID-19 World: Determinants of Behavioral Intention

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A CORRELATIVE STUDY OF K-12 TEACHER TECHNOLOGY ACCEPTANCE IN A POST COVID-19 WORLD: DETERMINANTS OF BEHAVIORAL INTENTION

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ABSTRACT

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The shift to emergency remote teaching due to the COVID-19 pandemic in the spring of 2020 forced educators across the globe to heavily rely on technology for the continuity of teaching and learning. As educators return to face-to-face instruction with increased access and expectations to implement technology in their classrooms, it is important to evaluate factors that impact teachers' acceptance of technology. The *Unified Theory of Technology Acceptance* (*UTAUT*) provides an instrument that can be utilized to measure factors that may determine teacher behavioral intention to integrate technology into their classrooms. In this quantitative survey research, K-12 teachers from a north-central Texas school district participated in the survey, and the results for correlational relationships were analyzed at the elementary, junior high and high school level. The data analysis showing behavioral intent to implement technology had positive correlations with performance expectancy, effort expectancy and attitude. The data also supported a positive correlation between frequency of technology professional development and behavioral intent to implement technology. The findings indicate that administrator facilitating technology integration along with effective frequent professional development both facilitate the integration of technology into the classroom by teachers.

DEDICATION

It is with genuine appreciation and love that I dedicate this dissertation to my confidante and champion, my husband, Damon. Thank you for encouraging me to pursue and persevere through this journey of enlightenment. It has not been easy, and I could not have done it without your support. To my parents, Leland and Linda Betsill, I am filled with gratitude for the strong foundation, unwavering confidence, and love you provide me over the years. To my father-in-law, Val, you have been a rock for our family and a constant presence in the lives of my children. I am ever grateful for you and your sacrifice which enabled me to realize this goal. To my children, Hadley and Declan, you are my heart and my future. My wish for you is to see that persistence and passion can make your dreams a reality, and I cannot wait to celebrate all your future accomplishments. Finally, I must express my deepest thanks to Dr. Celina Sau Lin Ing. You have provided me invaluable advice and guidance throughout my academic career. I cannot thank you enough for your continued friendship and counsel.

To my family:

For your love, flexibility, and encouragement I am eternally thankful and blessed.

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CHAPTER I

INTRODUCTION

Technology is a vital and fundamental component of current classroom learning strategies. Today's students are members of a digital generation where the presence of technology is forcing traditional teaching methods to evolve (Gunter & Reeves, 2017). However, according to Gunter and Reeves (2017), many teachers lack the essential technical understanding, skills, patience, and confidence to effectively integrate technology into daily lesson plans. Consequently, advantages to using technology are negated if there is a basic failure to properly integrate it with specific content. As a result, a need exists to support and nurture teacher technology acceptance through technology-based professional development activities in order to increase teacher confidence in technology integration.

This reliance on technology to sustain instruction was crucial during the school closures due to the COVID-19 pandemic in the spring of 2020. Educators were forced to shift their practice from traditional in-person teaching to emergency remote teaching within a matter of days. Educators were not prepared or trained for emergency remote teaching, but it was required to ensure the continuity of learning for students at a distance (Trust & Whalen, 2020). School closures, remote learning, and the heavy reliance on technology continued through the 2021-2022 school year resulting in three years of impact on education. Zhao (2020) stated: "Tofu is not cheese. We should not expect it to smell or taste like cheese nor should we pretend it is or make it taste and smell like cheese," (p 189), i.e., the education system should not pretend nor

expect for online learning to be the same as face-to-face learning. Daniel (2020) observed that while there may be a desire to return to traditional learning methods, as even today at the time of publication, there are still waves of COVID-19 outbreaks throughout the United States; there will not be a smooth, one-time transition back to normality. Additionally, Zhao (2020) stated "[*n*]*ot return to the same education after we return to the same school* seems to be a widely shared desire among the innovative" (p. 194, emphasis in original). Meaning that many educators do not wish for a return to pre-COVID school, but rather continue to advance education with the technology implemented during the COVID pandemic. Regardless of the desires or wishes of educators, parents, communities, or students for past teaching and learning approaches, going forward, there has been a significant impact on education due to the pandemic.

As a result of the pandemic, many school districts increased the number of technological devices and digital products for student use. This change included providing access to Internet connectivity to students and teachers through mobile hot-spots for students to use at home. According to Wolff (2020), the increased technological availability within schools may lead to enhanced integration and a transformation of learning, ultimately advancing sustainability in education after COVID-19. With this increased access and support for instructional technology in classrooms, combined with their experiences during the COVID-19 school closures, are teachers more likely to integrate it into their lessons?

Need for the Study

In spring 2020, the devastating coronavirus (COVID-19) highlighted the fallibility of the educational systems in the United States, specifically in the use of technology, as unexpected worldwide closures of schools resulted in a rapid pivot from face-to-face instruction to emergency remote learning almost overnight. As a result of COVID-19 school closures and the

subsequent shift to online and hybrid, (i.e., simultaneous online and face-to-face) teaching during the 2020 - 2021 school year, many districts allocated additional funding to increase the number of devices provided to students – many moved to a 1:1 implementation ratio, adopted a learning management system (LMS), and introduced required technology training for teachers. This continued shift in the use of technology in educational settings exponentially grew in a year and a half during pandemic education. Technology usage has been increasing in classrooms across the country; teachers are receiving more technology devices to support their delivery of instruction, and the number of student devices present on campuses is also increasing. Prior to the pandemic there was an awareness of the benefits of technology in classrooms (Nepo, 2016; Rosenfeld, 2013, Zhao, 2020), yet technology professional development had been a slow process. The impact of COVID-19 was a drastic acceleration of this shift in thinking and practice resulting in an upsurge in availability of technology professional development (Foulger et al., 2020). However, do teachers feel comfortable and knowledgeable enough with the technology to successfully integrate it into classroom content in a meaningful manner? As the education system moved to have students back in a face-to-face environment about a year and a half after the initial shut down in the spring of 2020, it is important to determine if teacher intent to integrate technology increased as a result of the changed norm due to the COVID-19 pandemic.

Yee and Abdullah (2021) assert that over the past twenty years, studies on technology acceptance have been conducted worldwide utilizing various theories and models. There is research available about technology acceptance in various professions including education (Attuquayefio & Addo, 2014; Yee & Abdullah, 2021) and there have been publications on teacher experiences and perceptions since the onset of the COVID-19 pandemic (An et al., 2021;

Bozkurt et al., 2022; Francom et al., 2021; Songkram & Osuwan, 2022; Trust & Whalen, 2021; Winter et al., 2021). Much of the published research is from the early stages of the pandemic, leaving a gap in the research on in-service teacher perceptions of technology in the classroom since the return to face-to-face instruction after the initial onset of the COVID-19 pandemic.

Therefore, this study addressed drivers of teacher technology acceptance and how it impacted the implementation of technology in the classroom at the end of the 2021-2022 school year, which was the first year in which all students returned to face-to-face instruction. Additionally, the study will add to the growing body of literature surrounding the *Unified Theory of Acceptance and Use of Technology (UTAUT)* in the K-12 classroom. This study aimed to fill the gap, furthering research on teachers' perceived acceptance by evaluating relationships between factors that influence teachers' behavioral intent to integrate technology. It also looked at how the frequency of technology professional development affected teacher acceptance of technology.

Statement of the Problem

Educator access to technology and technology professional development in school districts in the United States is increasing, even more so since the onset of the COVID-19 pandemic in the spring of 2020, when administrators, instructors, and students were forced to rapidly change the delivery of instruction and submission of student work using a digital platform. Since the return to in-person instruction, which happened for most institutions in the United States approximately a year later, educational stakeholders recognized the need for effective technology integration in classrooms and other learning environments and are increasing their efforts to support that initiative. However, a question still remains: Do teachers maintain a high level of technology acceptance now that they are no longer fully reliant on technology to educate students?

Pinar et al. (2014) state, “clearly, technology in the curriculum must be critically evaluated, not uncritically embraced” (p. 719). Teachers should not use technology for the sake of just using technology; according to Pinar (2014), technology should be deliberately selected and evaluated to support the curriculum, the needs of the educator and students, and eventually to assist the students’ integration into society. According to Kopcha et al., (2020), increasing awareness of teachers’ technology acceptance as it pertains to the integration of technology into their curriculum may allow teachers to effectively shift their focus of how they utilize technology in meaningful ways to solicit active student engagement in their classrooms.

According to Bandura (1997) supporting teachers in the development of their technological and pedagogical efficacy will affect their willingness to adopt new educational technologies enabling them to deliver more creative, learner-centered instruction. Due to the school closures and need to shift to emergency remote teaching at the onset of the COVID-19 pandemic, the rate of teacher engagement with technology was accelerated and as a result, there has been an overall increase in their confidence for using it (Winter et al., 2021). Consequently, in the current climate of education and the increased demand for the usage of technology in classrooms, it is important to address teachers’ acceptance of technology with the intention of supporting them in implementing technology in their classrooms to facilitate more learner-centered instruction.

Purpose of the Study

The purpose of this study was to describe how performance expectancy, effort expectancy, attitude toward using technology, social influence, facilitating conditions, self-efficacy, anxiety, and frequency of professional development are related to K-12 teacher behavioral intent to integrate technology.

Research Questions

The research questions that guided this study were:

Research Question One (RQ1)

What is the relationship amongst (1) performance expectancy, (2) effort expectancy, (3) attitude toward using technology, (4) social influence, (5) facilitating conditions, (6) self-efficacy, and (7) anxiety and K-12 teachers' behavioral intent to use technology integration?

Research Question Two (RQ2)

How does the frequency of technology professional development relate to K-12 teachers' behavioral intent to integrate technology?

Definition of Terms

Attitude Toward Using Technology

The overall feelings of an individual to using a system (Venkatesh et al., 2003); includes confidence, anxiety, and satisfaction pertaining to items related to the usefulness of a computer as a tool in the classroom (Pynoo et al., 2011).

Behavioral Intention

The extent to which a person has constructed conscious plans to perform or not perform a specified future behavior (Warshaw & Davis, 1985).

Effort Expectancy

"[T]he degree of ease associated with the use of the system" (Venkatesh et al., 2003, p. 450).

Facilitating Conditions

"[T]he degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p. 453).

Performance Expectancy

"[T]he degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003, p. 447).

Professional Development (PD)

Specialized training provided to educators in order to support and improve their professional skills, knowledge, competence, and effectiveness in current or future roles.

Self-Efficacy

The belief in one's ability to achieve a goal or outcome, a personal judgment in one's capability; an individual's belief in their capability to execute behaviors necessary to meet expected outcomes (Bandura, 1997).

Social Influence

"[T]he degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p. 451).

Technology Acceptance

Based on self-reflection if an individual use or intend to use the technology; (Pynoo et al., 2011); determined in this study by behavioral intention, attitude, and self-efficacy.

Technology Integration

Technology integration is the use of digital technologies in the classroom allowing students to apply computer and technology skills to learning and problem-solving. That is, it is used to support students in structuring their own knowledge through the completion of authentic, meaningful tasks (Wang et al., 2004).

Technology Self-Efficacy

Technology self-efficacy is one's personal judgment of their capability to succeed at a given task. Technology self-efficacy is the belief in one's ability to meaningfully integrate technology tools in the classroom (Bandura, 1997; Goddard et al., 2000).

UTAUT (The Unified Theory of Acceptance and Use of Technology)

A technology acceptance model that aims to explain user intentions to use an information system and subsequent usage behavior (Venkatesh et al., 2003).

Summary

The purpose of this study was to describe how performance expectancy, effort expectancy, attitude toward using technology, social influence, facilitating conditions, self-efficacy, anxiety, and frequency of professional development are related to K-12 teachers' behavioral intent to integrate technology. The next chapter presents a review of the relevant literature.

CHAPTER II

REVIEW OF LITERATURE

Introduction

The purpose of this study was to describe how performance expectancy, effort expectancy, attitude toward using technology, social influence, facilitating conditions, self-efficacy, anxiety, and frequency of professional development are related to K-12 teacher behavioral intent to integrate technology. This chapter provides a review of literature concerning teacher technology acceptance including: (1) The *Unified Theory of Acceptance and Use of Technology*, (2) the educational shift caused by the COVID-19 pandemic, (3) concern for technology integration, (4) preparing teachers for 21st century learners, and finally, (5) a summary will conclude the chapter.

The Unified Theory of Acceptance and Use of Technology

While the research question guiding this study was specific to teachers' acceptance of technology in the classroom, to comprehend acceptance within the framework of the *Unified Theory of Acceptance and Use of Technology (UTAUT)*, it was necessary to understand how previous technology acceptance studies were utilized to develop a unified theory and how the *UTAUT* applied to educational studies. The *Unified Theory of Acceptance and Use of Technology* is not a novel theory of technology acceptance. It has come about through the evolution and reevaluation of many previous theories and models of technology acceptance. This

section will discuss how the *UTAUT* was developed, how it has been utilized to predict behavioral intent to use technology in various fields, and how it has been applied specifically to education research.

Information and communication technology (ICT) began its growth in business and education in the 1980s. Marangunić and Granić (2015) stated, "[w]ith the growing development of technology…and it's integration into users' private and professional life, a decision regarding its acceptance or rejection still remains an open question" (p. 81) resulting in numerous theories and models of technology acceptance and its effective usage. The foundation of these concepts can be connected back to Warshaw and Davis' (1985) research on behavioral intention (BI) in which they provided a precise definition of *intention*. During this same time period, Davis (1985) developed a new theoretical model, Technology Acceptance Model (TAM), with a goal of improving understanding of user acceptance while providing insight into successful design and implementation of new information systems. Since then, many theoretical models for technology have been developed, and researchers have been challenged with the need to navigate through the models in order to select specific and effective constructs from them or select a "favored model," each of which could disregard contributions from other constructs or models (Venkatesh et al., 2003).

As the need to access user acceptance and the use of information technology grew, more models and theories were developed to provide insight into user behaviors. Venkatesh et al. (2003) identified the existence of a multitude of competing models and identified a need for a unified theory of acceptance, and thus developed the *Unified Theory of Acceptance and Use of Technology*. The *UTAUT* is a technology acceptance model that aims to explain user intentions to use an information system and subsequent usage behavior. It is important to highlight technology as it pertains to education. Kopcha et al. (2020) explains that:

> examining technology integration through the lens of *quantity* could be misleading because it is easier for teachers to use technology for teacher-centered activities…scholars have repeatedly noted the same phenomenon: *Teachers have more access to technology than ever yet continue to enact practices that are largely teacher-centered* (p. 730, emphasis in original).

Lathan (2022) described teacher-centered learning as "the more traditional or conventional approach [where] the teacher functions in the familiar role of classroom lecturer, presenting information to the students, who are expected to passively receive the knowledge being presented" (para. 3). Technology proponents have urged for a focus on *quality* integration of technology focusing on student-centered uses of technology where students play a more active role in their own learning through creation, collaboration, and critical thinking and teachers role shift to one of a facilitator (Horn & Staker, 2015; Lathan, 2022; Tucker, 2020).

If the aim is for teachers to shift how they integrate technology into classrooms, there needs to be some level of technology acceptance. With the continued evolution of educational technologies, incorporating information and communications technology (ICT) into the teaching process can transform traditional pedagogy and "facilitate communication and interaction between students and teachers in virtual environments" (Radovan & Kristl, 2017, p. 11). The *UTAUT* is an instrument that can be implemented to help gauge teacher technology acceptance. The following sections will introduce how the *UTAUT* was developed and how it has been utilized in the realm of education.

Developing a Unified Theory

To provide a more unified model for user acceptance, Venkatesh et al. (2003) conducted an extensive review of user acceptance models with the purpose of understanding the acceptance of new information technologies by individuals. To formulate the *UTAUT*, they addressed

similarities and differences, specifically conceptual and empirical similarities across models. Eight prominent models and theories of individual acceptance are identified by Venkatesh et al. (2003) as widely accepted and used by researchers. These are cited by Venkatesh et al (2003) as: (1) Innovation Diffusion Theory (IDT) (Rogers, 1995), (2) Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975), (3) Theory of Planned Behavior (TPB) (Ajzen, 1991), (4) Social Cognitive Theory (SCT) (Bandura, 1986), (5) Technology Acceptance Model (TAM) (Davis 1989), (6) Model of PC Utilization (MPCU) (Thompson et al., 1991), (7) Motivational Model (MM) (Davis et al., 1992), and (8) Combined TAM and TPB (C-TAM-TPB) (Taylor and Todd, 1995).

It was found that across the eight aforementioned models, between two to seven determinants of acceptance were hypothesized, for a total of 32 constructs. After a systemic evaluation of the eight models, intention or usage was determined to be directly controlled by seven constructs: (1) performance expectancy, (2) effort expectancy, (3) social influence, (4) facilitating conditions, (5) attitude towards using technology, (6) self-efficacy, and (7) anxiety.

Four of the seven constructs were identified as having a significant role as direct determinants of user acceptance and usage behavior: (1) performance expectancy, (2) effort expectancy, (3) social influence, and (4) facilitating conditions. Also identified as concurrently significant were four key moderating variables (experience, voluntariness, gender, and age) (Venkatesh et al., 2003) as identified in Figure 1 (used with permission, see Appendix H).

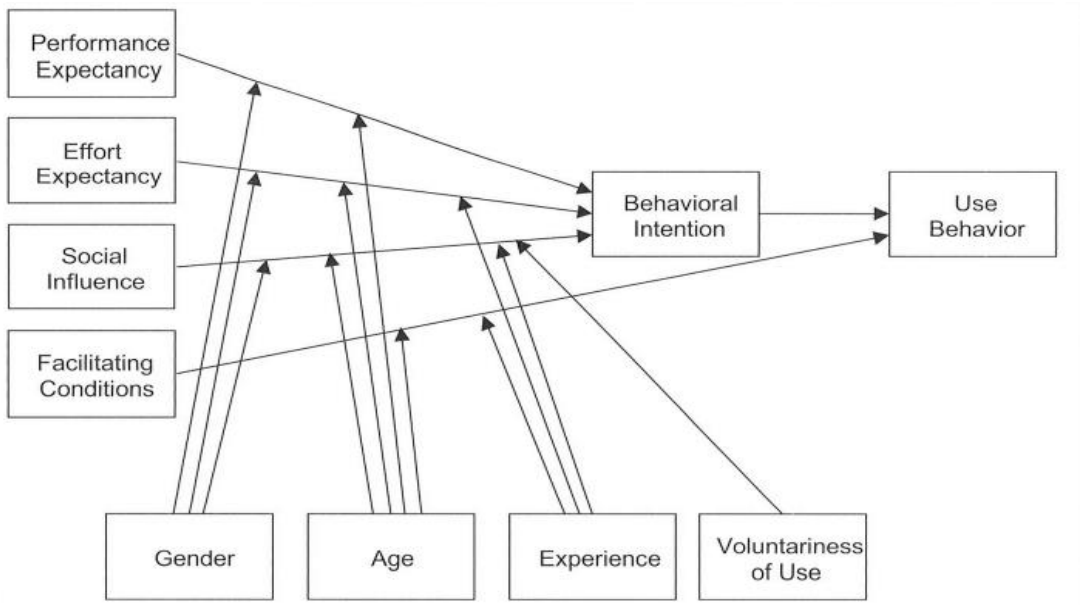


Figure 1.
UTAUT Research Model

Note. This model presents the research model for the *UTAUT*. From "User acceptance of information technology: Toward a unified view" by V. Venkatesh et al., 2003, *Management Information Systems Quarterly, 27(3),* p. 447. Copyright 2003 MIS Quarterly.

To measure behavioral intent, three scale items that have been extensively used in individual acceptance research were adapted from Davis et al. (1989, as cited in Venkatesh et al., 2003) for inclusion in the *UTAUT* questionnaire. The three questions used by Venkatesh et al. to measure behavioral intent were: (1) I intend to use the system in the next <n> months, (2) I predict I would use the system in the next <n> months, and (3) I plan to use the system in the next <n> months (p. 460). As the authors of the *UTAUT* conducted a thorough analysis of literature on the topic of technology acceptance to design their model, "it is reasonable to expect a theory that integrates the most important contributions from other models to be superior to the previous theories explanation of technology acceptance and use" (Attuquayefio & Addo, 2014, p. 250).

Constructs of the UTAUT

The *Unified Theory of Acceptance and Use of Technology* identified seven constructs that influenced behavioral intention to use the specified technology system. The following will provide information on each of the seven constructs of the *UTAUT* in addition to behavioral intent.

(1) Performance Expectancy (PE). An early study of performance expectancy explained that if a person performs poorly when they expect to do well, they will experience dissonance, and as a result, will attempt to minimize this poor performance (Aronson & Carlsmith, 1962). The authors of the *UTAUT*, Venkatesh et al. (2003), expanded on this description to define the construct as the extent that an individual believes that using the technology/system will aid them in securing gains in job performance thus indicating that performance expectancy and identifying it as the strongest predictor of behavioral intention. This explanation of performance expectancy supports the notion that if teachers are expected to integrate technology in their classrooms, there is a higher likelihood of technology acceptance.

(2) Effort Expectancy (EE). For inclusion in *UTAUT*, effort expectancy is a measure of "ease associated with the use of the system" (Venkatesh et al., 2003, p. 450), meaning, will the system be easy or difficult to access and utilize? The term *effort* can be described as "the action of trying, exertion of strength or endeavor" (Mathibe, 2008, p. 5). It is anticipated that the easier a technology is to use the higher is the likelihood of acceptance of said technology. If a large amount of effort is anticipated by the teachers in order to utilize the available technology, the prospects of them accepting and using the technology in their classrooms will decrease. Effort expectancy is one of the four constructs identified by Venkatesh et al. (2003) as having a significant role as a direct determinant of user acceptance and usage behavior.

(3) Attitude Towards Using Technology (ATUT). The relationship between attitude and behavior has long been studied and has resulted in finding that attitude is instrumental in driving behaviors and that these attitudes have a considerable amount of predictive utility (Cialdini et al., 1981). Notably, Venkatesh et al. (2003) cited Fishbein and Ajzen (1975), amongst the principal researchers in building the construct for attitude towards using technology. Fishbein and Ajzen deemed that an "appropriate measure of intention will usually allow accurate prediction of behavior" (p. 382) and went on to say that "attitudes toward an object will have at best a low relation to any given behavior with respect to that object" (p. 383). Venkatesh et al. (2003) defined attitude towards using technology as the overall feelings of an individual to using a system. Pynoo et al. (2011) described attitude as including confidence, anxiety, and satisfaction pertaining to items related to the usefulness of a computer as an instructional tool in the classroom. It is interesting to note that there are some conflicting perceptions among these researchers as to how attitudes towards using technology impact intent to use technology.

(4) Social Influence (SI). Social influence is one of the four constructs that Venkatesh et al. (2003) identified as direct significant determinants of user acceptance and usage behavior. According to the Fishbein paradigm, behavioral intention is affected by social influence. Kelman (1961, as cited by Ryan, 1982), indicates that social influence may result in an individual behaving in a manner that is compliant, meeting expectations of others regardless of their own values. Venkatesh et al. (2003) describes social influence as the weight an individual places on the opinions of others pertaining to the need for them to use new technology systems.

(5) Facilitating Conditions (FC). Venkatesh et al. (2003) defines facilitating conditions as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (p. 453). They theorized this construct to be one of the four

significant determinants of user acceptance and usage behavior, but ultimately found it not to be significant because the effect of it was accounted for by effort expectancy. Thompson et al. (1991) explained when users are trained and have support, as they encounter difficulties while using technologies, there is a distinct reduction and potential elimination of barriers. These definitions support that facilitating conditions foster an environment in which a task is easier to complete.

(6) Self-Efficacy (SE). Bandura (1977) defines perceived self-efficacy as a judgment of one's personal capability; in a later (1997) study, he expanded on his first definition and described self-efficacy as a "judgment of one's ability to organize and execute given types of performances, whereas an outcome expectation is a judgment of the likely consequence such performances will produce" (p. 21). The *UTAUT* is specifically designed to evaluate behavior intentions as it pertains to technology usage. While Venkatesh et al. (2003) did not determine self-efficacy to be a significant determining factor for behavioral intention, many other researchers (Bandura, 1977; Bandura 1997; Goddard et al., 2000; Sparks, 2002; Tschannen-Moran & Hoy, 2001) have supported that self-efficacy influences people's choice of activities and settings through their perceptions of their ability to succeed. Those who have low self-efficacy will either never attempt the new instructional concept or technique or will abandon it entirely after they meet challenges with actual classroom implementation.

(7) Anxiety (ANX). The American Psychological Association (2022) defines anxiety as "emotion characterized by feelings of tension, worried thoughts and physical changes like increased blood pressure" (para 1) and went on to explain that due to apprehension, people may avoid some situations. If educators are anxious about integrating technology into their classrooms, it is possible that their intent to utilize technology will be diminished. The study by

Calisir et al. (2014) found a negative effect on perceived ease of use of technology, supporting previous research that discussed the undesirable impact that anxiety has on technology acceptance, particularly during the early adoption period.

(8) Behavioral Intent (BI). As stated previously, behavioral intent was evaluated by Vankesh et al., (2003) through three questions in the survey and the seven constructs above were used to measure the influence on behavioral intent. Warshaw and Davis (1985) defined behavioral intention as "the degree to which a person has formulated conscious plans to perform or not perform some specified future behavior" (p. 214). Venkatesh et al. (2003) identified the seven constructs defined above to be significant determinants of behavioral intention in the models they evaluated. They hypothesized performance expectancy, effort expectancy, social influence, and facilitating conditions as direct determinants of user acceptance and usage behavior while theorizing attitude, self-efficacy, and anxiety not to be direct determinants of behavior. The tests to confirm *UTAUT* as a valid and reliable instrument to measure technology acceptance through behavioral intention resulted in strong empirical support for UTAUT and indicated performance expectancy, effort expectancy, and social influence as direct determinants of intention to use. Other studies, in which *UTAUT* was utilized, variations were found for direct determinants of behavioral intention such as in the study by Radovan and Kristl (2017) in which they utilized a confirmatory factor analysis. Their study found the construct of behavioral intention to be dependent on performance expectancy and social influence, but then found facilitating conditions rather than effort expectancy to be a determining factor. Attuquayefio and Addo (2014) and Yee and Abdullah (2021) conducted 24 educational based reviews of the *UTAUT* collectively. Of these 24 teacher technology acceptance studies, behavioral intention predictors identified by Venkatesh et al. (2003) were also indicated as follows: performance

expectancy identified in 18 studies, effort expectancy in 12 studies, and social influence was determined to be a predictor in eight studies.

Application of the UTAUT in Educational Studies

The *UTAUT* was initially tested and developed in longitudinal field studies for new technology in the workplace across four industries: entertainment, telecom services, banking, and public administration (Venkatesh et al., 2003). Since the development of the *UTAUT*, it has been widely used in technology acceptance research in a variety of fields. Attuquayefio and Addo (2014) and Yee and Abdullah (2021) conducted 24 teacher-based reviews of the *UTAUT* collectively. Of the collective 24 teacher focused studies, behavioral intention predictors as identified by Venkatesh et al. (2003) were also indicated in these many of these studies reviewed. The 24 studies supported the assumptions by Venkatesh et al. (2003) as follows: performance expectancy identified in 18 studies, effort expectancy in 12 studies, and finally social influence was determined to be a predictor in eight studies. The research study conducted by Yee and Abdullah (2021) assessed *UTAUT* and other models as conceptual frameworks in education research. They evaluated 39 studies occurring over a span of 13 year, between 2007 and 2020, and have established that the *UTAUT* has been widely accepted and implemented to study acceptance of technology in the field of education. Yee and Abdullah (2021) depicted a chronological profile of UTAUT usage showing "an incremental trend and actively conducted from 2017 to date" (p. 13).

Studies that reviewed *UTAUT* as a conceptual framework (Attuquayefio & Addo, 2014; Yee & Abdullah, 2021) have established that the *UTAUT* has been widely accepted and implemented to study acceptance of technology in the field of education. Yee and Abdullah (2021) stated that "technology acceptance studies among academicians and students [utilizing

UTAUT] were extensively carried out worldwide" (p. 13). While Attuquayefio and Addo (2014) explained selecting the *UTAUT* for their research was "justified by its global and integrative approach, incorporating a wide variety of explanatory variable from the main theoretical models developed to explain technology acceptance and use" (p. 250). Yee and Abdullah (2021) found that acceptance of information and communication technology (ICT) studies were most frequently utilized to evaluate student acceptance (58.97%). While reviews show that many of the studies that use *UTAUT* in the education sector focus on post-secondary students or student teachers, there are applications of *UTAUT* for teacher acceptance. While Attuquayefio and Addo (2014) only reviewed one study that focused on in-service teachers out of the 20 studies evaluated, of the 39 studies evaluated by Yee and Abdullah (2021), 16 (41.03%), were focused on teachers' acceptance of ICTs. Additionally, 30 (76.91%) of the studies reviewed utilized *UTAUT* versus other models. One study evaluated by both reviews was Pynoo et al. (2011) which utilized *UTAUT* to evaluate teachers' acceptance of a digital learning environment.

The study by Pynoo et al. (2011) correlated the four constructs that formed the base of the *Unified Theory of Acceptance and Use of Technology* (performance expectancy, effort expectancy, social influence, & facilitating conditions) to predict acceptance. Acceptance in this study was measured as attitude, behavioral intention, self-reported use, and near-term use (i.e., use behavior obtained from log files). In this study, Pynoo surveyed secondary school teachers in Belgium three times over the course of a year (T1 n = 64, T2 n = 41, T3 n =55) to measure their acceptance of the technology, in this study the technology was Smartschool. The results of the study aligned with Venkatesh et al. (2003) in that performance expectancy was the chief predictor of acceptance, but found that other constructs have significant influences of teacher use of technology. The discussion of predicting acceptance stated:

> teachers…intend to use Smartschool because it is useful (PE) and their superiors expect them to use it (SI); they report they use Smartschool more frequently the more they feel that their superiors expect them to use it (SI) and if the ideal conditions are created (FC); and their actual use of Smartschool depend on its usefulness (PE) and pressure from superiors to use Smartschool (SI). (Pynoo et al., 2011, p. 573).

The Educational Shift Caused by the COVID-19 Pandemic

The education system is in a unique period in which technology and technology professional development is at the forefront as an essential priority of the education system. The problem is that even though technology availability is increasing, "[t]here is an apparent gap between the amount of technology available in today's classrooms and teachers' use of that technology for instructional purposes" (Kopcha, 2012, p. 1109). Later, Kopcha et al. (2020) cited multiple researchers, expressing that after nearly 20 years of K-12 technology usage, teacher-centered practices continue to be the primary application of technology regardless that technology is now more readily available.

Even as early as 1997, Bandura observed that technology is increasingly impacting instruction, is rapidly changing, and is requiring constant advancement of knowledge and skills. Years later, Pinar et al. (2014) stated that curriculum, especially instructional design, has been influenced by technology, and "technology literacy must be viewed in the context of the changing nature of the general or core curriculum" (p. 718). In spring 2020, COVID-19 caused widespread school closures, accentuating the limitations of the educational system regarding the use of technology. Almost overnight, it became necessary that educators become knowledgeable and competent with online education without the necessary training or technology backing.

In 1992, Fensham described a novel period of fluidity in technology education that still holds true today, especially given the fallout from the current COVID-19 pandemic. As noted in

the meta-narrative review by Bozkurt et al. (2022), “quick adaptability and flexibility have been key to surviving the substantial challenges generated by COVID-19” (p. 892).

Technology as a “Lifeboat”

As districts “survived” the second half of the spring 2020 semester and welcomed the summer break, they entered a time in which the format for the delivery of instruction in fall 2020 was unknown. Many districts evaluated potential resources and learning management systems (LMS) over the summer and deliberated over all the potential scenarios in which instructors may physically return to school or continue with online teaching. With an uncertain future, districts knew they needed to be prepared, and many adopted new LMS to support any modality of instruction that would be required in the coming school year, while at the same time, meeting state requirements for documenting attendance during remote learning.

As the fall 2020 school year approached, announcements were made stating that districts were forced to return to school via remote (online) learning. This required an innumerable number of educators to learn a new system for developing and distributing instruction. Even for those who delivered instruction through a familiar platform, expectations for the rigor of instruction were much higher compared to the pass/fail guidelines that were implemented during the spring emergency remote setting.

Multiple researchers have determined that teachers’ persistence, resilience, and level of effort when setbacks occur, or when things do not happen as planned, are directly influenced by self-efficacy beliefs (Bandura, 1977, 1997; Sparks, 2002; Tschannen-Moran & Hoy, 2001). With the dynamic changing educational environment instructors have experienced over the course of the pandemic and with the rapid change in the instructional tools to be utilized to deliver the different instructional methods, even veteran teachers are feeling the strain and

questioning their own abilities and effectiveness. Moore-Hays (2011) explained the lack of support for changes impacts teachers, leaving them feeling unprepared when faced with pedagogical implications as a result of a shift to a new teaching and learning paradigm. A study by Songkram and Osuwan (2022) explained how teachers around the world utilized various online teaching platforms, social tools, and communication tools during the pandemic, yet "most teachers still lacked knowledge and skills in using technology, which rendered teaching and learning inefficient" (p. 2). Due to COVID-19, technology was required for the continuity of teaching and learning, and as a climate is emerging in which technology use has become an expectation in classrooms. Teachers' technology acceptance may have been impacted from a variety of sources including their performance during COVID-19, watching others perform tasks, verbal persuasion encouraging extra effort and persistence including that from administration, technology support and peers, and their physical and emotional states (Sparks, 2002).

District technology support personnel needed to prepare teachers purposefully and systematically during this emergency situation. At the onset of emergency remote learning, districts resorted to "triage professional development" (Foulger et al., 2020, p. 518) with the intention of filling some of the gaps in knowledge and skills, allowing for the continuity of education and learning. As technology usage continues to advance exponentially, the necessity for professional development to support teachers in the effective implementation and integration of technology into the classroom will continue to escalate. A study by An et al., (2021) found that professional development was necessary to help teachers better communicate with families and prepare K-12 teachers for future emergencies. Importantly they also found that most of the participants wanted to learn more about online teaching and a "one size fits all" approach will not work, but rather customized PD with ongoing support at regular intervals and just-in-time

support and feedback are important, especially during these unprecedented times. As many teachers indicate plans to continue use of digital teaching practices and online tools after the pandemic (Francom et al., 2021), it will be important to provide continuous professional development for technology integration beyond what was needed for continuity during the pandemic.

Researchers propose that staff training or professional development activities support increasing and enhancing teacher skills (Bandura, 1977, 1997; Darling-Hammond & Bransford, 2005; Goddard et al., 2000; Spark, 2002) theorizing that these skills, in turn, positively impact and increase acceptance. Currently, technology professional development is an ongoing meaningful concern in many countries including the United States; the U.S. National Education Technology Plan 2010 (NEPT) calls for more training as it recognized that there is a distinct disparity in understanding and skill level amongst educators with new and emerging technologies utilized daily by professionals in other sectors (Chung & O'Connor-Petruso, 2013).

Importantly, an earlier evaluative report published by the U.S. Department of Education (2009) identified an essential need for strong technology professional development (PD), particularly within economically disadvantaged schools. In fact, this research study equated a lack of training as a distinct obstacle to effective technology usage by educators. Moore-Hayes (2011) later identified the most critical obstacle to technology integration to be personal barriers; teachers are hesitant to integrate technology despite the availability and PD opportunities, they are not confident in their skills, and are disinclined to ask for help. Early stages of the COVID-19 pandemic teachers still expressed lack of confidence and the need for support and training for problems they encounter with using technology during school closures (Winter et al., 2021). Research has shown a positive correlation between technology training and technology

acceptance, in addition to intention to help other teachers with technology integration (An, 2018). Researchers emphasize that in an effort to build teacher skills, it is imperative to implement effective professional development (Bandura, 1997; Goddard et al., 2000; Zimmerman, 2014).

As schools move back to in-person learning there is a heightened awareness that it is necessary to be prepared for possible future school closures due to a new strain of COVID-19, other diseases, or disasters (Trust & Whalen, 2021). The primary solution to this potential problem is access to technology for both students and teachers in addition to effective training that will allow teachers to have the knowledge and skills to utilize technology for the continuity of teaching and learning both in and outside of the school building.

Preparing Teachers for 21st Century Learners

Moving forward into the complex "world *with* COVID-19" (Teräs et al., 2020, p. 9, emphasis in original), van den Berg (2020) states that experiences during the pandemic have shown educators it is possible to meet the preferred mode of study for students using 21st-century skills. Although technology in and of itself does not provide students with 21st-century skills, the ability to harness technology for a variety of purposes is a key component of 21st-century skills.

Students in today's classroom have been immersed in technology essentially their entire lives and possess a natural comfort in using technological tools. As the world becomes more technology-driven and digitized, the need for teachers to support students' ability to harness and utilize technology for marketable jobs and for personal growth and development is amplified. Thannimalai and Raman (2018) explain "technology must be integrated in the classroom according to the 21st-century education and the needs of students of the Z generation who are

digital natives" (p. 222). These digital natives already have the capacity to effectively organize, evaluate, and communicate information through leveraging technology (Beriswill et al., 2016). Teachers are faced with a teaching and learning paradigm where they must demonstrate educational technology literacy although not feel fully prepared (Moore-Hayes, 2011).

Teachers are preparing students to live and work during the Fourth Industrial Revolution which is focused on technology-driven jobs, and the digital economy resulting from that revolution (Thannimalai & Ramen, 2018). Assessing the likelihood for success of newly introduced technologies through understanding the drivers of acceptance allows for the implementation of professional development activities. Completion of these activities enhance skills and nurture teacher technology acceptance, especially for those less inclined to adopt new systems (Venkatesh et al., 2003). While technology integration is emerging as a priority post-COVID-19, teachers will likely encounter difficulties as they are early in their attempts of implementation known as the "implementation dip." It is likely that the "dip" will ascribe the problems to the technology and could develop "technology hostile beliefs" (Thrum & Barzel, 2020, p. 1420) adversely impacting the distribution of resources in support of technology integration.

According to Hulon et al, (2020), adult learners are actively very motivated when there is a compelling need to learn the material and directly apply that information to their own situation or work. The current unstable status of education, due to the uncertainties of the pandemic, has made the implementation of technology particularly relevant to the situation of every educator, and as a result, may increase not only the need but the desire for more prevalent technology professional development programs. This is critical to increasing teacher skills and technology self-efficacy because their acceptance of educational technologies is linked to their efficacy

beliefs that would reflect in their level of effort and duration of that effort during stressful situations (Bandura, 1977, 1997; Sparks, 2002; Tschannen-Moran & Hoy, 2001). These unfamiliar circumstances include the shift to online learning due to school closures and teaching in hybrid learning environments, i.e., teaching both face-to-face and online simultaneously.

Based on an extensive 40-year literature review, Zee and Koomen (2016) suggested that teachers' perceived usefulness, ease of use, and attitude toward technology may be positively influenced by their self-efficacy, which potentially furthers their implementation of technology in the classroom. Collectively, these findings call for an urgent need for a curricular vision with the respect to technology for learning amongst educators; the production of technically literate educators will fall on the shoulders of teacher education (Darling-Hammond & Bransford, 2005) and professional development programs.

As the world becomes more technology-driven and digitized, increasing educator technology acceptance through effective technology professional development will empower active engagement in teaching and learning strategies. Access to technology also allows for flexibility to support students' diverse learning and technology-based educational needs by providing "appropriate" and "meaningful" educational materials and experiences within the curriculum (Darling-Hammond et al., 2017; Nepo, 2016).

Professional Development: A Consequence of the Pandemic

As a direct consequence of the pandemic, online teaching and learning, as well as a more ubiquitous integration of technology in the classroom, will likely become more commonplace for a majority of campuses moving forward. Effective professional development plans will be required (Foulger et al., 2020), ensuring that teaching and learning can continue uninterrupted now and in the future. Educational institutions strive to allow for the continuity of learning

despite the crisis and social distancing (Teräs et al., 2020). Accordingly, the education system is in an unprecedented time in which technology and technology professional development is at the forefront and a priority of the education system.

Reeves and Pedulla (2013) state that online professional development (OPD) can be implemented as a positive step to eliminating various barriers to face-to-face professional development such as scheduling and access to technology. Zhu and Liu (2020) believe that technologists need to develop a capacity for online teaching with professional staff supporting teachers with knowledge of online systems. Tweed (2013) suggests that providing quality professional development training on an individual basis to meet the target needs of teachers with low self-efficacy increases these teachers' self-efficacy. This training will make them more effective and skillful and would reduce the cost of providing professional development activities to those who do not need it in specific areas. As Goodlad and Su (1992) wrote: curriculum as technology focuses on the problem of packaging and presenting material to the learner, but not the individuality of the learner or the content. With the aim of mitigating this dichotomy, districts should provide a variety of presentation styles and topics for teachers to select whichever option best suits their technology skill level and content area so as to achieve an increase efficacy.

As the usage of technology in both teaching and learning continues to advance, the necessity for professional development programs to support teachers in the effective implementation and integration of technology into the classroom will continue to increase. Thurm and Barzel's (2020) study found that professional development programs significantly influence teachers' technology-related beliefs and technology use. This indicates that professional development may positively influence teacher technology acceptance; when

teachers' have high technology acceptance, their integration of technology into the classroom settings increases. In other words, if the training can encourage desired results through behavioral changes, an individual's sense of self-efficacy increases (Sparks, 2002).

While barriers and disagreements to technology integration do continue to exist, many of those arguments that have been prominent in the past have lessened considerably over time as demand and funding for technology increase. Particularly so, these issues have been heavily impacted with current unanticipated widespread events such as the spread of COVID-19 globally, and its drastic impact on the delivery of instructional lessons and materials. As noted by An et al., (2021) a positive outcome of the pandemic was a shift to "technology-enabled learning…an opportunity to get all teachers to explore the use of technology for teaching and learning…rethinking normal and taking advantage of online and blended learning to improve students' learning and meet their different needs" (p. 2608).

Summary

This chapter presented literature on four interrelated topics relevant to this study: A *Unified Theory of Acceptance and Use of Technology*, the educational shift caused by the COVID-19 pandemic, concern for technology integration, and preparing teachers for 21st century learners. The review of literature has demonstrated that there is limited literature available on evaluating constructs that impact teacher technology acceptance after the COVID-19 pandemic, therefore there is a need for this study. The next chapter focuses on the methodology employed to conduct the study. The topics will include: introduction, research design, participants, setting, instrumentation, reliability and validity, data collection procedures, data analysis procedures, limitations of the study, and a summary.

CHAPTER III

METHODOLOGY

Introduction

The purpose of this study was to describe how performance expectancy, effort expectancy, attitude toward using technology, social influence, facilitating conditions, self-efficacy, anxiety, and frequency of professional development are related to K-12 teachers' behavioral intent to integrate technology. *Unified Theory of Acceptance and Use of Technology (UTAUT)* was designed by Venkatesh et al. (2003) to measure and evaluate drivers for acceptance of technology. For this study, the *UTAUT* was focused on K-12 teachers' intentions to integrate technology.

This chapter presents the methodology used to conduct this study and is organized into the following sections: (1) Introduction (2) Research Design, (3) Participants, (4) Setting, (5) Instrumentation, (6) Reliability and Validity, (7) Data Collection Procedures, (8) Data Analysis Procedures, (9) Limitations of the Study, and (10) Summary.

Research Design

A quantitative approach, specifically survey design, was utilized for this study as it is essential to collect empirical data on teachers' opinions and perceptions to analyze and evaluate their responses. Quantitative design encompasses an extensive discipline incorporating various methodological approaches: experimental, quasi-experimental, and non-experimental. The quantitative research approach that was implemented in this study was non-experimental,

specifically, the study looked at correlational research. Correlational research is employed within educational settings to test questions about relationships between variables without controlling or manipulating them.

The survey measured and quantified a "property," i.e., technology acceptance, already in existence (Hoy & Adams, 2016). Ponto (2015) advocates for the legitimacy, value, and usefulness of survey research which supports researchers in describing and exploring variables within the constructs of their interest. In this study, the construct of interest is technology acceptance which was measured through the use of the survey instrument titled, *Unified Theory of Acceptance and Use of Technology (UTAUT)* designed by Venkatesh et al. (2003). Survey research allows for the collection of data and information from a large population. In this study, the data collected were utilized to evaluate drivers of teachers' intent to integrate technology. Additionally, data on frequency of technology development were also evaluated for its effect on teachers' technology acceptance.

For this study, to answer research question one, the independent variables were the seven constructs of the *UTAUT,* (1) performance expectancy, (2) effort expectancy, (3) attitude toward using technology, (4) social influence, (5) facilitating conditions, (6) self-efficacy, and (7) anxiety and the dependent variable was behavioral intent to implement technology. For the second research question, the independent variable was the demographic question, frequency of professional development, and the dependent variable was behavioral intent to implement technology.

Participants

The population of this research study included kindergarten through 12th-grade teachers from a north-central Texas school district during the 2021-2022 school year. The total

population of teachers in the district was just over 1,500. All teachers from the district were invited to participate in the survey for the study. Participants were self-selected to participate. A total of 209 teachers accessed the survey and 19 responses were removed because they selected the option to opt out or were not K-12 classroom teachers. The final sample size was 190 teachers.

Demographic questions were included in the online survey. Table 1 displays demographic data collected from the survey and includes correlating percentages of the characteristics of the total population as reported in the 2020-21 Texas Academic Performance Report (TAPR), District Staff Information (Texas Education Agency, 2022). This table presents participants' demographics and compares it to the demographics of the population of district teaching staff. The data in the table demonstrates that the sample that was used in the study is representative of the population of the district.

Table 1

Demographic Characteristics of Participants in Study (N=190) versus Total Population

	Number	Percentage	Total Population Percentage
Level of Instruction			
Elementary (K-6)	75	39.5	*
Junior High (7-9)	66	34.7	*
High School (10-12)	66	25.8	*
Highest Degree Held			
No Degree	0	0.0	0.3
Bachelors	93	49.0	65.7
Masters	93	49.0	32.9
Doctorate	4	2.1	1.1
Age			
24 and under	7	3.7	*
26-41	72	37.9	*
42-64	108	56.8	*
65 and over	3	1.6	*
Gender			
Female	164	86.3	81.3
Male	25	13.2	18.7
Prefer not to say	1	0.5	*
Ethnicity			
American Indian	0	0.0	0.7
Asian	2	1.1	2.2
Black or African American11	11	5.8	6.4
Hawaiian or Other Pacific Islander	1	0.5	0.2
Hispanic or Latino	20	10.5	13.7
White	148	77.9	76.1
Mixed Race	4	2.0	0.6
Other	1	0.5	*
Prefer not to respond	3	1.6	*
Years of Experience			
Beginning Teachers	3	1.6	3.9
1-5 Years of Experience	31	16.3	23.8
6-10 Years of Experience	41	21.6	23.6
11-20 Years of experience	66	34.7	29.7
Over 20 Years of Experience	49	25.8	19.0 [α]
Number of Technology PD in past 12 months			
0-2 per years	122	64.2	*
3-4 per year	63	18.9	*
5 or more per year	5	2.6	*

* Data not available on TAPR report

[α] Combined TAPR data original report separates 21-30 years and over 30 years

Setting

The study was conducted at a north-central Texas school district. The district was founded in 1958 as a result of three cities merging their school districts while keeping their local governments separate. Prior to unifying into the current school district, the area was served by four early schools that opened as early as 1882. When the tri-city district was created, it served 3,116 students its first year. Currently, the district serves approximately 22,962 students across 23 elementary schools (grades K-6), five junior high schools (grades 7-9), four high schools (grades 10-12), and an alternative school staffed with teachers from all grade levels.

The district prides itself with being "rich with diversity, which gives the district a distinctly international flavor," supporting students that represent more than 70 different native languages (HEBISD, n.d.) and has been identified as the most diverse school district in Texas.

Instrumentation

The instrument utilized to collect data for this study was the *Unified Theory of Acceptance and Use of Technology (UTAUT)* (Appendix A). Venkatesh et al. (2003) adapted this survey after an extensive review of eight prominent user acceptance models in order to produce a unified theory of acceptance which would include constructs that showed significant impact on user acceptance across all models. This survey contained 31 seven-point Likert scale questions (ranging from 1 meaning *Strongly Disagree* to 7 meaning *Strongly Agree*) to collect participant data and responses of their perceptions of seven constructs and their behavioral intention to use technology. Likert-scale instrumentation is commonly used in surveys and the seven-point scale, such as the one used in this study, have "been shown to reach the upper limits of the scale's reliability" (Allen & Seaman, 2007, p. 64). Willits et al. (2016) described the seven category response scales as straight forward, and useful for extending delimitation of responses.

The seven constructs that are direct determinants of behavioral intention (BI) include: (1) performance expectancy (PE), (2) effort expectancy (EE), (3) attitude towards using the technology (ATUT), (4) social influence (SI), (5) facilitating conditions (FC), (6) self-efficacy (SE), and (7) anxiety (ANX). The purpose of these constructs is to evaluate the correlation of each of the constructs on behavioral intention as it pertains to intent to implement technology. Venkatesh et al. (2003) measured behavioral intent by including three Likert-scale questions in which they adapted from Davis et al. (1989, as cited in Venkatesh et al., 2003). With the permission of Venkatesh et al. (2003), a few phrases were adapted for this study to better fit the use of technology in a K-12 classroom. In addition, 9 demographic questions were added at the beginning of the instrument. Demographic data were utilized to ensure the sample was representative of the population and to answer research question two pertaining to identifying correlations between demographics, specifically frequency of technology professional development, and behavioral intent to integrate technology.

Reliability and Validity

Validity and reliability of the questionnaire have been demonstrated by the original authors of the *UTAUT*. One of the objectives of Venkatesh et al (2003) in formulating the *Unified Theory of Acceptance and Use of Technology* was to empirically validate the *UTAUT*. They did this in multiple steps, with the first being initial testing across four organizations (N = 215). In this initial testing the constructs were modeled using reflective indicators and the internal consistency reliabilities (ICR's) were all greater than .70 (Venkatesh et al., 2003). They evaluated the inter-item correlation matrices in which they established that the intra-construct item correlations were very high and inter-construct item correlations were low; this process was repeated two additional times with identical patterns. To further validate the *UTAUT* and add external validity, Venkatesh et al. gathered data from two additional organizations (N=133) in

order to cross-validate the instrument. They used the same data analysis procedures as in the preliminary testing, the result was a pattern that emulated the initial validation. These results indicate that the *UTAUT* is not only a valid, but a reliable instrument for measuring technology acceptance. Venkatesh et al. (2003) states, "[t]hese tests provided strong empirical support for *UTAUT*…*UTAUT* was able to account for 70 percent of the variance - a substantial improvement over any of the original eight models and their extensions " (p. 467).

Since the creation of *UTAUT*, multiple researchers have implemented it into their studies. Attuquayefio and Addo (2014) identified 20 studies that utilized *UTAUT* as the theoretical framework, 12 of which were in the field of education. Additionally, Yee and Abdullah (2021) evaluated 39 studies conducted between 2007 and 2020 and found that *UTAUT* was continuously utilized to examine user acceptance and favored over other existing models. Many of the studies evaluated conducted analysis of reliability and validity and/or Cronbach's alpha for internal validity.

Reliability was specifically addressed by Alshahrani and Walker (2017). They cited previous research in which confirmatory factor analysis computed construct reliability (CR) in addition to subsequent validity indices resulting in robust construct reliability and high internal consistency. Also addressed in Alshahrani and Walker (2017) research findings was robust convergent validity (CV) for the constructs in the *UTAUT* model. The favored and established use of this instrument in various fields, including education, has demonstrated that the *UTAUT* is a valid and reliable instrument for collecting data on user acceptance of technology and was therefore selected for use in this study.

Data Collection Procedures

Subsequent to obtaining approval from the Institutional Review Board at The University of Texas Rio Grande Valley, data were collected from participants. Demographic data and the

Unified Theory of Acceptance and Use of Technology (UTAUT) were combined into a single survey which was made available to participants through a secure Qualtrics online survey. The survey was distributed mid-April of 2021 to all district teachers via their district email address by the researcher. The email included a message from the researcher summarizing the purpose of the survey and a link to the online consent form. Participants who agreed to participate were directed to the online survey which took approximately 10 minutes to complete.

Given that participation in the survey was voluntary, there was a high probability of having a large non-response rate that would result in a non-response error. To gather as much data as possible to allow for reliable conclusions and generalizations to be drawn (de Vaus, 2014), the invitation to participate was resent to teachers every two weeks with identical verbiage in the email to remind them of the opportunity to participate in the study. This resulted in a total of four invitations to participate being emailed. The survey closed mid-June 2021. This resulted in 209 teachers participating in the survey. Of the 209 respondents to the survey, 15 opted out of completing it, and 4 were filtered out by the researcher because they were not K-12 classroom teachers, leaving a final sample size of N = 190.

Data that were submitted were returned confidently to the researcher via Qualtrics. The survey was anonymous and no identifying information was collected; all data collected remained confidential.

Data Analysis Procedures

This study addressed two research questions. To answer the research questions addressed in this study, the Statistical Package for the Social Sciences (SPSS) verizon 26 was utilized to analyze the data collected. The following describes the data analysis procedures by research question.

RQ1: What is the relationship amongst (1) performance expectancy, (2) effort expectancy, (3) attitude toward using technology, (4) social influence, (5) facilitating conditions, (6) self-efficacy, and (7) anxiety and K-12 teachers' behavioral intent to use technology integration?

To address the first research question, a Pearson Correlation was conducted to determine the strength and direction of the seven constructs of the *UTAUT* survey and behavioral intent. A copy of the original data were created and the data were sorted into three grade level groups, (1) elementary (n = 75), (2) junior high (n = 66), and (3) high school (n = 49) to allow for comparison. The sample collected was through voluntary responses, from here random samples were taken to eliminate bias, reduce sampling error, and ensure that any significance found was not due to large sample size. A random selection of 30 participants were selected from each of the grade level groups to run data analysis and to allow for comparison between groups. Additionally, a random sample of 40 participants were selected from the raw data as a baseline to compare all the groups to. The correlation was performed four times, one on each random sample. Data were then analyzed for correlations and results were compared across groups.

RQ 2: How does the frequency of technology professional development relate to behavioral intent to integrate technology?

Just as in the first research question, the data remained grouped into a mixed sample in addition to samples from each grade level group. A Pearson Correlation was repeated with each random sample (whole group, elementary, junior high and high school) to determine if there was a significant correlation between frequency of professional development and behavioral intent to integrate technology.

Limitations of the Study

The purpose of this study was to describe how performance expectancy, effort expectancy, attitude toward using technology, social influence, facilitating conditions, self-efficacy, anxiety, and frequency of professional development are related to K-12 teachers' behavioral intent to integrate technology. The following limitations may prevent the generalizability of the study's findings:

1. Sampling bias. Teacher bias and preference could factor in, and work in favor of, or against, the research and data. The teachers in this study volunteered for, and therefore, are self-selected for their participation in the study. Some teachers are early adopters and excited to learn anything new about technology and implement it into their teaching strategies, methodologies, and lesson plans; on the other hand, there are other teachers who already have very negative opinions or experiences with technology. This could influence the study if they decline to participate; therefore, data reflecting those with a negative opinion of technology would not have been included in the study.
2. Non-response bias. The exclusively online survey produced a reduced sample size resulting in a non-response error which could impact the margin of error of confidence level. Timing or other extraneous variables could have also influenced the non-response rate. The reduction of sample size made the generalization of data more limited.
3. Influence. The researcher in this study is an instructional technology coach for the district. This may have influenced the motivation of teachers to participate in the study.

4. Technology Integration not defined for survey respondents. The definition of technology integration was left undefined and open for interpretation from respondents. It is possible their understanding of technology integration did not align with the definition used in this study. Variations in definition of terminology could have resulted in variations in responses to survey questions.
5. Lack of longitudinal perspective. This study was conducted in a specific time frame during the first year's return to in-person learning after the initial onset of the COVID-19 pandemic. This study does not permit an evaluation of the long-term impact of the pandemic on teachers' perceived technology acceptance.
6. Limitations of Likert scales. There are two limitations that could influence the responses of this study. Participants may agree with statements in the survey and answer in a favorable manner; this is known as acquiescence bias. Additionally, participants may desire to provide positive impressions of their attitudes and answer questions to reflect their desired appearance, which is social desirability or conformity bias. The research questions that guided this study sought to find answers pertaining to teacher technology acceptance, which for the purposes of this study, was measured through self-reflection. Self-reflection is based on opinions and perspectives rather than fact.
7. Extraneous variables. There are other possible extraneous variables that may have impacted the results of the study. These variables could include: COVID fatigue, limited time to participate due to teacher workload, and other personal or environmental factors. Other limitations could be the format of the survey including the length or complexity of questions and/or lack of open-ended questions for participants to explain their perceptions and experiences. While each of these

variables may have had an effect on this study, every attempt was made to minimize the effect of these variables on the results of this study.

Summary

This chapter described the methodology that was used to conduct the research study in alignment with the purpose of the study. This chapter included the following elements: (1) Introduction (2) Research Design, (3) Participants, (4) Instrumentation, (5) Reliability and Validity, (6) Data Collection Procedures, (7) Data Analysis Procedures, (8) Limitations of the Study, and (9) Summary. The following chapter presents the results of the study.

CHAPTER IV

RESULTS

Introduction

The purpose of this study was to describe how performance expectancy, effort expectancy, attitude toward using technology, social influence, facilitating conditions, self-efficacy, anxiety, and frequency of professional development are related to K-12 teachers' behavioral intent to integrate technology. The following two research questions were addressed:

RQ1: What is the relationship amongst (1) performance expectancy, (2) effort expectancy, (3) attitude toward using technology, (4) social influence, (5) facilitating conditions, (6) self-efficacy, and (7) anxiety and K-12 teachers' behavioral intent to use technology integration?

RQ2: How does the frequency of technology professional development relate to behavioral intent to integrate technology?

Results for Research Question One

Prior to evaluating the data to answer the research questions, Cronbach's Alpha (α) was utilized to confirm internal score consistency of this study. The Cronbach's Alpha was calculated to be .776. According to Salkind and Frey (2020), coefficients .70 or higher are typically desired for most types of reliability, therefore the α for this study was sufficient to show internal score consistency.

To determine the relationship amongst (1) performance expectancy, (2) effort expectancy, (3) attitude toward using technology, (4) social influence, (5) facilitating conditions, (6) self-efficacy, and (7) anxiety and K-12 teachers' behavioral intent to integrate digital technologies a Person correlation was conducted using a statistical analysis program (SPSS).

The Pearson Correlation resulted in all groups (sample of whole, elementary, junior high and high school) showing behavioral intent to use technology had significant moderate to strong positive correlations between performance expectancy (PE), effort expectancy (EE), and attitude (ATUT). Elementary teachers had strong correlations to all three constructs, the results were as follows, PE ($r = .576$, $\rho < .001$), EE ($r = .540$, $\rho = .002$), with the strongest being ATUT ($r = .804$, $\rho < .001$). Junior high teachers' strongest correlation with behavioral intent was PE ($r = .625$, $\rho < .001$), next was EE ($r = .531$, $\rho = .003$) and moderate correlation to ATUT ($r = .455$, $\rho = .011$). High school teachers showed similar hierarchy is correlation of these three constructs as junior high; strongest being PE ($r = .511$, $\rho = .004$), followed by EE ($r = .411$, $\rho = .024$), then ATUT ($r = .385$, $\rho = .036$). The whole group correlations were as follows, PE ($r = .677$, $\rho < .001$), EE ($r = .597$, $\rho < .001$) and ATUT ($r = .748$, $\rho < .001$).

Social influence was significant with a moderately positive correlation to behavioral intent in the whole group ($r = .436$, $\rho = .005$), elementary ($r = .398$, $\rho = .037$) and junior high ($r = .390$, $\rho = .033$) samples. High school showed no significant correlation to social influence. The correlation between facilitating conditions and behavioral intent showed no significant correlation in any groups. There was a significantly and moderately positive correlation of self-efficacy and behavioral intent in the whole group ($r = .358$, $\rho = .024$) and high school ($r = .389$, $\rho = .034$) samples. Finally, anxiety showed a moderately negative significant correlation to behavioral intent in the whole group ($r = -.342$, $\rho = .031$) and junior high ($r = -.387$, $\rho = .035$) sample. Table 2 below depicts the output from SPSS for the Pearson Correlations between the seven constructs and behavioral intent in each of the sample groups.

Table 2

Correlation of Constructs and Behavioral Intent

Construct	Pearson r	Significance
	Behavioral Intent	
Whole Group		
Performance Expectancy	.677**	<.001
Effort Expectancy	.597**	<.001
Attitude	.748**	<.001
Social Influence	.436**	.005
Facilitating Conditions	.143	.397
Self-Efficacy	.358*	.024
Anxiety	-.342*	.031
Elementary		
Performance Expectancy	.576**	<.001
Effort Expectancy	.540**	.002
Attitude	.804**	<.001
Social Influence	.398*	.037
Facilitating Conditions	.278	.136
Self-Efficacy	.221	.241
Anxiety	-.235	.211
Junior High		
Performance Expectancy	.625**	<.001
Effort Expectancy	.531**	.003
Attitude	.455*	.011
Social Influence	.390*	.033
Facilitating Conditions	.314	.091
Self-Efficacy	.318	.087
Anxiety	-.387*	.035
High School		
Performance Expectancy	.511**	.004
Effort Expectancy	.411*	.024
Attitude	.385*	.036
Social Influence	.135	.478
Facilitating Conditions	.093	.625
Self-Efficacy	.389*	.034
Anxiety	-.183	.333

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Results for Research Question Two

To determine how the frequency of technology professional development related to behavioral intent to integrate technology a second set of Pearson Correlations were carried out on each of the four sample groups. Significant positive correlations between frequency of professional development and behavioral intent were present in the elementary and junior high samples. For each of the three behavioral intention questions elementary teachers' results had moderately positive correlations. The three questions were intent, predict, and plan to integrate technology and the correlations ranged from .417 to .434 with a minimum significance of .022. There was also a moderately positive correlation between frequency of professional development and mean behavioral intent ($r = .428$, $\rho = .018$). Junior high teachers showed significant moderately positive correlation between PD and behavioral intent on two of the three questions, intent ($r = .388$, $\rho = .034$) and plan ($r = .388$, $\rho = .034$). There was also a significant positive correlation to mean behavioral intention ($r = .369$, $\rho = .045$). High school correlations were all less than .1 showing insubstantial correlations. Table 3 below depicts the output from SPSS for the Pearson Correlations between the teacher reported frequency of professional development and behavioral intent in each of the sample groups. The correlation was evaluated for each of the three behavioral intent questions individually and as a single variable (Mean Behavioral Intent).

Table 3

Correlation Between Professional Development and Behavioral Intent

	Pearson r	Significance
Frequency of Professional Development		
Whole Group		
Q22_1 Intent to integrate	.121	.458
Q22_2 Predict to integrate	.154	.344
Q22_3 Plan to integrate	.110	.498
Mean Behavioral Intent	.130	.424
Elementary		
Q22_1 Intent to integrate	.434*	.017
Q22_2 Predict to integrate	.430*	.018
Q22_3 Plan to integrate	.417*	.022
Mean Behavioral Intent	.428*	.018
Junior High		
Q22_1 Intent to integrate	.388*	.034
Q22_2 Predict to integrate	.317	.088
Q22_3 Plan to integrate	.388*	.034
Mean Behavioral Intent	.369*	.045
High School		
Q22_1 Intent to integrate	-.023	.905
Q22_2 Predict to integrate	.066	.728
Q22_3 Plan to integrate	-.042	.827
Mean Behavioral Intent	.001	.996

* Correlation is significant at the 0.05 level (2-tailed)

Summary

This chapter presented the results from the statistical analysis of the survey results in order to test the research questions presented in this study. The next chapter will present the conclusions, interpretations, and implications of the results.

CHAPTER V

CONCLUSIONS, INTERPRETATIONS, AND IMPLICATIONS

Introduction

The purpose of this study was to describe how performance expectancy, effort expectancy, attitude toward using technology, social influence, facilitating conditions, self-efficacy, anxiety, and frequency of professional development are related to K-12 teachers' behavioral intent to integrate technology. The previous chapter presented the results obtained through Pearson Correlations of the variables. This chapter presents the conclusions, interpretations, and implications related to those results.

Conclusions and Interpretations for Research Question One

The first research question examined the relationship between the seven constructs of the *UTAUT*, (1) performance expectancy, (2) effort expectancy, (3) attitude toward using technology, (4) social influence, (5) facilitating conditions, (6) self-efficacy, and (7) anxiety and K-12 teachers' behavioral intent to use technology integration. The Pearson Correlation of the survey results for research question one was presented in Table 2 on page 43. According to Cohen (1988, as cited in Hopkins, 2002) correlation coefficients between 0.1-03 is small, 0.3-0.5 is moderate or medium, and 0.5 and above have a high magnitude effect. This was the guidance to determine significance of results for this study.

In the research conducted by Venkatesh et al. (2003) four constructs were identified as significant predictors of behavioral intention, performance expectancy, effort expectancy, social

influence and facilitating conditions. In this study, resulted in all samples having statistically significant positive correlations between K-12 teachers' intent to integrate technology and three variables, performance expectancy, effort expectancy, and attitude. While social influence was significant with a moderately positive correlation to behavioral intent all groups other than high school. None of the samples showed any significant correlation between behavioral intent and facilitating conditions. The results of the data analysis resulted in some alignment with Venkatesh et al. (2003) as both studies found performance expectancy, effort expectancy and social influence to be significant predictors of behavioral intention.

Performance Expectancy

For all samples, the correlation with performance expectancy was above 0.5 and statistically significant at the 0.01 level (2-tailed). The authors of the *UTAUT*, Venkatesh et al. (2003) also found performance expectancy as the strongest predictor of behavioral intention as it is based on an individual's belief that using technology will support them in securing gains in job performance. The result of the statistical analysis in this study aligns with finding from previous studies. *UTAUT* was utilized in the 2010 study by Pynoo et al., the result of a hierarchical regression analysis pooled over three measurements resulted in performance expectancy being the strongest indicator of behavioral intent ($\beta = .42$, $\rho < .001$). Radovan and Kristl (2017) evaluated *UTAUT* data through a confirmatory factor analysis and also found performance expectancy to be the strongest predictor of behavioral intent ($\beta = .414$, $\rho < .001$). These results are echoed across many other studies; eight studies of the twelve educational studies reviewed by Attuquayefio and Addo (2014) and eight of the fourteen reviewed by Yee and Abdullah (2021) also indicated performance expectancy as a significant predictor of behavioral intention. There are consistent results supporting that the most significant predictor of behavioral intention to use

technology is performance expectancy. This may be of consequence, as many educators are accountable to an evaluation system. If there is a technology component, as there is in the Texas Teacher Evaluation and Support System (T-TESS), helping administrators and teachers understand how technology integration is being measured and how it impacts performance evaluations can be a key component to influence teacher behavioral intent to use technology.

Effort Expectancy

Effort expectancy had the second highest statistically significant correlation to behavioral intent in this study. The sample from the whole group, elementary and junior high all presented high correlations ($r > .5$) and high school had a moderate correlation ($r = .411$). All results had significance of at least the 0.05 level (2-tailed). Venkatesh et al. (2003) identified effort expectancy as one of the four constructs as having a significant role as a direct determinant of user acceptance and usage behavior and the statistical analysis of this study supported their findings. Five studies reviewed by Attuquayefio and Addo (2014) and seven reviewed by Yee and Abdullah (2021) also found effort expectancy to be significant determinants of behavioral intent. The data indicated that the easier a technology is to use, the higher the likelihood of acceptance. If the goal is to have teachers increase their acceptance of digital technologies into their classroom the technology must be easy to use and require a minimum amount of effort as possible to integrate.

Attitude Towards Using Technology

Attitude towards using technology, while a factor in determining behavioral intention, was theorized by the original authors to not be a direct determinant of intention. An interesting divergence from the original study by Vantekesh et al. (2003) was overall, teachers in this study showed a strong positive statistical correlation between behavioral intent and attitude towards

using technology (r = .748, $p < .001$). Attitude had the strongest correlation in elementary (r = .804, $p < .001$) and moderate in junior high (r = .455, $p = .011$) and high school (r = .385, $p = .036$). An interesting correlation found in the study by Pynoo et al., (2010) was that a primary predictor of attitude was performance expectancy ($\beta = .71$, $\rho < .001$), but also found effort expectancy to be a significant predictor. They interpreted these results to mean that "teachers hold a positive attitude of [technology] because it is useful (PE) and easy to use (EE)" (Pynoo et al., 2010, p. 573.)

Social Influence

Social influence was also identified by Venkatesh et al. (2003) as a direct significant determinant of user acceptance and usage behavior. Pynoo et al. (2003) also found social influence to be a significant factor in predicting behavioral intention ($\beta = .28$, $\rho < .001$). Also, Attuquayefio and Addo (2014) and Yee and Abdullah (2021) each reviewed four education studies using UTAUT that found social influence to be a significant predictor. The results of this study found social influence to have a moderate positive correlation to technology acceptance in all samples other than high school teachers which showed no significant correlation. It is possible that teachers are more frequently working in "silos" at the high school level due to the diversity in specialized courses offered. Oftentimes, there may only be one person teaching specific courses therefore there is no other teacher to collaborate with on how to teach the content and integrate the technology. Additionally, unlike in lower grade levels, secondary schools frequently do not have common planning periods for teachers to work together, reducing the opportunity for teachers to communicate, collaborate and share how they are using technology in their classrooms. All collectively may play a role in social influence not being a significant factor to influence teacher intent to use technology at the high school level.

Facilitating Conditions

While Venkatesh et al. (2003) theorized that facilitating conditions would be a direct significant predictor, their study did not support this; they explained that it was "nonsignificant due to the effect being captured by effort expectancy" (p. 468). The results of this study also found facilitating conditions was not a significant factor in predicting behavioral intent. Aligned with this was the findings from Pynoo et al. (2010) where facilitating conditions was not found to be a significant predictor of intent. While these studies did not identify facilitating conditions as determinants to intent, other studies have found that it was (Radovan & Kristl, 2017, Yee & Abdullah, 2021). Although there is not a consensus in the findings across all studies pertaining to the relationship between facilitating conditions and behavioral intention, most would likely agree that putting supports in place to aid teachers with their technology integration may allow for teachers to better understand both how and why to integrate technology in the classroom which could increase their technology acceptance.

Self-Efficacy

High school teachers were the only group to show a significant correlation in regard to self-efficacy ($r = .389$, $p = .034$). This is a unique finding as across all other studies evaluated in this research, as none reported self-efficacy as having a significant impact on behavioral intention. While *UTAUT* studies have typically not shown self-efficacy to be a significant predictor of behavioral intention other researchers have found self-efficacy as a key factor in teacher behaviors. Goddard et al. (2000) asserts that research indicates a teacher's self-efficacy beliefs are ideal in forecasting teacher behaviors that foster student achievement. For this study, an interpretation pertaining to the high school teachers is possible that while they are not influenced as much by social influence to integrate technology, they are more driven by

"confidence in one's competence" (Christensen & Knezek, 2017, p. 22). In the study by Tschannen-Moran and Hoy (2001), multiple researchers were referenced stating that teachers with more self-efficacy were more receptive to new ideas and trends, and thus were more amenable to attempting new methods to meet student aspirations and needs. Teachers who try something new or different will likely experience a "hiccup" in the execution of their plans. Highly efficacious teachers will rethink, regroup, reorganize, and try again. As mentioned previously, high school teachers are more likely to work independently of peers, and therefore self-efficacy may be a factor that allows them to explore new ideas and activities, including those that are technology based, in their classrooms.

Anxiety

Anxiety was not found to be a significant factor for behavioral intention for elementary and high school teachers. One group, junior high teachers, did show a moderately negative significant correlation ($r = -.387$, $p = .035$). This indicates that junior high teachers are less likely to have intentions to integrate technology if they are apprehensive to do so. Similar to self-efficacy, none of the research reviewed for this study showed anxiety to be a significant factor for determining behavioral intention. This result for the junior high group is anomalous compared to other studies and even within this study. Knowing that anxiety may be a determining factor is important for those that aim to have increase teachers' perceptions of technology acceptance. Providing technology professional development may allow teachers to feel more comfortable with the technology available in their classrooms which could, in turn, reduce anxiety. If anxiety is reduced, then it is probable that they would be more accepting of technology increase their intent to integrate it into their classrooms.

Conclusions and Interpretations for Research Question Two

The second research question examined the relationship between frequency of technology professional development and behavioral intent. The results for research question one were presented in Table 3 on page 45. Elementary teachers were the only group to show any significance between frequency of professional development and behavioral intent. The result of the data analysis was a moderately positive correlation, r ranged from .426 - .447 with significance at the 0.05 level (2-tailed). Junior high had a slightly positive but not significant correlation and high school was less than .1 indicating insubstantial correlation.

In looking for variation in the data to explain why there was a lack of significance there was not any prominent data point that could explain the distinction. Elementary did not report a significantly greater frequency of professional development. They reported attending a mean of 3.1 professional developments per year which was less than junior high (mean = 3.93) but more than high school (mean = 2.83). The median for PD had a similar pattern with elementary median being 2.5, junior high with 3.5 and high school having a median of two. To determine the most common amount of PD teachers attended in each grade level group, the mode was evaluated. Elementary teachers most frequently reported only going to one professional development per year while junior high and high school most frequently reported attending two. With the current data showing no large difference in frequency of professional development between groups it is difficult to interpret the reason that high teachers were the only grade level group that did not show a significant correlation between frequency of professional development and behavioral intent.

Although results were not consistent across grade level groups, there is still significance in the results that indicate that frequency of professional development does have an impact on K-12 teachers' acceptance of digital technologies. This supports the idea that if there is a desire to

increase teacher technology acceptance, which in turn, should increase their implementation of technology in the classroom, there needs to be an emphasis on providing frequent and consistent technology professional development. According to Bandura (1997), up-to-date technology professional development is vital to ensure that practices and structures are successfully implemented. This finding is consequential in the current post-COVID-19 climate in which there has been a substantial increase of access to digital technologies in classrooms.

Implications for Practice

This study aimed to extend the knowledge surrounding factors that impact K-12 teachers' behavioral intent to integrate digital technologies. The findings demonstrated that the performance expectancy, effort expectancy, and attitude were significant factors that positively influence teacher technology acceptance. These findings are aligned with the findings of Bakir (2015) who stated, "successful implementation should be faculty-driven, promote advocacy among administration and faculty without mandates, and support pedagogical beliefs of the faculty" (p. 127). If administrators have low or missing expectations for technology usage, teachers will perceive this as a barrier to technology usage (Uslu, 2017). In a study by Thannimalai and Raman (2018), their findings determined "that Principals' Technology Leadership is a good predictor for Teachers' Technology Integration" (p. 221). Furthermore, they found that a deciding factor to facilitate technology integration into the classroom was professional development, concluding that a "principal's support or ability in conducting professional development in schools indirectly helps facilitate or enhance the integration of technology in the classroom by teachers" (p.221).

The findings from these researchers and the current study support the conclusion that performance expectancy has an impact on teacher technology acceptance. This result can be useful to administrators as they evaluate teacher performance in classrooms. In Texas, where the

study was conducted, teachers are evaluated using the Texas Teacher Evaluation and Support System (T-TESS) which provides continuous formative feedback to educators to improve their practice. Within the domains of the T-TESS rubric, teachers are evaluated on their integration of technology and the focus is on shifting to a student-centered approach for the use of that technology. This performance expectancy can be leveraged to encourage teacher acceptance of technology usage as teachers work to increase their performance evaluations by administrators. Garet, et al. (2001) indicated that "sustained and intensive" (p. 935) professional development had a higher likelihood of having an impact. Ongoing support for teachers to learn about instructional technologies may in fact increase their technology acceptance and empower them to actively engage in student-centered teaching and learning strategies (Kopcha, 2012) which supports students' diverse and technology-based educational needs. Rosenfeld (2013) and other researchers (Antonenko et al., 2020; McKnight et al., 2016; Nepo, 2016) recognized that education can harness technological usage to change teaching and learning through using technology for exploration, collaboration, and critical examination for students to construct knowledge, thereby shifting from a teacher-directed to a student-centered environment. A study by Blanchard et al. (2016) demonstrated that technology professional development is most effective in increasing standardized test scores "if it is done school wide and takes place over 2 to 3 years" (p. 217) and can result in transformation, altering the "teachers' roles and instructional practices and may change the ways in which students are learning in that classroom" (p. 209).

The results of this study could impact the perspective of school and district leaders pertaining to the importance of increasing teacher technology acceptance through continued professional development and setting expectations for teachers to integrate technology in their classrooms. Thannimalai and Raman (2018) found professional development to be a direct

influence of technology acceptance, noting that teachers that had more technology training were more likely to be accepting of technology.

The study by Thrum and Barzel (2020) found that implementing professional development programs either reduces the "implementation dip" or helps teachers to frame their negative experiences with technology as a natural part of the implementation process. Focusing on the use of technology in professional development can increase teachers' confidence and competence in using technology (Shriner et al., 2010). It may be beneficial for the goal of teacher professional development to align technology integration with pedagogy, curriculum, standards, and content knowledge (Darling-Hammond & Bransford, 2005; Matherson et al., 2014) to make the use of technology more meaningful for both the teachers and students.

Recommendations for Further Research

This study examined correlations between various factors that impact teachers' behavioral intent to integrate technology in their classrooms. It will be important to evaluate the lasting impact on teachers' view of technology: specifically, their perceived acceptance to integrate technology into their classroom environment. There is an increasing demand on educators to prepare students to use technology in innovative ways as they leave school it is imperative to further understand what impacts teacher technology acceptance. Based on the findings in this study, the following are recommendations for future studies:

1. This study was conducted in a suburban K-12 district in north-central Texas. To increase generalizability and reliability of the findings, future studies should be conducted in other districts (public, charter, or private) outside of this geographical area.
2. This study was a cross-sectional study at one point in time after the first year back after the COVID-19 pandemic. Further studies could evaluate teacher technology

acceptance longitudinally either multiple times throughout a year or over a period of many years to identify how the various factors and demographics impact teacher acceptance over time.

3. The data collected for this study were all based on self-reporting from the participants. Further studies could additionally collect data on self-reported perceptions pertaining to a specific technology used in the district and additionally collect data on actual use. It would be beneficial to evaluate if the self-reported technology acceptance has a significant positive correlation with actual usage of the specific technology.
4. Designing a study in which a control group received the basic district technology professional development and a test group received additional professional development and support over a specified period of time prior to conducting data collection is needed. This could further the understanding of upholding the recommendation of a need for frequent and ongoing professional development for teachers, ideally during regular school hours. Including research to determine specifics on the types of technology professional development teachers are attending (i.e., large group, 1:1, coaching sessions, co-teach, required versus optional) may provide insight as to why some are more positively impacted by it than others.
5. Providing participants with a definition of technology integration and possibly examples of what it looks like in the classroom prior to completion of the survey. This allows for a common vocabulary to be used across all participants rather than each answering questions with their own interpretations of what technology integration means. This may provide a baseline of comparison for teachers to

compare and reflect on their interactions with technology in the classroom as they respond to questions and allow for some consistency across respondents.

Summary

As we continue to prepare students for learning and working during what is now known as the Fourth Industrial Revolution, "[t]he goal is to prepare students with the knowledge, skills, and dispositions to be successful in a globally competitive market and to have teachers who can promote these competencies" (Blanchard, et al., 2016, p. 207). This study aimed to describe how performance expectancy, effort expectancy, attitude toward using technology, social influence, facilitating conditions, self-efficacy, anxiety, and frequency of professional development are related to K-12 teachers' behavioral intent to integrate technology.

A significant outcome of this study is the influence of expectations on a teacher to integrate technology both by peers (social influence) and supervisors (performance expectancy). This supports a key notion of the profound effect a school leader can have when they have both knowledge of educational technology and set a school wide goal to integrate technologies, they have the capacity to "gear 'the ship' in the right direction" (Rabah, 2015, p. 28). Also, of significance was the finding that the ease of use (effort expectancy) along with teacher attitude towards using technology were determining factors for technology acceptance.

REFERENCES

Allen, I. E. & Seaman, C. A. (2007). Statistics roundtable: Likert scales and data analyses. *Quality Progress*. Retrieved September 25, 2021, from https://www.bayviewanalytics.com/reports/asq/likert-scales-and-data-analyses.pdf

Alshahrani, H. A. & Walker, D. A. (2017). Validity, reliability, predictors, moderation: The UTAUT model revisited. *General Linear Model Journal, 43(2)*, 23-34. https://www.academia.edu/48755854/Validity_Reliability_Predictors_Moderation_The_UTAUT_Model_Revisited?from=cover_page

American Psychological Association. (2022). *Anxiety*. APA. Retrieved April 2, 2022, from https://www.apa.org/topics/anxiety

An, Y. (2018). The effect of an online professional development course on teachers' perceptions, attitudes, self-efficacy, and behavioral intentions regarding digital game-based learning. *Educational Technology Research and Development, 66*, 1505-1527. https://doi.org/10.1007/s11423-018-9620-z

An, Y., Kaplan-Rakowski, R., Yang, J., Conan, J., Kinard, W. & Daughrity, L. (2021). Examining K-12 teachers' feelings, experiences, and perspectives regarding online teaching during the early stage of the COVID-19 pandemic. *Educational Technology Research and Development, 69,* 2589-2613. https://doi.org/10.1007/s11423-021-10008-5

Antonenko, P. D., Dawson, K., Cheng, L., & Wang, J. (2020). Using technology to address individual differences in learning. In M.S. Bishop, E. Boling, J. Elen & V. Svihla (Eds.), *Handbook of Research in Educational Communications and Technology: Learning Design* (5th ed., pp. 99-114). Springer. https://doi.org/10.1007/978-3-030-36119-8_6

Aronson, E. & Carlsmith, J. M. (1962). Performance expectancy as a determinant of actual performance. *Journal of Abnormal and Social Psychology, 65(3)*, 178-782. https://doi.org/10.1037/h0042291

Attuquayefio, S. & Addo, H. (2014). Review of studies with UTAUT as conceptual framework. *European Scientific Journal, 10(8)*, 249-258. https://doi.org/10.19044/esj.2014.v10n8p%25p

Bakir. N (2015). An exploration of contemporary realities of technology and teacher education: Lessons Learned. *Journal of Digital Learning in Teacher Education, 31(3)*, 117-130. https://doi.org/10.1080/21532974.2015.1040930

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215. http://dx.doi.org/10.1037/0033-295X.84.2.191

Bandura, A. (1997). *Self-efficacy: The exercise of control*. W. H. Freeman and Company. https://archive.org/details/selfefficacyexer0000band

Beriswill, J. E., Bracey, P. S., Sherman-Morris, K., Huang, K., & Lee, S. J. (2016). Professional development for promoting 21st century skills and common core state standards in foreign language and social studies classrooms. T*echTrends: Linking Research and Practice to Improve Learning, 60(1)*, 77-84. doi.org/10.1007/s11528-015-0004-5 foreign language and social studies classrooms. T*echTrends: Linking Research and Practice to Improve Learning, 60(1)*, 77-84. doi.org/10.1007/s11528-015-0004-5

Blanchard, M., LePrevost, C., Tolin, A., & Guiterrez, K., (2016). Investigating technology-enhanced teacher professional development in rural, high-poverty middle schools. E*ducational Researcher, 45(3)*, 207–220. https://doi.org/10.3102/0013189x16644602

Bozkurt, A., Karakaya, K., Turk, M., Karakaya, Ö., & Vastellanos-Reyes, D. (2022). The impact of COVID-19 on education: A meta-narrative review. *Tech Trends, 66*, 883-896. https://doi.org/10.1007/s11528-022-00759-0

Calisir, F., Gumussoy, C. A., Bayraktaroglu, A. E., & Karaalli, D. (2014). Predicting the intention to use a web-based learning system: Perceived content quality, anxiety, perceived system quality, image, and the Technology Acceptance Model. *Human Factors and Ergonomics in Manufacturing & Service Industries, 24(5)*, 515-531. https://doi.org/10.1002/hfm.20548

Chung, F. & O'Connor-Petruso, S. A. (2013). Future of technology. In D. Ness & C. Linn (Ed.). *International education an encyclopedia of contemporary issues and systems.* (pp. 232-238). Taylor & Francis Group. https://ebookcentral-proquest-com.ezhost.utrgv.edu

Christensen, R. & Knezek, G. (2017). Validating the technology proficiency self-assessment questionnaire for 21st century learning (TPSA C-21). *Journal of Digital Learning in Teacher Education, 33(1),* 20-31. https://doi.org/10.1080/21532974.2016.1242391

Cialdini, R. B., Petty, R. E., & Cacioppo, J. T. (1981). Attitude and attitude-change. *Annual Review of Psychology, 32(1),* 348–404. https://doi.org/10.1146/annurev.ps.32.020181.002041

Daniel, S. J. (2020). Education and the COVID-19 pandemic. *Prospects, 49,* (91–96). https://doi.org/10.1007/s11125-020-09464-3

Darling-Hammond, L. & Bransford, J. (2005). *Preparing teachers for a changing world: What teachers should learn and be able to do*. Jossey-Bass.

Darling-Hammond, L., Burns, D., Campbell, C., Goodwin, A. L., Hammerness, K., Low, E. L., McIntyre, A., Sato, M., & Zeichner, K. (2017). *Empowered Educators: How high-performing systems shape teaching quality around the world.* Jossey-Bass.

Davis, F. D. (1985). *A technology acceptance model for empirically testing new end-user information systems: Theory and results* [Doctoral dissertation, Massachusetts Institute of Technology]. https://dspace.mit.edu/bitstream/handle/1721.1/15192/14927137-MIT.pdf

de Vaus, D. (2014). *Surveys in social research* (6th ed.). Routledge.

Fensham, P. (1992). Science and technology. In P. Jackson (Ed.), *Handbook of research on curriculum,* (pp. 789-829). Macmillan. https://archive.org/details/handbookofresear0000unse_n2n7

Fishbein, M. & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research.* Addison-Wesley. https://people.umass.edu/aizen/f&a1975.html

Foulger, T. S., Graziano, K. J., Schmidt-Crawford, D. A., & Slykhuis, D. A. (2020). Throw me a lifeline: A professional development program for teacher educators managing the demands from the rapid transition to online teaching. In R. E. Ferdig, E. Baumgartner, R. Hartshorne, R. Kaplan-Rakowski, & C. Mouza (Eds.), *Teaching, technology, and teacher education during the COVID-19 pandemic: Stories from the field* (pp. 517-520). Association for the Advancement of Computing in Education (AACE). https://www.learntechlib.org/p/216903/

Francom, G. M., Lee, S. J. & Pinkney, H. (2021) Technologies, challenges and needs of K-12 teachers in the transition to distance learning during the COVID-19 pandemic. *Tech Trends, 65,* 589-601. https://doi.org/10.1007/s11528-021-00625-5

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38*(4), 915–945. https://doi.org/10.3102/00028312038004915

Goddard, R., Hoy, W., & Hoy, A. (2000). Collective teacher efficacy: Its meaning, measure, and impact on student achievement. *American Educational Research Journal, 37(2),* 479–507. https://doi.org/10.3102/00028312037002479

Goodlad, J. & Su Z. (1992). Organization of the curriculum. In P. W. Jackson (Ed.), *Handbook of research on curriculum,* (pp. 327-344). Macmillan.

Gunter, G. A., & Reeves, J. L. (2017). Online professional development embedded with mobile learning: An examination of teachers' attitudes, engagement and dispositions. *British Journal of Educational Technology, 48(6),* 1305–1317. https://doi-org.ezhost.utrgv.edu/10.1111/bjet.12490

Hopkins, W. G. (2002). *A Scale of magnitudes for effect statistics*. New view of statistics: Effect magnitudes. Retrieved September 4, 2022, from https://sportsci.org/resource/stats/effectmag.html

Horn, M. B. & Staker, H. (2015). *Blended: Using disruptive innovation to improve schools*. Jossey-Bass.

Hoy, W. K. & Adams, C. M. (2016). *Quantitative research in education: A primer* (2nd ed.). Sage.

Hulon, S. I., Tucker, M. H., & Green, A. M. (2020). Virtual Professional Learning for in-service teachers to support teaching and learning in online environments. In R. E. Ferdig, E. Baumgartner, R. Hartshorne, R. Kaplan-Rakowski, & C. Mouza (Eds.), *Teaching, technology, and teacher education during the COVID-19 pandemic: Stories from the field* (pp. 43-46). Association for the Advancement of Computing in Education (AACE). https://www.learntechlib.org/p/216903/

Hurst-Euless-Bedford Independent School District. (n.d.). *About HEB ISD: History*. HEBISD. Retrieved, October 19, 2022 from https://www.hebisd.edu/domain/111

Kopcha, T. J. (2012). Teachers' perceptions of the barriers to technology integration and practices with technology under situated professional development. *Computers and Education, 59(4),* 1109-1121. https://doi.org/10.1016/j.compedu.2012.05.014

Kopcha, T. J., Neumann, K. L., Ottenbreit-Leftwich, A., & Pitman. E. (2020). Process over product: The next evolution of our quest for technology integration. *Education Technology Research Development, 68,* 729-749. https://doi.org/10.1007/s11423-020-09735-y

Lathan, J. (2022, February 14). *Complete guide to teacher-centered vs. student-centered learning*. University of San Diego Online Degrees. Retrieved June 16, 2022, from https://onlinedegrees.sandiego.edu/teacher-centered-vs-student-centered-learning/

Marangunić, N. & Granić, A. (2015). Technology acceptance model: A literature review from 1986 to 2013. *Universal Access in the Information Society, 14(1).* 81-98. https://doi.org/10.1007/s10209-014-0348-1

Matherson, L. H., Wilson, E. K., & Wright, V. H. (2014). Need TPACK? Embrace sustained professional development. *The Delta Kappa Gamma Bulletin: International Journal for Professional Educators, 81*(1), 45–52.

Mathibe, I. (2008). Expectancy theory and its implications for employee motivation. *Academic Leadership: The Online Journal, 6(3),* https://scholars.fhsu.edu/alj/vol6/iss3/8

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. https://doi.org/10.1080/15391523.2016.1175856

Moore-Hayes, C. (2011). Technology integration preparedness and its influence on teacher-efficacy. *Canadian Journal of Learning and Technology/La revue canadienne de l'apprentissage et de la technologie, 37(3),* 1-15. https://www.learntechlib.org/p/42748/

Nepo, K. (2016). The use of technology to improve education. *Child Youth Care Forum, 46(2),* (207-221). https://doi.org/10.1007/s10566-016-9386-6

Pinar, W. F., Reynolds, W. M., Slattery, P., & Taubman, P. M. (2014). *Understanding curriculum: An introduction to the study of historical and contemporary curriculum discourses*. Peter Lang.

Ponto, J. (2015). Understanding and evaluating survey research. *Journal of the Advanced Practitioner in Oncology, 6(2),* 168-171.

Pynoo, B., Devolder, P., Tondeur, J., van Braak, J., Duyck, W., & Duyck, P. (2011). Predicting secondary school teachers' acceptance and use of a digital learning environment: A cross-sectional study. *Computers in Human Behavior, 27*. 568-575. http://dx.doi.org/10.1016/j.chb.2010.10.005

Rabah, J. (2015). Benefits and challenges of information and communication technologies (ICT) integration in Quebec English schools. *TOJET the Turkish Online Journal of Educational Technology, 14(2),* 24-31

Radovan, M. & Kristl, N. (2017). Acceptance of technology and its impact on teacher's activities in virtual classroom: Integrating UTAUT and CoI into a combined model. *The Turkish Online Journal of Educational Technology, 16(3)*. 11-22. https://files.eric.ed.gov/fulltext/EJ1152624.pdf

Reeves, T. D. & Pedulla, J. J. (2013). Bolstering the impact of online professional development for teachers. *The Journal of Educational Research & Policy Studies, 1,* 56-66. https://eric.ed.gov/?id=ED545314

Rosenfeld, B. (2013). Technology and the Curriculum. In D. Ness & C. Linn (Ed.). *International education an encyclopedia of contemporary issues and systems.* (pp. 204-208). Taylor & Francis Group. https://ebookcentral-proquest-com.ezhost.utrgv.edu

Ryan, M. J. (1982). Behavioral intention formation: the interdependence of attitudinal and social influence variables. *Journal of Consumer Research, 9(3),* 263-278. https://doi.org/10.1086/208922

Salkind, N. J. & Frey, B. B. (2020). *Statistics for people who (think they) hate statistics* (7th ed.). Sage.

Shriner, M., Clark, D. A., Nail, M., Schlee, B. M., & Liber, R. (2010). Social studies instruction: Changing teacher confidence in classrooms enhanced by technology. *Social Studies, 101*(2), 37–45. https://doi.org/10.1080/00377990903283999

Songkram, N. & Osuwan, H. (2022). Applying the technology acceptance model to elucidate K-12 teachers' use of digital learning platforms in Thailand during the COVID-19 pandemic. *Sustainability, 14(10),* 1-12. https://doi.org/10.3390/su14106027

Sparks, D. (2002). *Designing powerful professional development for teachers and principals*. National Staff Development Council. https://eric.ed.gov/?id=ED470239

Teräs, M., Suoranta, J., Teräs, H., & Curcher, M. (2020). Post-Covid-19 education and education technology 'solutionism': A seller's market. *Postdigital Science and Education*, 1-16.

Texas Education Agency. (2022). *Texas academic performance reports*. TEA. Retrieved April 10, 2022, from https://tea.texas.gov/texas-schools/accountability/academic-accountability/performance-reporting/texas-academic-performance-reports

Thannimalai, R., & Raman, A., (2018). The influence of principals' technology leadership and professional development on teachers' technology integration in secondary schools. *Malaysian Journal of Learning and Instruction, 15(1),* 203-228. https://files.eric.ed.gov/fulltext/EJ1185796.pdf

Thompson R. L., Higgins, C. A.& Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS Quarterly, 15(1),* 125-143. https://doi.org/10.2307/249443

Thurm, D. & Barzel, B. (2020). Effects of a professional development program for teaching mathematics with technology on teachers' beliefs, self-efficacy and practices. *ZDM Mathematics Education 52*, 1411–1422. https://doi.org/10.1007/s11858-020-01158-6

Trust, T. & Whalen, J. (2020). Should teachers be trained in emergency remote teaching? Lessons learned from the COVID-19 pandemic. *Journal of Technology and Teacher Education, 28(2),* 189-199. https://www.learntechlib.org/primary/p/215995/

Trust, T & Whalen, J. (2021). Emergency remote teaching with technology during the COVID-19 pandemic: Using the whole teacher lens to examine educator's experiences and insights. *Educational Media International, 58(2),* 145-160. https://doi.org/10.1080/09523987.2021.1930479

Tschannen-Moran, M. & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education, 17(7),* 783-805. https://doi.org/10.1016/S0742-051X(01)00036-1

Tucker, C. R. (2020). *Balance with blended learning: Partner with your students to reimagine learning and reclaim your life*. Corwin.

Tweed, S. R. (2013). *Technology implementation: Teacher age, experience, self-efficacy, and professional development as related to classroom technology integration.* [Doctoral dissertation, East Tennessee State University]. Student Works. https://dc.etsu.edu/etd/1109/

U.S. Department of Education. (2009). *Evaluation of the enhancing education through technology program: Final report.* http://www2.ed.gov/rschstat/eval/tech/netts/finalreport.html

Uslu, Ö. (2017). Evaluating the professional development program aimed technology integration at the era of curriculum change. *Educational Sciences: Theory & Practice*, *17*(6), 2031–2055. https://doi-org.ezhost.utrgv.edu/10.12738/estp.2017.6.0116

van den Berg, G. (2020). How the COVID-19 pandemic has changed open distance learning – A curriculum perspective. *United Nations Educational, Scientific and Cultural Organization,* 1-11.

Venkatesh, V., Morris, M., Davis, G., & Davis, F. (2003). User acceptance of information technology: Toward a unified view. *Management Information Systems Quarterly, 27(3),* 425-478. https://doi.org/10.2307/30036540

Wang, L., Ertmer, P., & Newby, T. (2004). Increasing preservice teachers' self-efficacy beliefs for technology integration. *Journal of Research on Technology in Education*, *36*(3), 231–250. https://doi-org /10.1080/15391523.2004.10782414

Warshaw, P. R. & Davis, F. D. (1985). Disentangling behavioral intention and behavioral expectation. *Journal of Experimental Social Psychology, 21,* 213-228. https://doi.org/10.1016/0022-1031(85)90017-4

Willits, F. K., Theodori, G. L., & Luloff, A. E. (2016). Another look at Likert scales. *Journal of Rural Social Sciences, 31*(3), 6. https://egrove.olemiss.edu/jrss/vol31/iss3/6

Winter, E., Costello, A., O'Brien, M. & Hickey, G. (2021). Teachers' use of technology and the impact of COVID-19. *Irish Educational Studies, 40(2),* 235-246. https://doi.org/10.1080/03323315.2021.1916559

Wolff, L. (2020). Sustainability Education in risks and crises: Lessons from COVID-19. *Sustainability, 12,* (1-6). https://doi.org/10.3390/su12125205

Yee, M. L. S. & Abdullah, M. S. (2021). A review of UTAUT and extended model as a conceptual framework in education research. *Jurnal Pendidikan Sains Dan Matematik Malaysia, 11*, 1-20. https://doi.org/10.37134/jpsmm.vol11.sp.1.2021

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

Zhao, Y. (2020). Tofu is not cheese: Rethinking education amid the COVID:19 pandemic. *ECNU Review of Education, 3(2),* 189–203. https://doi.org/10.1177/2096531120928082

Zhu, Z. & Liu, J. (2020). Education in and after COVID-19: Immediate responses and long-term visions. *Postdigital Science and Education,* 1-5. https://doi.org/10.1007/s42438-020-00126-3

Zimmerman, B. J. (2014). Self-efficacy: An essential motive to learn. In G. S. Goodman (Ed.), *Educational Psychology Reader: The Art and Science of How People Learn*, (pp. 217-224). New York: Peter Lang, International Academic Publishers.

APPPENDIX A

APPENDIX A

UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY (UTAUT) SURVEY

ITEMS AND INSTRUCTIONS

Instructions: The following scale will be used for this survey:

1 Strongly Disagree
2 Disagree
3 Somewhat Disagree
4 Neutral
5 Somewhat Agree
6 Agree
7 Strongly Agree

Please select the option that represents the extent to which you agree or disagree with each of the statements. The survey routinely takes less than 25 minutes to complete.

Performance expectancy

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
I would find integrating technology useful in my classroom.							
Using technology enables me to accomplish tasks more quickly.							
Using technology increases my productivity.							
If I integrate technology, I will increase my chances of getting a higher rating on my T-TESS evaluation.							

Effort expectancy

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
My interaction with technology would be clear and understandable.							
It would be easy for me to become skillful at integrating technology.							
I would find technology easy to use.							
Learning to integrate technology is easy for me.							

Attitude toward using technology

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
Integrating technology is a good idea.							
Technology makes work more interesting.							
Working with technology is enjoyable.							
I like working with technology.							

Social Influence

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
People who influence my behavior think that I should integrate technology.							
People who are important to me think I should integrate technology.							
The administration of my school and/or district has been helpful in the integration of technology.							
In general, the district has supported the use of technology.							

Facilitating Conditions

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
I have the resources necessary to integrate technology.							
I have the knowledge necessary to integrate technology.							
Using technology is not compatible with the curriculum I use.							
A specific person (or group) is available for assistance with technology integration difficulties.							

Self-efficacy

I could integrate technology…

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
If there was no one around to tell me what to do as I go.							
If I could call someone for help if I got stuck.							
If I had a lot of time to plan the integration for which the technology was provided.							
If I had just the built-in help (tutorial webpage) of the technology for assistance.							

Anxiety

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
I feel apprehensive about integrating technology.							
It scares me to think that the technology will not work as expected during the lesson.							
I hesitate to use technology for fear of making mistakes I cannot correct.							
Technology is somewhat intimidating to me.							

Behavioral Intention to use technology integration

	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
I intend to integrate technology in the next month.							
I predict I would integrate technology in the next month.							
I plan to integrate technology in the next month.							

APPENDIX B

APPENDIX B

DEMOGRAPHIC QUESTION ITEMS

1. What level of instruction do you teach at?
   a. Elementary (K-6)
   b. Junior High (7-9)
   c. High School (10-12)
   d. None of the above

2. What specific grade level(s) do you teach? (Select all that apply.)
   a. Kindergarten
   b. 1st grade
   c. 2nd grade
   d. 3rd grade
   e. 4th grade
   f. 5th grade
   g. 6th grade
   h. 7th grade
   i. 8th grade
   j. 9th grade
   k. 10th grade
   l. 11th grade
   m. 12th grade

3. What subject area(s) do you teach? (Select all that apply.)
   a. ELAR
   b. Math
   c. Science
   d. Social Studies
   e. Fine Arts
   f. Physical Education/Health
   g. World Languages
   h. Career and Technology Education
   i. Other (specify) _____

4. What is your highest level of education completed?
    a. No Degree
    b. Associates
    c. Bachelors
    d. Masters
    e. Doctorate

5. Which category below include your age?

18	28	38	48	58
19	29	39	49	59
20	30	40	50	60
21	31	41	51	61
22	32	42	52	62
23	33	43	53	63
24	34	44	54	64
25	35	45	55	65 and older
26	36	46	56	
27	37	47	57	

6. What is your gender identity?
    a. Male
    b. Female
    c. Transgender
    d. Gender Variant/Non-Conforming
    e. Not Listed (specify)_____
    f. Prefer not to respond

7. What is your ethnicity?
    a. American Indian or Alaska Native
    b. Asian
    c. Black or African American
    d. Hawaiian or Other Pacific Islander
    e. Hispanic or Latino
    f. White
    g. Mixed Race
    h. Other (specify):_____
    i. Prefer not to respond

8. How many years have you been teaching?
    a. Beginning Teacher (First year)
    b. 1-5 Years of Experience
    c. 6-10 Years of Experience
    d. 11-20 Years of Experience
    e. Over 20 Years of Experience

9. In the past 12 months how many technology professional development trainings have you attended. Your best estimate is fine.
    _____ Number of trainings

APPENDIX C

APPENDIX C

INVITATION TO PARTICIPATE IN STUDY AND CONSENT

A CORRELATIVE STUDY OF K-12 TEACHERS' PERCEIVED TECHNOLOGY SELF-EFFICACY AND TECHNOLOGY INTEGRATION

This research study is being conducted by Maria Ing at The University of Texas Rio Grande Valley

The purpose of this study is to examine the relationship between K-12 teachers' technology self-efficacy beliefs, frequency of technology professional development, and their readiness to integrate digital technologies and resources in the classroom.

Participation should take about 10 minutes to complete.

Participation in this research is completely voluntary. If there are any questions or parts of this study which you are uncomfortable completing, feel free to skip that question and terminate your participation at any time without question or comment.

You must be a full-time classroom teacher in HEB ISD to participate. If you are not a full-time classroom teacher in HEB ISD, please do not participate.

All survey responses received will be treated confidentially and stored on a secure server. However, given that the surveys can be completed from any computer (e.g., personal, work, school), there is no guarantee of the security of the computer on which you choose to enter your responses. As a participant in this study, please be aware that certain technologies exist that can be used to monitor or record data and/or websites that are visited.

This research has been reviewed and approved by the University of Texas Rio Grande Valley Institutional Review Board for Human Subjects Protection (IRB). If you have any questions about your rights as a participant, or if you feel that your rights as a participant were not adequately met by the researcher, please contact the IRB at (956) 665-3598 or irb@utrgv.edu.

APPENDIX D

APPENDIX D

INSTRUMENT PERMISSION

From: Maria Ing <maria.ing01@utrgv.edu>
Sent: Monday, March 7, 2022 1:27 PM
To: vvenkatesh@vvenkatesh.us; davis001@umn.edu; Davis, Fred <FredDavis@ttu.edu>
Subject: Request for use of UTAUT instrument

Hello,

I am hopeful that I am reaching the correct people for this request as the emails on the original article entitled "User Acceptance of Information Technology: Toward A Unified View" sent back the emails as undeliverable. If this email reaches you in error please let me know so I may search for the appropriate contact information.

I am a doctoral student at The University of Texas Rio Grande Valley, completing a dissertation in the Doctor of Education in Curriculum and Instruction program, with a specialization in Educational Technology.

I am writing to ask for written permission to use the UTAUT in my research study.

My study focuses on factors that influence teachers' intent to implement digital technologies into the classroom. My research is being supervised by my professor, Dr. Maria Elena Corbeil.

I would like to use the instrument in its entirety; adapting the questions, only changing "the system," to be focused on digital technologies. I will invite the 1,500 teachers from my school district to participate in the online survey using the secure platform, Qualtrics.

I assure you that I will use the UTAUT only for my research study and will not sell or use it for any other purposes and will include a statement of attribution and copyright on all copies of the instrument. If you have a specific statement of attribution that you would like for me to include, please provide it in your response.

I look forward to hearing from you. Please contact me if you have any questions.

Regards,
Maria Ing M.Ed.
The University of Texas Rio Grande Valley Doctoral Student

maria.ing01@utrgv.edu

From: Davis, Fred <Fred.Davis@ttu.edu>
Sent: Monday, March 7, 2022 7:44 PM

To: Maria Ing <maria.ing01@utrgv.edu>
Subject: RE: Request for use of UTAUT instrument

You have my permission to use the UTAUT on your research study.

Best wishes
Fred Davis

From: Gordon Davis <davis001@umn.edu>
Sent: Monday, March 7, 2022 10:23 PM

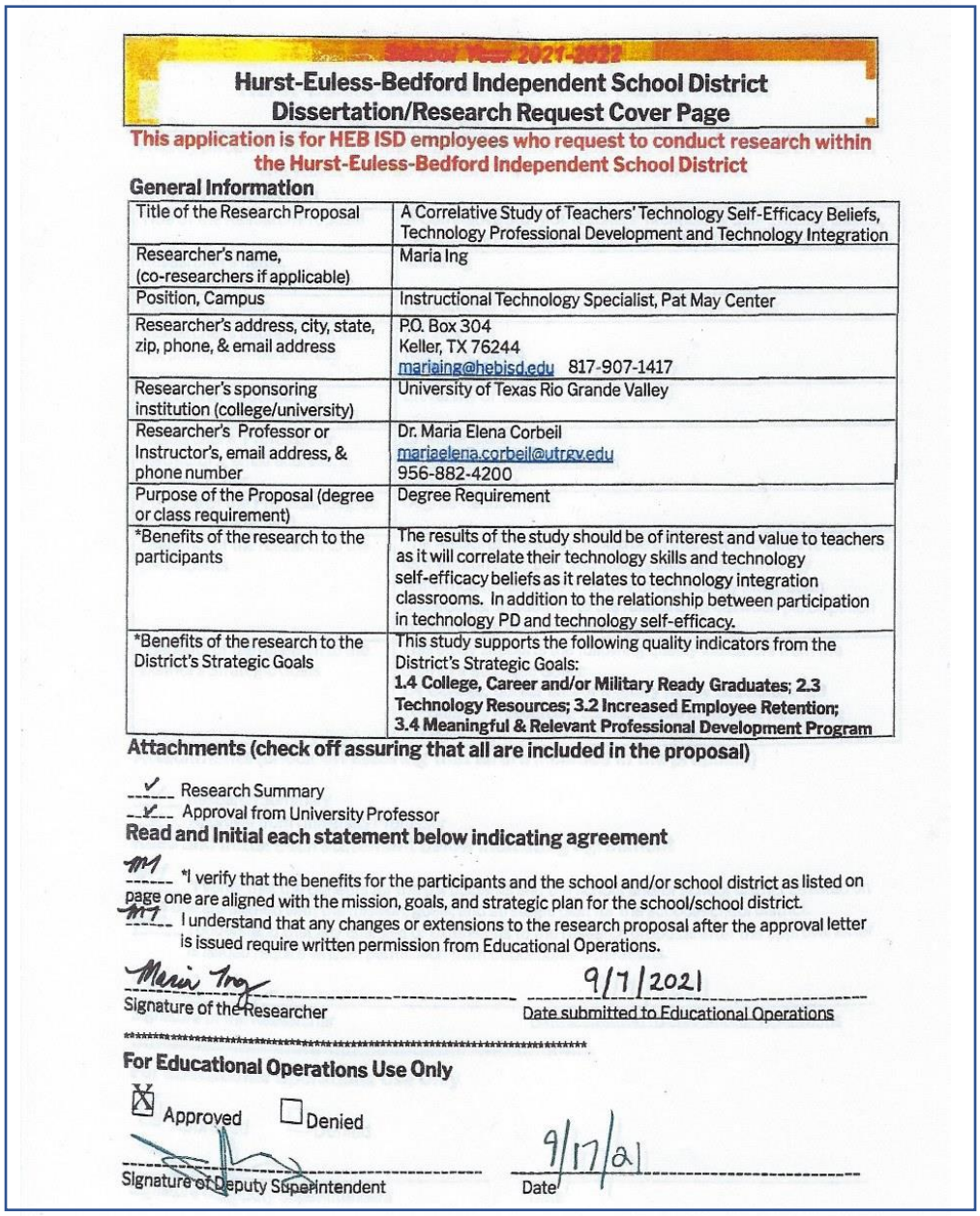
To: Maria Ing <maria.ing01@utrgv.edu>
Subject: Re: Request for use of UTAUT instrument

You have permission.
Gordon Davis

APPENDIX E

APPENDIX E

SCHOOL DISTRICT PERMISSION TO CONDUCT AND USE RESEARCH INSTRUMENT



School Year 2021-2022

Hurst-Euless-Bedford Independent School District
Dissertation/Research Request Cover Page

This application is for HEB ISD employees who request to conduct research within the Hurst-Euless-Bedford Independent School District

General Information

Title of the Research Proposal	A Correlative Study of Teachers' Technology Self-Efficacy Beliefs, Technology Professional Development and Technology Integration
Researcher's name, (co-researchers if applicable)	Maria Ing
Position, Campus	Instructional Technology Specialist, Pat May Center
Researcher's address, city, state, zip, phone, & email address	P.O. Box 304 Keller, TX 76244 mariaing@hebisd.edu 817-907-1417
Researcher's sponsoring institution (college/university)	University of Texas Rio Grande Valley
Researcher's Professor or Instructor's, email address, & phone number	Dr. Maria Elena Corbeil mariaelena.corbeil@utrgv.edu 956-882-4200
Purpose of the Proposal (degree or class requirement)	Degree Requirement
*Benefits of the research to the participants	The results of the study should be of interest and value to teachers as it will correlate their technology skills and technology self-efficacy beliefs as it relates to technology integration classrooms. In addition to the relationship between participation in technology PD and technology self-efficacy.
*Benefits of the research to the District's Strategic Goals	This study supports the following quality indicators from the District's Strategic Goals: **1.4 College, Career and/or Military Ready Graduates; 2.3 Technology Resources; 3.2 Increased Employee Retention; 3.4 Meaningful & Relevant Professional Development Program**

Attachments (check off assuring that all are included in the proposal)

✓ Research Summary
✓ Approval from University Professor

Read and initial each statement below indicating agreement

MI *I verify that the benefits for the participants and the school and/or school district as listed on page one are aligned with the mission, goals, and strategic plan for the school/school district.
MI I understand that any changes or extensions to the research proposal after the approval letter is issued require written permission from Educational Operations.

Maria Ing — Signature of the Researcher
9/7/2021 — Date submitted to Educational Operations

****

For Educational Operations Use Only

☒ Approved ☐ Denied

Signature of Deputy Superintendent
9/17/21 — Date

APPENDIX F

APPENDIX F

INSTITUTIONAL REVIEW BOARD APPROVAL

The University of Texas Rio Grande Valley
Institutional Review Board

April 8, 2022

Maria Ing
College of Education & P-16 Integration
Via Electronic Routing System

Dear Ms. Ing:

RE: EXEMPT DETERMINATION FOR IRB-21-0425 "A Correlative Study of K-12 Teachers' Perceived Technology Self-Efficacy and Technology Integration"

The study in reference has been determined 'Exempt' under the Basic HHS Policy for Protection of Human Research Subjects, 45 CFR 46.104(d). The determination is effective as of the date of this letter within the exempt category of:

> *"*(2) 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) and (i) 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."

Research that is determined to be 'Exempt' under the Basic HHS Policy for Protection of Human Research Subjects is not exempt from ensuring protection of human subjects. The Principal Investigator (PI) is responsible for the following through the conduct of the research study:

1. Assuring that all investigators and co-principal investigators are trained in the ethical principles, relevant federal regulations, and institutional policies governing human subjects' research.
2. Disclosing to the subjects that the activities involve research, and that participation is voluntary, during the informed consent process.
3. Providing subjects with pertinent information (e.g., risks and benefits, contact information for investigators, and IRB/ORC) and ensuring that human subjects will voluntarily consent to participate in the research when appropriate (e.g., surveys, interviews).
4. Assuring the subjects will be selected equitably, so that the risks and benefits of the research are justly distributed.
5. Assuring that the privacy of subjects and confidentiality of the research data will be maintained appropriately to ensure minimal risk to subjects.

Exempt research is subject to the ethical principles articulated in The Belmont Report, found at the Office of Human Research Protections (OHRP) Website: www.hhs.gov/ohrp/humansubjects/guidance/belmont.html

Unanticipated Problems: Any unanticipated problems or complaints must be reported to the IRB promptly. Further information concerning unanticipated problems can be found in the IRB procedures manual.

Continuing Review: research deemed 'Exempt' is not subject to annual review by the IRB.

Modifications: Any change to your protocol requires a Modification Request (Amendment) for review and approval prior to implementation. The IRB may review the 'Exempt' status at that time and request an application for approval as non-Exempt research.

Closure: Please notify the IRB when your study is complete through submission of a final report. Upon notification, we will close our files pertaining to your study.

If you have any questions, please contact the Human Subjects Protection Program/IRB by phone at (956) 665-3598 or via email at irb@utrgv.edu.

Sincerely,

Institutional Review Board for the Protection of Human Subjects in Research

orc/ska

Brownsville • Edinburg • Harlingen

APPENDIX G

APPENDIX G

RECRUITMENT EMAIL

Hello,

My name is Maria Ing. I work as an Instructional Technology Coach for HEB ISD and am a doctoral student in the College of Education & P-16 Integration at The University of Texas Rio Grande Valley (UTRGV). I would like to invite you to participate in my doctoral dissertation research study to examine the relationship between drivers of K-12 teachers' acceptance of technology and their intent to integrate technology into their classrooms.

This research study has been reviewed and approved by the Institutional Review Board for the Protection of Human Subjects (IRB) at the University of Texas Rio Grande Valley and Hurst-Euless-Bedford ISD executive leadership.

In order to participate, you must be 18 years or older and be a K-12 classroom teacher in HEB ISD. Participation in this research is completely voluntary, you may choose not to participate without penalty.

As a participant, you will be asked to complete an online survey which should take about 10 minutes to complete. All data will be treated as confidential; personal privacy will be protected as the survey will be anonymous, administered online using a software program called Qualtrics which will not collect personal identifiers.

If you would like to participate in this research study, please click on the survey link below and read the consent page carefully. If you would like to complete the survey, click on "I agree." If not, please exit the web browser or click on "I do not want to participate".

Survey Link: https://utrgv.co1.qualtrics.com/jfe/form/SV_3TSHR4FnUniXYhM

If you have questions related to the research, please contact me by telephone at 817-399-2109 or by email at mariaing@hebisd.edu.

My faculty advisor, Dr. Maria Elena Corbeil, may also be contacted at mariaelena.corbeil@utrgv.edu.

If you have any questions about your rights as a participant, or if you feel that your rights as a participant were not adequately met by the researcher, please contact the University of Texas Rio Grande Valley Institutional Review Board (IRB) at (956) 665-3598 or irb@utrgv.edu.

Thank you.
Maria Ing M.Ed.

APPENDIX H

APPENDIX H

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Order Date	26-Mar-2022	**Type of Use**	Republish in a thesis/dissertation
Order License ID	1204034-1		
ISSN	0276-7783	**Publisher**	Society for Management Information Systems and Management Information Systems Research Center of the University of Minnesota
		Portion	Chart/graph/table/figure

LICENSED CONTENT

Publication Title	MIS quarterly	**Publication Type**	e-Journal
Article Title	User acceptance of information technology: Toward a unified view	**Start Page**	425
		End Page	478
Author/Editor	Society for Information Management (U.S.), University of Minnesota. Management Information Systems Research Center	**Issue**	3
		Volume	27
		URL	http://www.misq.org
Date	01/01/1984		
Language	English		
Country	United States of America		
Rightsholder	M I S Quarterly		

REQUEST DETAILS

Portion Type	Chart/graph/table/figure	**Distribution**	United States
Number of charts / graphs / tables / figures requested	1	**Translation**	Original language of publication
		Copies for the disabled?	No
Format (select all that apply)	Print, Electronic	**Minor editing privileges?**	No
Who will republish the content?	Academic institution	**Incidental promotional use?**	No
Duration of Use	Current edition and up to 5 years	**Currency**	USD
Lifetime Unit Quantity	Up to 499		
Rights Requested	Main product		

NEW WORK DETAILS

Title	A CORRELATIVE STUDY OF K-12 TEACHERS' TECHNOLOGY ACCEPTANCE BY MEASURE OF THE UTAUT	**Institution name**	The University of Texas Rio Grande Valley
		Expected presentation date	2022-10-24
Instructor name	Dr. Maria Elena Corbeil		

ADDITIONAL DETAILS

Order reference number	N/A	**The requesting person / organization to appear on the license**	Maria Ing

REUSE CONTENT DETAILS

Title, description or numeric reference of the portion(s)	Figure 3	**Title of the article/chapter the portion is from**	User acceptance of information technology: Toward a unified view
Editor of portion(s)	Davis, Fred D.; Davis, Gordon B.; Morris, Michael G.; Venkatesh, Viswanath	**Author of portion(s)**	Davis, Fred D.; Davis, Gordon B.; Morris, Michael G.; Venkatesh, Viswanath
Volume of serial or monograph	27	**Issue, if republishing an article from a serial**	3
Page or page range of portion	425-478	**Publication date of portion**	2003-08-31

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BIOGRAPHICAL SKETCH

Maria Ing was born in Bethesda, Maryland to Leland and Linda Betsill. As a member of a Navy family, Maria attended many schools during her primary and secondary education. After 22 years of service, her father retired from the Navy to his hometown of Bedford, Texas where Maria graduated from Trinity High School in Euless, Texas in 2001. After graduation she attended the University of Texas Arlington (UTA) where she completed a Bachelor of Science in Biology degree. While at UTA she decided to be a teacher and enrolled into the Education Career Alternatives Program (ECAP). Maria completed her degree and certification program in the summer of 2006 and began her career in education as a science teacher at Hurst-Euless-Bedford ISD. In May 2016, Maria earned a Master of Education (M.Ed.) in Educational Technology from The University of Texas Rio Grande Valley (UTRGV) then continued to complete their principal certification program. In December 2022, she fulfilled the requirements to obtain a Doctor of Education (Ed.D.) in Curriculum and Instruction from UTRGV.

Maria spent 12 years teaching freshman science (Integrated Physics and Chemistry and Biology) at Hurst-Euless-Bedford ISD. In 2018 she transferred into the role of an Instructional Technology Coach to support teachers with their technology integration goals. Maria accepted a position as an assistant principal at a Brewer High School in 2022. Maria has various educator certifications through the Texas Education Agency including Principal, Legacy Master Technology Teacher, and Composite Science 8-12.

Maria may be reached at: riagirl83@gmail.com