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Pedagogy After a Pandemic: Predicting Continued Elementary Teacher Usage of Educational Technology After the COVID-19 Pandemic

Jessica Freeland
University of South Alabama, jellisfreeland@gmail.com

THE UNIVERSITY OF SOUTH ALABAMA
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BY

Jessica Freeland
M.Ed., University of South Alabama, 2012
B.S., University of South Alabama, 2006

A Dissertation

Submitted to the Graduate Faculty of the
University of South Alabama
in partial fulfillment of the
requirements for the degree of

Doctor of Philosophy

in

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Chair of Thesis Committee: Dr. Joel Billingsley	
Shenghua Zha (Apr 22, 2022 22:28 CDT)	Apr 22, 2022
Committee Member: Dr. Shenghua Zha	
	Apr 25, 2022
Committee Member: Dr. Joe Gaston	
	Apr 25, 2022
Chair of Department; Committee Member: Dr. James Van Haneghan	
Tres Stefurak (Apr 25, 2022 11:33 CDT)	Apr 25, 2022
Director of Graduate Studies: Dr. Tres Stefurak	
	Apr 26, 2022
Dean of the Graduate School: Dr. J. Harold Pardue	

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ABSTRACT

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Elementary teachers around the world were recently faced with transitioning to hybrid or virtual teaching due to the COVID-19 pandemic. This was a situation that teachers had never been in before and one in which they had not been trained. Due to the availability of educational technology, teachers were able to adopt new programs, often having to seek out training on their own, in order to successfully deliver instruction. This study aims to determine how the COVID-19 pandemic has affected teacher use of educational technology, what factors predict the continued use and frequency of use of educational technology once the pandemic has ended, and how teachers feel educational technology affects student motivation, achievement, and behavior.

To test these hypotheses, an online survey was distributed to elementary teachers around the United States, with the majority in a large Alabama school district. Participants answered questions regarding their use of educational technology before, during, and intended use after the COVID-19 pandemic. Upon completion of the survey, participants were invited to participate in a follow-up semi-structured interview to collect qualitative data.

Responses were analyzed using descriptive statistics, paired t-tests, and linear regression tests. Results showed large effect sizes regarding a decrease in the number of educational technology programs used during the pandemic, and an increase in the frequency of use of educational technology programs during the pandemic. Individual

innovativeness, perceived ease of use, and perceived usefulness were all found to be statistically significant predictors of nearly all dependent variables, and educational technology use was found to be a statistically significant predictor of teacher beliefs regarding student motivation, behavior, and achievement.

These results indicate the importance of educational technology in the classroom and how strongly its use is predicted and affected by perceptions of usefulness, ease of use, and innovativeness. On this basis, the use of educational technology during the COVID-19 pandemic should be taken into account for future school or district technology initiatives.

CHAPTER I

INTRODUCTION

Overview

On January 9, 2020, the world learned of a deadly new virus originating in Wuhan, China. Although precautions were taken at borders and airports, the first U.S. case was reported on January 21st and the World Health Organization issued a Global Health Emergency shortly afterward on January 31st, with the U.S. declaring it a Public Health Emergency on February 3rd (AJMC Staff, 2020).

U.S. schools began to respond to the virus in mid-February, with schools in New York and Washington state closing temporarily for deep cleaning. On February 25, the Center for Disease Control issued a warning to U.S. schools that they should begin preparing for virus-related closures. The first school, Bothell High School, closed in Washington state on February 27th. As Washington was one of the first states hit by the virus, it also had the first district to fully close and convert to virtual learning, the Northshore district, consisting of 24,000 students (Edweek, 2020). Harvard University became the first major university to close for the semester on March 10th (King, 2020). On March 11th, the virus, now dubbed COVID-19, was officially declared a pandemic, spurring the issuance of travel bans across the globe. Closures across schools, districts, and states were now beginning to spread rapidly across the country, with Ohio becoming the first state to close schools statewide on March 12th, with 15 other states following suit the next day (Edweek, 2020).

By March 16th, 27 states and U.S. territories had closed schools, with Kansas being the first state to announce that schools would be closed for the remainder of the school year. Finally, on March 25th, the last remaining states and territories closed their schools – all U.S. schools had either fully transitioned to virtual learning or had ended their school year early (Edweek, 2020). As such, teachers from all levels of education found themselves tasked with teaching students virtually, something in which K-12 teachers, particularly those teaching at the elementary level, had not been trained. Although the COVID-19 pandemic temporarily turned the world of education upside-down, it also allowed teachers to explore new tools and technologies to which they might not have otherwise used or been exposed.

While a worldwide pandemic or extended school closure isn't unprecedented, how such a closure has been addressed in this instance is. In 1908, in the midst of the tuberculosis pandemic, the United States followed the lead of Germany and created open-air schools, in lieu of closing schools, as doctors believed that the circulation of fresh air would reduce the spread of the virus (Pruitt, 2020). In 1918, during the influenza pandemic, school responses ranged from staying open, to individually quarantining, to Saturday school, an adjusted academic calendar, or even fully closing for up to 15 weeks (Foss, 2020). Nearly two decades later, in 1937, the polio pandemic caused Chicago area public schools to delay the start of the school year to reduce the spread of the virus. Instead, teachers presented 15-minute lessons over the radio, with the daily schedule and assignments being published in the morning paper. The program lasted for roughly three weeks and was deemed a success; however, some students were unable to participate due to the lack of a radio (Strauss, 2020). In 2005 a different kind of catastrophe closed

schools in the South for nearly an entire semester – Hurricane Katrina. Schools in New Orleans and the Mississippi Gulf Coast were closed after the storm, ranging from five weeks to more than seven weeks, with some schools not returning until early 2006 (Hill, 2020). During this time, unless students were able to move to an unaffected district, there was no instruction available. As a result, it is estimated that some students lost as much as two years' worth of learning (Curriculum Management Solutions, 2020). Most recently, in 2014, the Ebola crisis in West Africa closed schools in areas like Sierra Leone for up to eight months. During this time, the radio teaching model was revisited, as teachers broadcast 30-minute lessons over the radio five days a week, with the opportunity for listeners to call in at the end of each session with questions (Powers, 2016). Extended school closures might not be new, but what is new is the fact that during the COVID-19 pandemic school closures, schools were able to continue instruction virtually, and to make use of educational technology, or EdTech, for the first time.

EdTech is becoming more integrated into schools throughout the U.S., with U.S. schools spending over $3 billion each year on hardware and software (Kaur, 2020). As such, the Technology Acceptance Model, developed in 1989 by Davis, has become a popular model to gauge the likelihood of teacher adoption of EdTech based on how users perceive the usefulness and ease of use of a particular product. Responses to survey items from this model have been correlated strongly to actual product use (Davis, 1989).

The Diffusion of Innovation Theory (Rogers, 2003) has also been widely used to study and even predict how quickly all organization members will adopt an innovation. However, this model has only been applied to typical adoption situations, and the COVID-19 school closures were anything but typical, presenting a unique opportunity for

studying the retention of innovation once the organizational or necessary requirement for it has been removed.

Finally, the lack of technology integration often boils down to first- and second-order barriers, as defined by Ertmer (1999). First-order barriers are typically obstacles beyond the teachers' control, such as funding, access to equipment, lack of administrative support, or lack of training. Second-order barriers are typically intrinsic to teachers, such as lack of confidence in technology integration, personal beliefs about technology, and even unwillingness to change. If more insight could be gained into why teachers choose to continue use of a particular technology after it is no longer required – whether it be due to demographics, background knowledge, or simply exposure to the product – schools and districts would have a better idea of how to select and introduce new technologies with faster and more complete adoption.

Problem Statement

Why pedagogy? Pedagogy is the practice, or even considered the art of teaching. In today's technology-rich world, it seems inevitable that the practice of teaching would be affected by technology. In fact, technology use among teachers has been discussed and studied for the past forty years. Okojie, et al. (2006) even go so far as to say that successful use of technology for instruction partially depends on familiarity with the relationship between technology and pedagogy. They argue that the integration of technology should be planned from the very beginning, not in the middle or thrown in at the end, so that it not only serves a purpose, but ties in seamlessly with the instruction. Both technology skills and pedagogical knowledge are required to form and implement successful technology integration. Okoji, et al., (2006) continue, suggesting that

technology should be considered integral to instruction, as opposed to a detachable component, and that technology in education should ultimately be considered as part of the pedagogical process.

Even before the COVID-19 pandemic, it was unlikely that a classroom would be found that was untouched by technology in some way – whether by a computer in the classroom, or by being integrated into daily lessons and activities. In 1981, Lidkte identified barriers to teacher adoption of computers, such as lack of training, lack of hardware and software, need for additional time, lack of knowledge, and lack of support. Now, nearly forty years later, these barriers to technology integration remain largely the same. While spending on hardware and software has greatly increased – to over $3 billion each year (Kaur, 2020) – schools and districts often lack training programs, tech support, planning time for teachers, and overall buy-in by teachers. Even though the benefits of technology integration, such as increased interest in school (Horn & Staker, 2015), increased higher-order thinking skills (Nelson Laird & Kuh, 2005; Salaber, 2014), increased writing skills and test scores (Dinc, 2019), and collaborative reasoning (Office of Educational Technology, 2019) have been realized, technology has not been fully integrated into U.S. schools.

Administrators recognize the importance of technology integration, with 7 out of 10 administrators identifying student engagement levels as an effective metric to evaluate technology integration (Evans, 2019), yet recognize that a lack of teacher training often hinders their technology integration plans. Additionally, 68% of administrators want their newly hired teachers to have the skills to be able to use and create media and videos

in the classroom, and 46% of administrators indicated that pre-service teachers should be trained how to create a flipped classroom environment (Horn & Staker, 2015).

Parents have also hopped onto the metaphorical bandwagon regarding technology integration in schools, with two-thirds of parents, regardless of community type, indicating that technology integration is important in order for their children to develop appropriate college and career readiness skills (Fullan, 2017), and 84% indicating that technology is a valuable addition to the school curriculum (Horn & Staker, 2015). Even so, parents' largest concern, having increased from 32% in 2013 to 51% in 2018, is that the use of technology in schools can vary too much between classrooms, subjects, or teachers (Evans, 2018).

Students recognized the importance of technology in school, not just for novelty or "fun," but for reasons such as letting them control the pace of their learning, allowing for more collaboration, being able to communicate with the teacher, applying knowledge to practical problems, developing problem-solving and critical thinking skills, and taking ownership over their learning (Fullan, 2017). Sixty-four percent of middle school students indicated that the effective use of technology in the classroom increased their interest in the topic, which seems to fill the need of the 67% of middle school students who indicated that they wished their classes were more interesting (Horn & Staker, 2015). Technology has even shown to be effective by helping students with disabilities improve the quality and quantity of their writing, and increase their motivation, engagement, peer and teacher interactions, and ability to work independently (Dinc, 2019). Finally, the use of digital simulations has been shown to significantly reduce student misconceptions on topics such as force and motion (Office of Educational

Technology, 2019) as well as give students a better understanding about the relationships between data and variables (DeJong, Linn, & Zacharia, 2013). So, while all of these populations recognize the importance of technology integration, there is still a disconnect between the value of technology integration and the actual implementation of technology integration.

Purpose of the Study

The purposes of this study were to determine how the COVID-19 school closures affected Educational Technology (EdTech) use among elementary teachers, and what factors predict what EdTech products elementary teachers intend to continue using after returning to in-person instruction. There have been numerous studies regarding the technology acceptance of teachers, pre-service teachers, and students, particularly regarding first- and second-order barriers (Ertmer, 1999). Some studies have even highlighted the significance of particular factors such as gender (Camilleri & Camilleri, 2017; Noh, Hamzah, & Abdullah, 2016) and age (Camilleri & Camilleri, 2017; Mize & Gibbons, 2000; Noh, et al., 2016).

The COVID-19 school closures, and subsequent virtual learning, presented new, and potentially groundbreaking, opportunities for research. This phenomenon had neither been studied, nor had occurred before. Rogers' Diffusion of Innovation Theory (2003) presents in-depth research and theories regarding how an innovation diffuses through a population; however, this research and the associated scenarios deal with innovations that are adopted over time and are either fully optional or fully required by organizational leaders. During the COVID-19 school closures, adoption of EdTech was required, either by school districts or simply out of necessity, to be immediately adopted with little to no

notice or training. Additionally, innovations are typically adopted indefinitely, at least until something newer or better comes along. The COVID-19 closures, however, present a unique situation where the innovation will only be required temporarily, then it will be up to individuals to decide whether to continue using it once it is no longer required. This unique situation presents a new learning opportunity to study what factors, or combinations of factors, contribute to a teacher's decision to use EdTech, as well as the implications regarding how student motivation and perceptions are affected based on whether or not they have the opportunity to continue using the EdTech they may have been exposed to during the closures.

First- and second-order barriers to technology integration, or those external and internal, respectively, to the user, (Ertmer, 1999) haven't changed much in the past forty years. This study provides insight into how to potentially counteract or even negate some of the second-order barriers in order to generate higher and faster rates of technology adoption among elementary teachers. Additionally, it may provide valuable insight into what sort of EdTech, or even specific programs, that elementary teachers found to be the most useful or effective, when forced to transition to virtual learning, and which of these programs made the best transition back to the in-person classroom. Finally, it will provide valuable insight into how the teachers perceive the effect of EdTech on student motivation, behavior, and achievement. All of these data points provide useful information that could be applied, not only in schools or districts, but also in teacher education programs and professional development programs, potentially even changing the way that pre-service and in-service teachers learn about and adopt EdTech.

Research Questions

The research questions in this study included:

1. Research Question #1: *How did the COVID-19 pandemic affect the use of EdTech among elementary teachers?*
2. Research Question #2: *How was the use of EdTech during the pandemic related to teacher intention to use EdTech in the 100% in-person classrooms?*
3. Research Question #3: *Did demographic factors predict elementary teachers' intentions to continue to use EdTech upon returning to the 100% in-person classroom?*
4. Research Question #4: *Does personal innovativeness predict whether elementary teachers intend to continue using EdTech upon returning to the 100% in-person classroom?*
5. Research Question #5: *Does perceived usefulness predict whether elementary teachers intend to continue to use EdTech upon returning to the 100% in-person classroom?*
6. Research Question #6: *Does perceived ease of use predict elementary teachers' intentions to continue to use EdTech upon returning to the 100% in-person classroom?*
7. Research Question #7: *What are the teachers' anticipated effects of the continuation of the use of EdTech on student attitudes, motivation, and achievement?*

Definitions of Terms

The following terms are defined in the context of this study:

Administrators: In the context of this study, administrators are defined as decision-making school leaders, such as principals, assistant principals, technology coordinators, and district-level administrators.

Educators: In the context of this study, educators are defined as either classroom or supplemental teachers, such as librarians, technology teachers, music teachers, etc. While educators from all grade levels and subject areas are mentioned in the literature review, the educators that were the subject of this study consisted of elementary classroom teachers, teaching kindergarten through fifth grade students. In the context of this study, the term "teachers" is synonymous with the term "educators."

Students: In the context of this study, students are defined as children enrolled in school in kindergarten through twelfth grade. While students from all grade levels are mentioned in the literature review, the students that were the secondary subjects of this study consisted of elementary students, enrolled in kindergarten through fifth grades.

First-Order Technology Barriers: First-order technology barriers are defined by Ertmer (1999) as barriers that are extrinsic to the teacher, such as funding, equipment, internet access, training, and administrative support.

Second-Order Technology Barriers: Second-order barriers are defined by Ertmer (1999) as barriers that are intrinsic to the teacher, such as personal beliefs about the value of technology and its applications in the classroom, beliefs about self-efficacy regarding technology use, and personal experiences with technology.

Educational Technology: Educational technology includes a plethora of resources and their interactions with each other, ranging from hardware and software, such as gamification, augmented and virtual reality, artificial intelligence, virtual field trips, and more; methods and implementation; manpower and management; and evaluation and continuous innovation (Lalwani, 2021), all dedicated to facilitating learning among students. The educational technology that is the focus of this study is defined as websites or programs that allow teachers to assign tasks to students and monitor their progress, such as EdPuzzle, NewsELA, Flocabulary, etc. Educational technology is abbreviated as EdTech.

Hybrid Learning: While the definition of hybrid learning may vary across disciplines, for the purpose of this study, hybrid learning is defined as a situation where classroom teachers are required to teach both in-person students and virtual students simultaneously.

Virtual Learning: For the purpose of this study, virtual learning is defined as a situation where classroom teachers are required to teach students, either synchronously or asynchronously, strictly through technology means, such as WebEx or Zoom, while students remain at home.

In-Person Learning: For the purpose of this study, in-person learning is defined as a situation where classroom teachers are required to teach students that are all attending in-person in the classroom.

Limitations of the Study

Since participation is not a requirement in any phase or in any school or district, the study is limited to participants that choose to participate. As such, these participants

might feel more strongly, either positively or negatively, regarding EdTech, compared to individuals that choose not to participate, meaning that results might be somewhat more biased, in either direction, than if an entire population at a particular school or district were to participate.

Since this study focuses on elementary teachers, results might not be generalizable to middle- or high-school teachers. These grade-level groupings have vastly different curricula from the elementary level, meaning that different EdTech programs and techniques may have been used during the school closures. Additionally, teachers at these different levels might have differing backgrounds, opinions, beliefs, and experiences regarding EdTech than those at the elementary level.

Finally, due to the inconsistencies in the availability of device and internet access during the pandemic, as well as school or district requirements regarding programs and frequency of use, the actual pandemic use might not accurately reflect the frequency and programs that teachers would have used had there been no issues regarding internet access, device access, or district requirements.

CHAPTER II

LITERATURE REVIEW

Educational Technology

EdTech is a branch of technology that focuses on tools, be it hardware or software, to promote education and learning (Lazaro, 2020). Technology is becoming more prevalent in everyday life and classrooms are no exception. In fact, public schools in the United States are so invested in technology that there is now a computer for every five U.S. students, and the public-school systems spend over $3 billion each year on technology and digital content (Herold, 2016). EdTech can help both students and teachers to focus on learning, help teachers to manage and present content, as well as to promote student engagement (Lazaro, 2020). There is no "one-size-fits-all" model for creating or implementing EdTech, as it can range from a "webquest," or online scavenger hunt, to an interactive body system diagram, to a website such as Newsela or EdPuzzle where students can be assigned tasks, such as reading a story or taking a quiz on a video, individually or as a class.

Implementation of EdTech can range from fully integrated with 1:1 student to device ratios, to no technology at all, often in the same school district, sometimes even the same school building if no district- or school-wide technology requirements are in place. There have traditionally been two models for integrating technology into schools, the instrumentalist view and the transparent view. The instrumentalist view considers the technology as just a tool, on which the quality of instruction or student work depends.

Schools following this model tend to put greater emphasis on having the "latest and greatest" technology which usually results in a constant flow of funds. Teachers following this view tend to place more emphasis on teaching technology skills in the hopes of being able to transfer those skills to other activities, and eventually to a work environment (Mize & Gibbons, 2000).

The transparent view considers technology to be immaterial and will use whatever technology is available, even if it is out of date. While teachers in schools operating under this view are usually given the option of when, if, and how they use the technology, it can give teachers a false sense that they are integrating technology when they may simply be using it for the sake of technology without any of the true benefits that come from true technology integration. Since technology is not truly integrated, it also makes it difficult for the technology to be evaluated, and when the technology does not meet the requirements of the lessons, the lessons may need to be revised to fit the technology, which often results in a less effective lesson (Mize & Gibbons, 2000). Regardless of the view, the impact of EdTech cannot be ignored, and both the benefits and barriers of its implementation have been recognized by stakeholders, ranging from students, to parents, to teachers, and up to administrators.

Student Impact and Perspectives

Today's students are often referred to as "digital natives," since they have had technology around them their entire lives and come to school already possessing a basic knowledge of technology skills and concepts that can often be transferred to using technology for educational or learning applications (Blocher, Armfield, Sujo-Montes, Tucker, & Willis, 2011). As such, they are typically eager to use technology in the

classroom and often have their own expectations for outcomes. And, technology integration is becoming more prevalent in schools, as indicated by a 2019 study by Project Tomorrow, which found that middle school students spend 1-2 hours per day in school using technology, then another 1-2 hours using technology for homework. At the elementary level, 12% of students are now using laptops or tablets provided by their schools.

A 2017 study through the Speak Up Project indicated that the majority of 6th to 8th grade students surveyed agreed that they were learning at their own pace, and they were in control of their learning. A smaller, yet still significant number of surveyed students indicated that they were collaborating more with other students (48%), they were spending more time to master skills or to learn something new (43%), and they were communicating with their teacher more frequently (39%) (Fullan, 2017). When it came to college and career readiness skill development, the same students agreed that they were developing creativity skills (56%), applying their new knowledge to practical problems (50%), developing problem-solving and critical thinking skills (47%), and they were taking ownership of their own learning (43%) (Fullan, 2017). These results echo a previous study by the Speak Up Project that indicated that 64% of middle school students agreed that they were more interested in school when technology was used and that they liked having some control over their learning. The importance of this was reiterated by the fact that over 67% of the middle school students surveyed indicated that they were often bored in school, and they wished school were more interesting (Horn & Staker, 2015). But even these impressive results were overshadowed by the most recent Speak Up Project study from 2019, with the majority of middle school students indicating that

technology integration in the classroom helped them achieve better grades, gain a better understanding of content, develop creativity skills, learn at their own pace, and feel in control of their own learning. Coming in just under the majority, 47% to 49% of middle school students agreed that technology integration made them more likely to finish homework assignments, helped them solve practical problems, developed their collaboration and critical thinking skills, and was a good fit to their style and goals (Evans, 2019). These findings also indicate that, not only is the use of technology beneficial for students, but that the students themselves recognize the benefits they are receiving by using technology in the classroom.

Bond and Bedenlier (2019) indicated that the use of technology to enhance student engagement can result in both short- and long-term social and academic outcomes, which Kahu (2013) dubbed proximal and distal consequences. Short-term outcomes included improved peer-to-peer and collaborative relationships (Zweekhorst & Maas, 2015), a stronger sense of wellbeing or belonging (Lear, Ansorge, & Steckelberg, 2010), increased motivation (Akbari, Naderi, Simons, & Pilot, 2016), and increased higher-order thinking skills and discipline specific knowledge (Nelson Laird, & Kuh, 2005; Salaber, 2014). Long term outcomes included increased educational community involvement (Chen, Lambert, & Guidry, 2010; Junco, 2014), personal development (Alioon & Delialioğlu, 2019), and lifelong learning (Karabulut-Ilgu, Jaramillo-Cherrez, & Jahren, 2018).

In a study by Dinc (2019) on how pre-service teachers perceived technology integration, participating teachers indicated that they felt technology helped increase student engagement, motivation, and interaction with peers which, in turn, affected

student achievement, particularly their writing skills and test scores (Gulek & Demirtas, 2005). Pennington (2010) added that the ability to make content more visual by using technology also had a positive impact on the learning of students with special needs, including improvements to their writing quality and quantity (Gulek & Demirtas, 2005). A literature review cited from Islam and Gronlund (2016) indicated improvements to students' ability to work collaboratively and study independently as well as increases to students' motivation, computing skills, and engagement. Additionally, they noted that teachers also benefitted from technology integration, as it allowed more flexibility and collaboration.

To give a more specific example of the benefits of EdTech in the classroom, Karsenti and Bugmann (2017) conducted a study involving the use of Minecraft for Education with 118 elementary students who were given 30 tasks to omplete within the program. Some of the main benefits identified from the study included increased student motivation, increased creativity, improved reading and writing skills, more collaboration among students, increased problem-solving skills, higher understanding of math and science concepts, increased perseverance, improved communication and social skills, and improved reasoning skills. A similar study by Kurvinen, Kaila, Laasko, and Salakosi (2020) focusing on using technology in math lessons had similar results, noting that the treatment group had a higher mean, higher median, lower standard deviation, and it made fewer errors and completed more calculations than the control group, concluding that learning performance can be improved by implementing weekly technology enhanced lessons. An additional 2020 study by Yang and Baldwin on using technology in a science, technology, engineering, and mathematics (STEM) environment argued that

technology allowed students to investigate phenomena or perform experiments that they might not otherwise have been able to do due to physical or financial constraints. These virtual simulations let students manipulate variables and test the outcomes to gain a better understanding of cause and effect and changes to variables.

EdTech has even gotten the attention of the U.S. Department of Education, specifically the Office of Educational Technology (2019), which identified nine dimensions of learning in STEM which included dynamic representations of systems or processes, collaborative reasoning support, individualized and immediate feedback, science augmentation skills to support science arguments and claims, implementation and testing of engineering design processes, computational thinking, project-based interdisciplinary learning, embedded and digital assessments, and development of evidence-based models. For example, a study focusing on the dimension of dynamic representations found that middle school physics students had fewer misconceptions about force and motion after participating in simulation activities. A second study, focusing on collaborative reasoning in fourth grade students, found that the use of virtual sticky notes in an online collaboration platform resulted in higher-level collaborations and responses for open-ended questions.

Aside from the benefits for the average student, EdTech can offer invaluable benefits and resources for English language learners (ELL) in particular. In 2018, the U.S. Department of Education released an "Educator Toolkit" on using EdTech to support ELL students. It highlighted benefits of using EdTech with ELL students such as the ability to present information in a variety of ways (i.e. images, videos, sound, text), proving richer examples of content or events, offering the ability to differentiate

instruction, as well as offering valuable supports such as videos, translations, recordings, or communication aids.

The Parents' Perspective

Although not nearly as much information is available on what parents think about their children using EdTech, what is available shows that parents understand its value. A 2017 study by Fullan indicated that two-thirds of parents, whether they were located in urban, rural, or suburban communities, agreed that the use of EdTech helped their children develop valuable college and career ready skills. An earlier study by Horn and Staker (2015) found that 84% of parents felt that the use of technology in schools was a valuable addition to their child's education.

However, even though parents appear to be supportive of EdTech in schools, they are not without their concerns. While parents do have concerns about their child's data privacy (24%) and the fact that teachers may lack the skills required to implement EdTech (18%), their largest concern is inequality in implementation between schools, or even between classrooms, a number that has risen from 32% in 2013, to 51% in 2018 (Evans, 2018), but decreased slightly to 46% in 2019 (Evans, 2019). Additionally, while 64% of parents are concerned about the amount of screen time their children are exposed to, only one-third of parents surveyed indicated that excessive screen time while at school was a concern to them (Evans, 2019).

Implications for Educators and Administrators

Albeit for different reasons, when looking into the use of EdTech in the classroom, it is important to gather data from both educators and administrators. Educators are the primary users of EdTech, as well as the focus of this dissertation, and

are likely to provide the most insight into the use of EdTech in the classroom. Although administrators are not typically users of EdTech themselves, they are often the ones keeping track of the student and teacher usage data for their school or district, meaning that they likely have valuable insight into the implementation of EdTech.

Educators

Back in 2008, the percentage of teachers who were customizing digital content to fit their instructional needs was only about 37%, a number that had grown to 53% in 2015 (Horn & Staker, 2015). This number is similar to the 51% of teachers who indicate that they want additional training on differentiating instruction using technology, followed by 26% of teachers wanting training on identifying appropriate, quality content, with only 16% desiring additional training on how to integrate technology into their lessons. When asked about the benefits of using EdTech in the classroom, teachers indicated that it helped their students to enhance their critical thinking and develop problem solving skills (Horn & Staker, 2015) and, when it comes to using mobile devices for learning, 86% of teachers felt that the most valuable outcome was student engagement (Evans, 2019).

Elementary teachers reported that the technologies they used most frequently were online curricula at 73% for K-2 teachers, skill development apps and software at 68% for K-2 teachers, videos and movies, tied at 66% for both K-2 and 3-5 teachers, and games at 56% for 3-5 teachers. While these numbers are impressive, the growth in use over the previous four years is also noteworthy, with online curriculum usage increasing by 62% and digital game usage increasing by 46% (Project Tomorrow, 2019b). Teachers are also tapping into the EdTech opportunity for themselves, as watching informational

videos online is apparently becoming the norm for teachers, with 82% reporting it as a regular activity. Likewise, the number of teachers participating in online conferences and webinars has increased to 40%, up from 28% prior to the COVID-19 outbreak (Project Tomorrow, 2019a). Some impressive numbers from Hong Kong's Education Bureau in 2016 (Wong) indicated that 78% of teachers claimed to be very confident or confident when it came to using educational technology in their classrooms. An additional 59% reported using free technology resources, 47% reported actually using EdTech in their lessons, and 41% reported using new technologies such as Web 2.0 (Wong). According to Fullan (2017), there was a 39% increase between 2014 and 2017 in the number of teachers using online videos during instruction, an increase to 36% of teachers using online curricula, and higher levels of adoption of cloud-based tools such as Office 365 or G-Suite.

While teachers seem to have embraced EdTech, they also know what they need more training in, with 51% of teachers indicating they need more training on using technology to differentiate instruction, 36% wanting training on using educational games in the classroom, and 32% wanting training on using technology for formative assessments (Horn & Staker, 2015). Librarians, often multi-tasking as tech specialists, also made their own list of recommendations for what teachers need to support the use of EdTech in the classroom, such as providing a curated grade- and content-specific library of digital resources, providing technology coaches or mentors, providing instructional videos of other teachers demonstrating the use of EdTech, and creating a professional learning community to support teachers in their EdTech usage (Horn & Staker, 2015).

Teachers have also recognized the value of technology integration within their classrooms, with more than 50% of flipped or blended teachers and 67% of virtual teachers indicating that effective technology instruction was extremely important regarding student success. In the traditional classroom, 49% of teachers indicated that their students were more motivated as a result of technology integration (Fullan, 2017).

Administrators

Administrators, while not typically users of EdTech themselves, tend to keep their finger on the pulse of the EdTech being used in their buildings. In fact, in 2014, 9 out of 10 administrators surveyed indicated that effective use of technology in the classroom was crucial for achieving their district or school's mission (Horn & Staker, 2015). In 2018, 43% of administrators indicated that digital content was important to increase equity across classrooms, schools, and districts. 60% of administrators indicated that they have adopted a 1:1 device policy, indicating that they were both literally and figuratively invested in the implementation of EdTech. 53% of administrators with a 1:1 device program reported that math was being effectively integrated with technology, compared to only 43% of administrators at schools without a 1:1 program (Evans, 2018). To measure the success of such technology initiatives, nearly 70% of administrators indicated increased student engagement as the most important metric. Other identified factors included increases to student work quality, increased student collaboration, and skill development (Evans, 2019).

In 2019, Project Tomorrow surveyed administrators regarding technology implementation in their schools and organized the results into three categories. "Established" indicated more than 2/3 of administrators had implemented a technology,

"Developing" indicated around 50% of administrators had implemented a technology, and "Nascent" indicated implementation of 40% or less. Technologies that were indicated as "established" included communicating via social media, using cloud-based tools for collaboration, use of mobile devices in class, and use of other digital content such as simulations, videos, and animations. "Developing" technologies included 1:1 device usage, virtual professional development, online student textbooks, and online classes. Finally, "nascent" technologies included blended learning formats, 1:1 devices to take home, game-based learning, and flipped learning formats (Evans, 2019).

As supportive of technology as administrators are, they still indicate barriers to fully implementing technology such as how to evaluate the quality of digital content, the lack of training for teachers, and the fact that pre-service and first-year teachers are not adequately trained in the use of technology (Horn & Staker, 2015).

Theoretical Framework

Due to the unique situation that teachers found themselves in during the COVID-19 school closures, several learning theories and models were selected to form the theoretical framework for this dissertation. Almost mirroring the fact that teachers had to pull components from multiple resources and combine them into cohesive learning and instruction, so too have components been pulled from these selected theories to make a patchwork-like framework. As much of this study focused on the acceptance and intended use of EdTech among elementary teachers, the Diffusion of Innovation Theory and Technology Acceptance Model served as the main model and theory for this study, with the Experiential Learning Theory and Discovery Learning Model serving as secondary models and theories. These models and theories were all approached from the

cognitive constructivist standpoint (Baker, Ng, & Friesen, 2019) in that, throughout the pandemic, teachers were constructing new knowledge regarding EdTech and its applications based on their pre-existing cognitive structures.

Experiential Learning Theory

The Experiential Learning Theory (Culatta, 2020), developed by Carl Rogers, focuses on experiential, or applied, learning that addresses what the learners want and need and includes the qualities of personal involvement, self-initiated learning, evaluation by learners, and effects on the learners. The principles of the Experiential Learning Theory state that the content must be relevant or important to the learner, the learning should be "threatening," i.e., provide new perspectives or attitudes, and the learning should be self-initiated. While this theory suggests that learning be “threatening” to the learner in that it challenges their attitudes or beliefs, it is important that external threats, such as possibility of failure or embarrassment, financial constraints, materials constraints, and so on, are at a minimum. Additionally, Rogers provides some direction for how learning is to be facilitated when using this theory. He states that for learning to take place, the learners should be total participants, for instance, participants should be committed to the learning and should participate in all aspects of it as opposed to picking and choosing components; participants should control the nature and direction of their learning; problems should be confronted directly; and learners should participate in self-evaluation throughout the learning process (Culatta, 2020).

During the COVID-19 school closures teachers likely participated in many online trainings as students so that they could experience the student side of things for themselves in order to get a better understanding of how that particular EdTech worked

and if it would meet their students' needs. As such, the closures and distance learning became a highly experiential learning situation for teachers, with their newly acquired knowledge being both highly and immediately applicable.

Discovery Learning Model

The Discovery Learning Model, which is based on Inquiry-Based Instruction, was developed by Jerome Bruner and involves building on past knowledge and experiences, using intuition, creativity, and imagination to learn and discover new information. According to Bruner, learning is not just absorbing information but continuing to actively seek information, problems, and solutions (Bruner, 1995).

The principles of the Discovery Learning Model include problem solving, learner management, integrating and connecting information, analyzing and interpreting information, and failure and feedback. Learners using this model are encouraged to identify problems and seek solutions using their existing or newly acquired knowledge. They are typically encouraged to do so independently, while working at their own pace, so that they feel more in control of their own learning. Learners are encouraged to integrate their newly discovered knowledge with their existing knowledge to form better real-world connections and extend their knowledge base. Unlike traditional learning models that often utilize rote memorization, the Discovery Learning Model encourages learners to analyze and interpret information so that it is more meaningful and useful to them. Finally, failure is embraced as a learning opportunity, as it allows learners to gain important feedback and experience about the content at hand (Pappas, 2014).

The Discovery Learning Model presents several advantages for learners such as allowing them to set their own pace, offering autonomy and independent learning,

promoting retention of content, and encouraging learners to be creative and motivated. This is achieved by the fact that learning sessions are typically interactive, experiential, and include techniques such as games, stories, or visual aids to help learners think and reflect on their learning (Pappas, 2014).

When COVID-19 forced schools to close around the world, teachers found themselves having to identify and participate in virtual learning to be able to teach remotely. Although they may not have been aware of it, teachers were likely utilizing the Discovery Learning Model during this uncertain time. Teachers were faced with a new problem: they had to convert their classroom to distance learning, something they had never done before and had likely not been trained in, so they had a major problem that they had to solve, likely on their own. Since little to no training was provided, teachers had to seek out training that met their needs. Luckily, many educational organizations began offering training online, either through videoconferencing or self-paced courses. This allowed teachers to identify learning opportunities that worked for them and to work through it at their own pace or on their own schedules. Teachers were able to identify training to suit their needs, so anything they learned was likely immediately of relevance and could be immediately applied to the classroom. Now, there was a plethora of information and training out there made available for teachers, so teachers had to analyze this information to see what would actually apply to them and what was worth their time that would make a positive impact in their classrooms. Finally, teachers likely encountered failures during this time, but one of the best ways to learn is through failure and the feedback that comes from that failure. As a result, teachers quickly learned what

didn't work and were able to make adjustments to ensure that they met the needs of their students as best they could during such an impossible situation.

Diffusion of Innovation Theory

The Diffusion of Innovation Theory was developed by Everett Rogers in 1962 as a way to study and explain how innovations diffused throughout populations. He defined diffusion as, "the process in which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003, p. 5). The idea is that, over the course of this communication, the members of the group ultimately converge with the same end result in regard to adopting an innovation. While most other behavior science theories have no limitations or requirements regarding time or length of the study, the Diffusion of Innovation Theory uses time as one of its most significant variables.

Although the timeline for the adoption of innovations can vary significantly between populations or innovations, according to Rogers (2003), there are several characteristics of the innovations themselves that can affect these adoption rates. Relative advantage is how a population perceives a new innovation as better, or improved, compared to the current status quo. Compatibility is the level at which the innovation is seen as consistent with current values and needs, as well as past experiences of populations. Complexity refers to how easy or difficult an innovation is to use. Trialability is to what extent the innovation can be used on a trial basis, in order to experience it without a commitment. Finally, according to Rogers (2003), observability is the extent to which innovation results can be observed by other potential adopters.

Rogers (2003) has identified three different ways in which a group or organization may adopt an innovation. When individuals within an organization are given the autonomy to decide whether to adopt a particular innovation, it is referred to as an optional innovation decision. When an organization uses a consensus of its members to decide whether to adopt an innovation, it is referred to as a collective innovation decision. Finally, an authority innovation decision is when individuals in positions of power in an organization decide whether to adopt an innovation on behalf of the entire organization.

When considering the adoption of innovations, it is the hope of the adopting organization that the consequences of adopting an innovation would be desirable, as opposed to undesirable. While this seems to be an obvious consideration for adopting an innovation, there are also two additional categories of consequences. Consequences of adopting an innovation can be either anticipated or unanticipated, and either directly or indirectly affect the social system or organization (Rogers, 2003).

Adopter Categories

Individuals participating in an innovation adoption project are typically categorized based on how quickly they adopt the technology in question. The categories include those of innovators, early adopters, early majority, late majority, and laggards. Innovators actively seek out new ideas and information and might even adopt a technology before it is a requirement. They have large interpersonal networks and a high amount of exposure to mass media. They are also willing to work outside of their comfort zone and are willing to accept occasional setbacks. While individuals in this category are often able to identify and adopt innovations before others might even be aware of them, they are also often considered to be "outsiders" by their peers and might not have a high

level of influence in influencing their colleagues to follow their lead in innovation adoption (Rogers, 2003).

Early adopters, on the other hand, are considered to be more integral to their social systems and can often set trends in regard to innovation adoption. This group is often sought out for information and advice regarding new innovations. Once this group has adopted an innovation, it reduces uncertainty about the innovation among its peers, often triggering critical mass for the adoption process (Rogers, 2003). In fact, the early adopters are positioned so strategically in the diffusion of innovation process, that Sanford (2018) even suggests that administrators actively seek them out to help speed up the process of an innovation adoption. He suggests having early adopters try out new innovations first to secure their feedback before pushing the innovation out to the entire organization. In the field of education, early adopters typically make up about 13% of teachers. Characteristics of early adopters often include those such as constant iteration and improvement of ideas, comfort having visiting colleagues and administrators in their classroom, able to design personalized curriculum, a commitment to supporting students, extreme credibility among their peers, eagerness to collaborate with colleagues and students, willingness to take risks, and comfort with being uncertain. Early adopters, on the other hand, are *not* necessarily, the youngest, the first to volunteer, the most tech-savvy, or the most outspoken (Sanford, 2018).

While the early majority may adopt an innovation more quickly than the late majority, they are often fairly similar in their characteristics. The early majority typically only adopt an innovation shortly before the late majority. They may hold more leadership positions and they may take more time to deliberate over whether to adopt an innovation

or not. Both the early and late majority typically each make up roughly one third of the members in an organization. Members of the late majority may end up ultimately adopting an innovation due to peer or organizational pressure and often wait until all or most uncertainties about an innovation have been addressed or removed before adopting (Rogers, 2003).

Finally, laggards are the last to adopt an innovation. They typically do not hold leadership positions in their organization and are often isolated in their social networks. Laggards often justify their reluctance to adopt an innovation as skepticism that the innovation might fail (Rogers, 2003).

Characteristics of Early Adopters

Early adopters typically include both the innovators and the early majority. Rogers (2003) has organized the characteristics of early adopters into three categories of socioeconomic status, personality characteristics, and communication behavior. For socioeconomic status, it has been generalized that, while there does not tend to be a difference in age between early and late adopters, early adopters do tend to have more years of formal education experience than late adopters. Earlier adopters also tend to be more literate, have higher socio-economic status, higher levels of upward social mobility, and belong to larger-sized organizations.

Personality characteristics of early adopters include higher levels of empathy, lower levels of dogmatism, greater ability to address abstractions, higher levels of rationality, higher levels of intelligence, more favorable attitudes to change, are better equipped to deal with risk and uncertainty, more favorable attitudes toward science, less fatalistic, and typically have higher aspirations.

Finally, communication behavior of early adopters includes higher levels of social participation, high levels of interconnectedness in interpersonal networks, a more cosmopolite lifestyle, higher levels of contact with change agents, higher exposure to mass media and interpersonal communication channels, higher levels of knowledge about innovations, higher levels of opinion leadership, and they tend to actively seek information (Rogers, 2003).

Individual Innovativeness

According to Rogers (2003), innovativeness is defined as "the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than the other members of a system" (p. 22). Agarwal and Prasad (1998) claim that individuals with higher levels of innovativeness can even serve as change agents during a diffusion of innovation process. A 2019 study by Akar on innovativeness among teachers revealed that the more innovative teachers are, the higher their levels of perceived ease of use and perceived use were, indicating that these innovative teachers not only felt that using a particular technology would be effortless, but also that it had great potential for use. Likewise, it was indicated that innovativeness contributed to the prediction of teachers' behavioral attention regarding technology.

The Technology Acceptance Model

Information technology was a rapidly growing field in the 1980s and it was quickly realized that there was not a reliable way to measure the correlation of usage from one study to another. To remedy this, a landmark paper was published out of the University of Michigan by Fred Davis (1989), detailing his research into a new model called the Technology Acceptance Model. This model was developed by focusing on

factors that were identified as perceived usefulness and perceived ease of use. "Perceived usefulness" refers to whether a person decides to use a particular technology, based on how useful they feel it will be to them or to what extent they feel it will enhance their performance on the job. In contrast, "perceived ease of use" refers to how easy a person feels that a particular technology would be to use (Davis, 1989). The key to these factors is that the focus is on how the usefulness and ease of use are perceived by the participant as opposed to a more measurable level of actual usefulness or ease of use.

Davis led two studies to test his newly developed Technology Acceptance Model scales on perceived usefulness and perceived ease of use, beginning with 14 items for each scale, which was later narrowed down to 5 and 6 items based on the results of the studies. The items included gathering participant reactions to statements based on how their job performance and quality were enhanced using the technology or how cumbersome they felt the technology in question was (Davis, 1989).

The first study focused on technology acceptance of new e-mail and editing systems. The Cronbach alpha reliability for the perceived usefulness of both systems had a reliability of .97, while the reliability for the perceived ease of use for the e-mail and editing systems, respectively, were .86 and .93. When results for the two systems were combined, reliability was .97 for perceived usefulness and .91 for perceived ease of use. Regarding the validity for this study, at the .05 level, 100% of the correlations of self-reported indicants of use were significant for perceived ease of use, and 95.6% of the correlations for self-reported indicants of use were significant for perceived usefulness, indicating a particularly high discriminant validity (Davis, 1989).

The second study took place after narrowing the initial scales down to six items each. For perceived usefulness, the Cronbach alpha was .98, and for perceived ease of use it was .94. Validity was 97.22%, with only two correlations not being significant. A factor analysis was executed to assess validity of the scale items. It was also identified that by omitting item 4 on the ease-of-use scale, the Cronbach alpha would increase to .95 (Davis, 1989).

Previous Research

The Technology Acceptance Model has been revised and applied to situations and populations around the globe, ranging from teachers, to students, to office workers, and more. Pre-service teachers, or undergraduate students enrolled in a teacher certification program, are no exception. A 2015 study by Anderson & Groulx focused on attempting to make predictions about technology use of pre-service teachers after they have graduated and begun teaching. More universities are including EdTech in their pre-service teacher programs, since it has shown to positively affect future use of EdTech (Tondeur, van Braak, Sang, Voogt, Fisser, & Ottenbreit-Leftwich, 2012).

Anderson & Groulx (2015) identified that the strongest predictors of the pre-service teachers' intentions of using technology in their future classrooms were perceived ease of use and subjective norm. The pre-service teachers anticipated using EdTech in their future classrooms because they felt that their future colleagues and supervisors would expect them to do so. Hsu (2013), Lee & Lee (2014), Smarkola (2011), and Tondeur et al. (2012), posited that by pre-service teachers having the opportunity to design, utilize, and reflect on lessons that integrate technology would increase, not only the self-efficacy and confidence, but also the likelihood of them continuing to use

EdTech after entering the educational workforce. Additionally, Ertmer and Ottenbreit-Leftwich (2010), Perkmen and Pamuk (2011), and Tondeur, et al. (2012) claimed that positive experiences and modeling of technology-integrated instruction while attending a pre-service teacher program can also lead to improved confidence and higher usage post-graduation.

Onal, Ibili, and Caliskan (2017) used the Technology Acceptance Model in a pretest-posttest format, teaching pre-service teachers how to use augmented reality to teach geometry, in between each test. While the pre-service teachers indicated it was difficult to learn augmented reality initially, they followed up by saying that it was easy to implement once learned, resulting in the number of positive opinions ultimately outweighing the negative opinions.

A recent study by Dinc (2019) surveyed 76 pre-service teachers about their perceptions of technology integration. Nearly two thirds of the participants mentioned concerns regarding using technology effectively and how to add technology resources to the classroom. Over one-third mentioned increasing student engagement through technology and how to integrate technology into *all* subject areas. Finally, additional comments were made from less than one fourth of participants that included topics of instructional supports, adding visibility to content, keeping technology integration just to core subjects, and increasing educational quality through technology, mirroring many of the same perceptions and concerns as veteran teachers and administrators.

Recently, the Technology Acceptance Model was even adapted to assess the technology acceptance of teachers regarding the use of mobile devices in South Korean classrooms (Leem & Sung, 2019). Five factors were identified from the study, including

interest, immediacy, instability, interactivity, and inconvenience. Interactivity, and instability were identified as relating to perceived usefulness, and inconvenience was found to be related to both perceived usefulness and perceived ease of use. Teachers that perceived a technology to be inconvenient or unstable were unlikely to use that technology, whereas teachers that perceived a technology to be interactive were more likely to implement that technology. 43.25% of the variance in the results was explained by immediacy, indicated by words such as "new," "fast," "moveable," "synchronous," "stimulating," "changeable," and "accessible." Additional variance was explained by interest (10.03%), interactivity (6.65%), instability (5.08%), and inconvenience (4.41%) (Leem & Sung, 2019).

The Technology Acceptance Model isn't limited to just teachers though, as Gürbüztürk (2018) used a modified Technology Acceptance Model to survey students on their perceptions regarding the use of SMART boards in the classroom. Across the board, students responded more positively to the positive items and more negatively to the negative items. The mean of the students' total scores was 40.65 out of a potential 50, indicating that the students had overwhelmingly positive attitudes towards the use of SMART boards in the classroom.

Teacher Adoption of Technology

The numerous iterations of and studies involving the Technology Acceptance Model have resulted in a list of recurring variables regarding whether teachers ultimately accept a particular technology (Venkatesh & Davis, 2000). Surprisingly, researchers were reporting many of the same variables, regardless of the subject population or type of technology in question. These variables, which can be divided into either barriers or

contributors, have remained largely consistent, even as far back as 1981 (Lidtke), highlighting the fact that many of the identified barriers still exist nearly forty years later and still have yet to be addressed. Venkatesh and Davis (2000) took this a step further and identified external variables for perceived usefulness that included image, job relevance, result demonstrability, subjective norm, and output quality. Their variables for perceived ease of use included facilitating conditions, computer playfulness, computer self-efficacy, and computer anxiety. A subsequent meta-analysis of Technology Acceptance Model studies resulted in the creation of four categories of variables: users' personal characteristics, organizational characteristics, system characteristics, and other characteristics (Venkatesh & Davis, 2000).

Contributors to Adoption

While access to technology and the internet can obviously positively contribute to the adoption of technology in the classroom, this section will focus more on factors that are more specific to teacher demographics or experiences that contribute to the likelihood that teachers will ultimately adopt a particular technology or integration strategy. According to Fullan (2017), teachers that have participated in an online or blended course at some point have higher valuations and aspirations in regard to educational technology. Unfortunately, though, according to Project Tomorrow (2019a), only about one-fifth of principals and teachers have taken such a course.

When asked to identify the elements most essential to integrating technology in the classroom, teachers participating in Project Tomorrow (2019a) responded with technology access, planning time, internet connectivity, and professional development. Fullan (2017) also identified three factors to identify teacher readiness for technology

integration, including whether teachers have the required skills, are willing to change their teaching practices, and have the right valuations or attitudes in regard to technology integration and digital learning. Building on this, Koehler and Mishra (2009) indicated that there are three types of knowledge required for classroom teachers to effectively integrate technology into their classrooms: technology knowledge, pedagogy knowledge, and content knowledge, which is now frequently referred to as "TPACK."

Professional development is one of the most requested items when it comes to technology integration, and, based on a teacher and administrator wish list for professional development topics compiled by Fullan (2017), both groups, particularly administrators, are realizing the need for training in technology and digital learning. The topic rated the highest on the wish list, by both groups, was differentiating instruction using technology, with 73% of administrators and 52% of teachers indicating a desire for professional development in that area. While teachers had a higher rate of requesting professional development on the topic of using educational games in the classroom compared to administrators (47% to 31%), the remaining topics of using mobile devices, implementing blended learning, using data to drive instruction, integrating technology into curriculum, and supporting student investigations with digital tools, were requested by administrators at a level nearly twice the amount of that requested by teachers (Fullan, 2017). While these are the professional development topics most often requested by teachers and administrators, Rodriguez and Knuth (2000) suggest that in order to be truly effective, professional development for technology integration should include: hands-on use of technology, student learning connections, curriculum specific applications, varied learning experiences, collegial learning, teachers' active participation, new teacher roles,

ongoing processes, ample time, administrative support, technical support and assistance, continuous funding, adequate resources, and streamlined evaluations.

While professional development for in-service teachers can positively contribute to the likelihood of technology adoption, effective modeling of technology integration in teacher preparation courses has been suggested as one of the best ways to prepare pre-service teachers for technology integration in their future classrooms (Keengwe, Onchwari, & Wachira, 2008). Tondeur, et al. (2012) add that this instruction should be high in both quality and quantity, echoing Haydn and Barton (2007) that observing model teachers integrating technology was one of the most important factors for motivating pre-service teachers to integrate technology into their own classrooms. Tearl and Golder (2008) added on to this idea, suggesting that such modeling, along with actual technology use, should be integrated throughout teacher preparation programs. Keengwe, et. al. (2012) continued by identifying a series of key themes for preparing pre-service teachers for technology integration, which include categories of implementing continuous feedback in place of traditional assessment, creating scaffolds for authentic technology experiences, peer collaboration, considering technology's role in education and reflecting on their attitudes about it, utilizing model teachers, and aligning practice and theory.

Demographic factors can also affect the technology adoption practices of teachers, as age has been shown to positively correlate with teachers' perceived usefulness and effective use in the classroom, and gender was shown to affect the integration of mobile resources in the classroom (Camilleri & Camilleri, 2017). Noh, et al. (2016) also found that teacher demographics could affect personal innovativeness

levels, and that teachers with higher levels of education that used technology more frequently were more likely to implement technology programs.

Teacher behaviors, beliefs, and attitudes play a large role in whether they decide to adopt a particular technology or digital learning component. Keengwe, et al. (2008) developed a list of suggestions for actions that teachers could take to contribute to the likelihood of accepting a particular technology. They suggested that teachers should become technology integration advocates, learn how to increase student motivation through technology, participate in authentic experiences in order to develop technology ownership, research the benefits of technology integration, create integrated lessons and activities, and foster a relationship between active teaching and active learning.

Even as far back as 1981, Lidkte identified several factors that could contribute to the likelihood of teachers integrating technology, factors which remain constant nearly forty years later. She suggested that teachers needed technology support personnel or procedures to assist them in the event of malfunctions or software use, they required training, they required sufficient hardware and software, and they needed additional planning time in order to develop their technology integration plans and activities. She also suggested providing additional lesson plans or curriculum materials, providing modeled examples of quality technology integration lessons, and rewarding excellent integrated teaching. In 2000, Mize and Gibbons (2000) reiterated many of these factors and added some of their own. They suggested that teachers needed to develop a clear vision for their integration strategy, they needed a stable work environment, and that administrators needed to be involved in the process. They also noted that as teachers' self-

perception of their own technology skills increases, they become more motivated to integrate technology into their classrooms.

Barriers to Adoption

The research on the technology acceptance of teachers has consistently resulted in the identification of many of the same barriers to adoption, indicating both the prevalence of the identified barriers and the reliability of the research. These barriers were initially divided into two categories by Ertmer (1999), with a third category suggested in 2012 by Tsai and Chai, focusing on teachers' design thinking. Design thinking (IDOU.com, 2021) focuses more on the human aspect of teaching and learning, specifically who the learner is and what their needs are. Design thinking typically employs strategies such as practicing observation, empathy, and interviews; creating prototypes to identify unmet needs; generating questions from problems; and understanding the past, present, and future through research.

First-Order Barriers

First-order barriers, as coined by Ertmer in 1999, are those barriers that are extrinsic to teachers and are usually beyond their control. The original first-order barriers, identified by Ertmer (1999), included lack of funding, lack of equipment, lack of planning time, or lack of technical support. Subsequent studies on teacher acceptance of technology have yielded additional first-order barriers such as lack of training (Hechter & Vermette, 2013), lack of administrative support, technical problems (Keengwe, et al., 2008), lack of maintenance services (Ertmer & Ottenbreit-Leftwich, 2010), lack of equipment access (Nikolopoulou & Gialamas, 2015), lack of sufficient computer labs, lack of reliable internet connectivity, lack of software, lack of technology planning (Hur,

Shannon & Wolf, 2016), and lack of evidence of technology integration effectiveness (Lidkte, 1981).

Evans (2019) surveyed teachers and identified the top five teacher requests regarding technology integration. These requests, which had not changed since 2014, included planning time, professional development opportunities, access to technology, adequate internet access, and access to tech support. Evans also identified a trending increase in the number of teachers requesting curated collections of digital or online resources, increasing from 25% in 2014, to 38% in 2018. When broken into groups based on years of teaching experience, teachers with 1 to 3 years of teaching experience indicated the highest responses regarding needs for a class set of devices, professional development, a list of resources recommended by the district, integration strategies, and curated resources, while teachers, with more than 16 years of teaching experience, indicated the highest responses regarding needs for collaborative planning time, tech support, internet reliability, and in-school coaching. Evans also found that teachers realized how important it was for students to have access to technology outside of the classroom, as 43% of surveyed teachers indicated it was a necessity in order for them to be effective when using technology inside the classroom.

Hechter & Vermette (2013) took the classification of barriers to technology integration a step further by categorizing them into the four areas of technological, administrative, philosophical, and organizational. Technological barriers include teacher knowledge, awareness, mentorship opportunities, skills, and training. Administrative barriers include teacher support, time, and access. Philosophical barriers include the teachers' own decisions about their teaching interests and practices. Finally,

organizational barriers include lack of equipment, student demographics, school priorities, and lack of budget. They then surveyed K-12 science teachers regarding their identified barriers to integrating technology into their science classrooms. Over half of the respondents indicated that access, time, lack of resources, and training were barriers to integration. Budget restrictions followed closely behind, with 37.9% of teachers indicating it as a barrier. The barriers that were reported the least by teachers were student age and, surprisingly, lack of science equipment, both at only 3.5% (Hechter & Vermette, 2013).

Prasojo, Habibi, Yaakob, Mukminin, Haswindy, & Sofwan (2019) developed yet another categorization for first-order barriers to technology integration, including lack of professional development, lack of funding, district culture, and school culture. They also made the argument that stakeholders often make the technology adoption their focus but do not provide adequate support, training, or conditions to ensure the innovation will be successful.

Second-Order Barriers

Second-order barriers are often trickier to overcome as they are intrinsic to teachers and relate to their beliefs regarding computers, teaching, classroom practices, and whether they are willing to change (Ertmer, 1999). Indicative of this is the fact that 67% of technology leaders report motivating teachers to alter their teaching practices to include technology is the greatest challenge to expanding technology use and a third of principals report that identifying teachers willing to try technology integration is their greatest obstacle to technology integration (Fullan, 2017).

Although they hadn't been named such yet, even as far back as 1981, second-order barriers to technology integration were identified by Lidkte (1981), many of which still remain today. Lidkte noted that, while many teachers felt that students should learn about technology, they felt the computers would be impersonal, or were either unaware of how to use the technology or didn't want to use the technology in their own classrooms. Teachers that did recognize the value in using technology in the classroom, however, were often held back from implementing it due to anxiety about technology or a feeling of loss of control of the classroom.

Blocher, Armfield, Sujo-Montes, Tucker, and Willis (2011) pointed out the fact that many veteran classroom teachers today did not grow up immersed in technology and may not be as comfortable using technology in their classrooms. On the other end of the spectrum, students in today's classrooms have grown up with technology, and have even been dubbed as "digital natives," due to their lifelong experience and even immersion in technology. Meanwhile, the veteran teachers just learning technology are considered "digital immigrants" (Presnky, 2001).

Hew and Brush (2006) organized the barriers to technology integration into six categories, with resources, institution, and assessment being first-order barriers, and knowledge and skills, attitudes and beliefs, and subject culture being second-order barriers. Then, they took it a step farther and created five categories of strategies for overcoming the barriers, such as dealing with resource scarcity, changing beliefs and attitudes, creating shared technology plans and visions, addressing professional development, and how to reconsider assessments. From there, they identified four gaps in knowledge that needed to be closed to effectively integrate technology. These knowledge

gaps included the relationship between the first- and second-order barriers, the relationship between the integration strategies, the strategies and barriers related to the various stages of the technology integration process, and strategies and barriers related to 1:1 device usage.

A meta-analysis by Noh, et al. (2016) identified several variables that could be considered either second-order barriers or contributors to technology adoption, based on at what level they are present in the teachers in question. For instance, level of confidence in using technology, years of technology experience (Rozell & Gardner, 1999), level of education (Tellis, Yin, & Bell, 2009), and previous experiences with technology (Gatignon & Robertson, 1991) were positively correlated with technology acceptance.

Second-order barriers have begun to overshadow first-order barriers, as Ertmer, Ottenbreit-Leftwich, Sadik, Sendurer, and Sendurer (2012) have suggested that more effort should be spent overcoming second-order barriers than first-order barriers. In fact, overcoming these barriers could ultimately change the makeup of education, according to Ritchie and Wiburg (1994), "Technology's greatest power may be the way in which its use causes teachers, administrators, and students to rethink teaching and learning" (p. 152).

Third-Order Barriers

Based on their research on technology integration in teacher education, Tsai and Chai (2012) suggested adding a third order of barriers to the acceptance and use of technology. They proposed that the design thinking of teachers might hinder the successful integration of technology, even though the facilities, equipment, and even the teachers' attitude towards technology are sufficient. Teachers might have everything they

need to integrate technology based on first- and second-order barriers, yet they may not have the design thinking skills to be able to design integrated lessons or learning environments.

Summary

This dissertation focused on the topic of predicting EdTech usage among elementary teachers after the COVID-19 pandemic has ended. The main model used for this study was the Technology Acceptance Model, and the main theory was the Diffusion of Innovation Theory. Secondary models and theories included the Experiential Learning Theory and the Discovery Learning Model. The Technology Acceptance Model has provided a series of survey items that have been proven to accurately gauge a participant's perception of ease of use and usefulness of a particular technology. This was be used in conjunction with the Diffusion of Innovation Theory's levels of adoption to gauge what factors predict whether elementary teachers intend to continue using EdTech after the COVID-19 pandemic has ended. Due to the way in which teachers had to essentially teach themselves how to integrate EdTech virtually, in person, or a combination of the two, the Experiential Learning Theory and Discovery Learning Model provided further theoretical insight into how knowledge and experience were achieved in order for EdTech to be successfully implemented, and how these experiences predict future EdTech use.

Over the past several decades, EdTech has played an increasingly important role in the classroom, and stakeholders at all levels have taken note of the results. Students have reported that using EdTech increases their motivation, quality of their work, collaboration skills, and the ability to set their own pace or learning path. While some

parents have voiced concerns about students potentially having too much screen time, they also indicated that EdTech helped their children to develop college and career readiness skills. Administrators may not be the primary users of EdTech in schools, however they are in a position to see the larger picture of how the use of EdTech affects a school, or even a district. Over 90% of principals indicated in a 2014 survey that they felt the effective use of technology was critical to achieve the core mission of their school or district (Horn & Staker, 2015). Additionally, many administrators have even come to expect their newly hired teachers to already possess technology integration skills. Finally, as the primary users of EdTech, teachers have indicated that student engagement is perhaps the most important metric in measuring the success of technology integration. While more teachers are using EdTech and results show increased student success, technology integration is still not without its barriers.

The barriers to technology adoption have remained largely unchanged since they were identified by Lidkte in 1981. These barriers were then categorized into first- and second-order barriers in 1999 by Ertmer. First-order barriers are those that are extrinsic to, or outside of a teacher's control, such as lack of hardware, lack of training, or lack of planning time. Second-order barriers are those that are intrinsic to a teacher, such as her beliefs about technology, beliefs about teaching, and willingness or unwillingness to change. A third-order barrier category was suggested by Tsai & Chai (2012) that included the concept of design thinking and how it could affect technology acceptance. Although these barriers may have been satisfied for in-person instruction, they may have become barriers once again during the pandemic. First-order barriers may have reappeared in the form of teachers having to work from home with minimal technology, students having to

learn from home with unreliable devices or internet, or a lack of training for teachers on how to implement virtual learning. Second-order barriers may have reappeared as teachers that were previously comfortable with using technology now being unsure how to use that technology in a virtual learning capacity. Finally, teachers that may have had adequate design thinking skills and the ability to design technology integrated lessons for the classroom may have struggled to transition those design thinking skills to creating instruction for a virtual learning environment.

CHAPTER III

METHODOLOGY

Research was conducted to understand better what factors predict whether teachers intend to use EdTech upon returning to the classroom after the COVID-19 school closures. Additional data was collected to better understand how the continuation or discontinuation of EdTech, upon returning to the classroom after COVID-19 virtual learning, is predicted to affect student motivation, attitudes, and engagement. A mixed methods study was conducted, primarily collecting quantitative data, with qualitative data also collected to add additional context and insight into participating teachers' experiences. The research was conducted over the course of two stages, collecting a total of 15 variables which were analyzed and run through statistical tests to assess how they predicted the anticipated usage of EdTech among teachers after returning to 100% in-person instruction.

Research Design

Assumptions of the Study

The development and implementation of this study were approached from the cognitive constructivist (Baker, et al., 2019) standpoint. Cognitive constructivism posits that learners actively construct knowledge based on cognitive structures that are already in place. Learners using this method are taught how to assimilate knowledge by modifying their existing cognitive framework in order to accommodate the new knowledge (McLeod, 2019). This is important for the development of this study, as the

participants are in positions where they likely had to seek out information or training on using EdTech on their own and had to integrate this knowledge, not only into their own existing knowledge bank, but also into their online teaching.

My assumptions were conceptualized during work on a master's degree in curriculum and instruction, through extensive work on a professional development program designed to train classroom teachers how to integrate the arts into their core subject areas, and over the course of working as an elementary teacher. This background developed my beliefs that learning is constructed by the learner by using previous learning as a scaffold to build new knowledge as proposed by Piaget (McLeod, 2019).

Participants

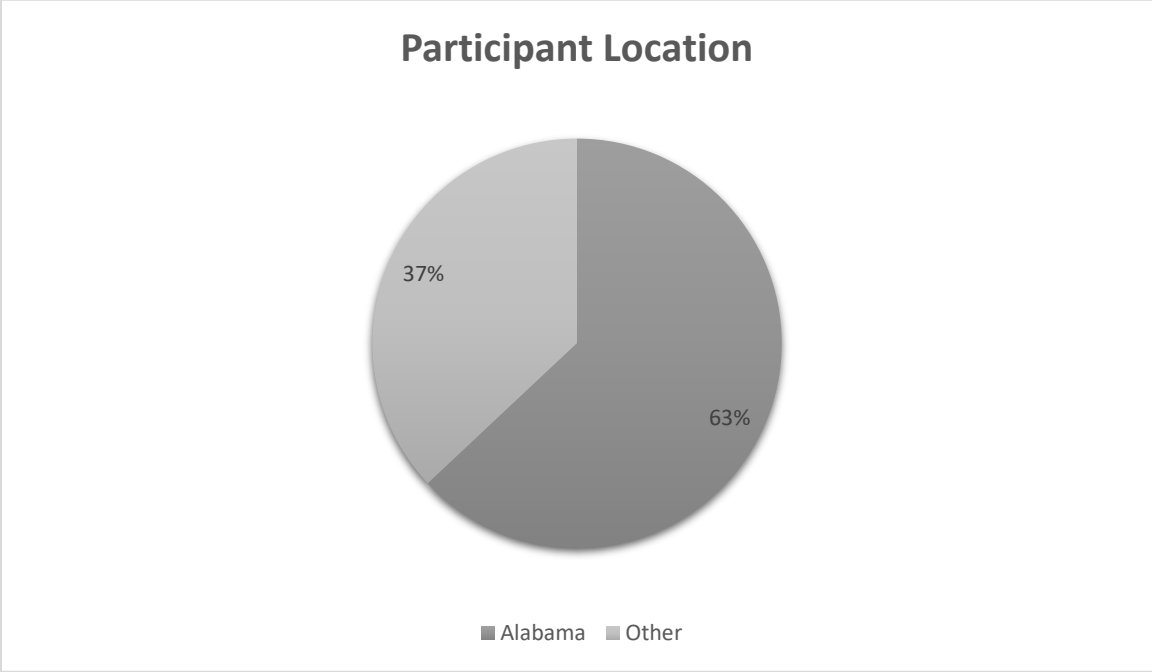
Participants were selected using both non-probability sampling (Glen, 2015) and voluntary response sampling (Crossman, 2020). For the survey stage, non-probability sampling was used, as the survey instrument was sent to teachers in a large local school district, to alumni of the University of South Alabama Elementary Teacher program, as well as posted to several teacher Facebook pages for maximum dispersal. Voluntary response sampling (Glen, 2015) was used for the follow-up interview stage, as participants were asked to indicate if they would be willing to participate in a follow-up interview. As this study focused on elementary teachers in particular, only their responses were taken into consideration.

Since the survey was directly distributed to teachers in a large Alabama district, it was unsurprising that this was the state that had the most respondents, making up nearly 63% of survey responses. The survey was distributed nationally over social media, so there were a handful of respondents from nearly every state, with California coming in

second at just over 6%. Seventeen states did not have any respondents, with the remaining states having between 1 and 10 respondents. Respondents in the Alabama district focused on in this study made up just over 62% of respondents, with only .6% of respondents from another Alabama district, and the remaining respondents from other states (Figure 1).

Figure 1

Participant Location: Alabama or Other State

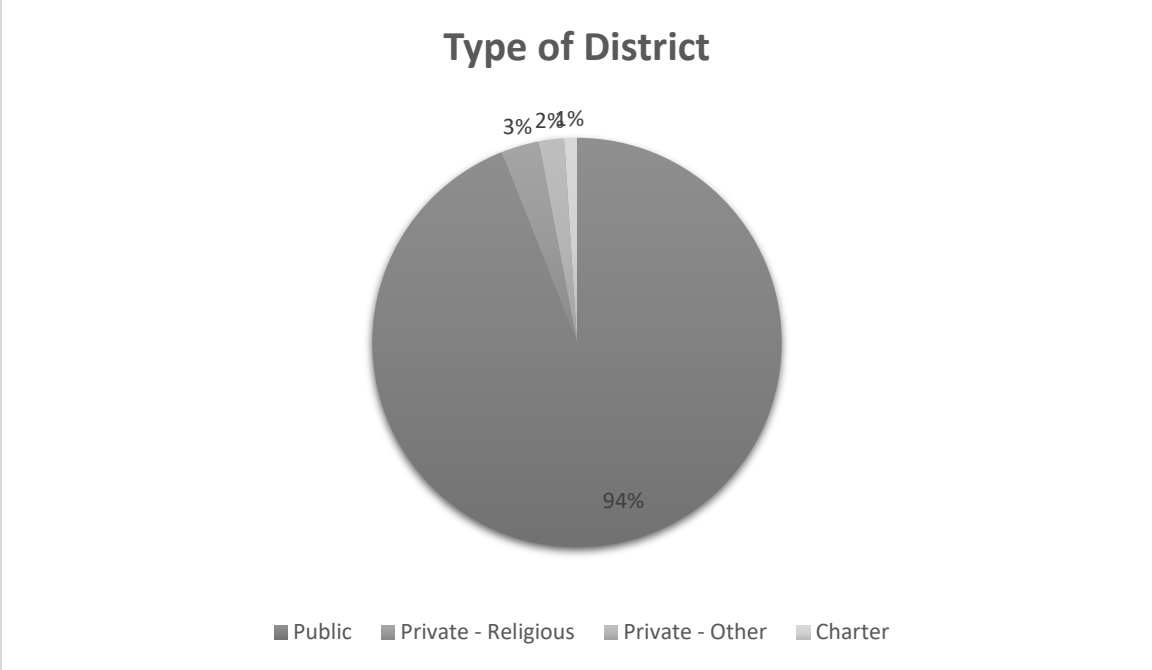


Additionally, teachers were asked what type of district they taught in – whether it was categorized as public or private (Figure 2). The great majority, 94% indicated teaching in a public school, 3% indicated teaching at a religious private school, 2%

indicated teaching at a non-religious private school, and 1% indicated teaching at a charter school.

Figure 2

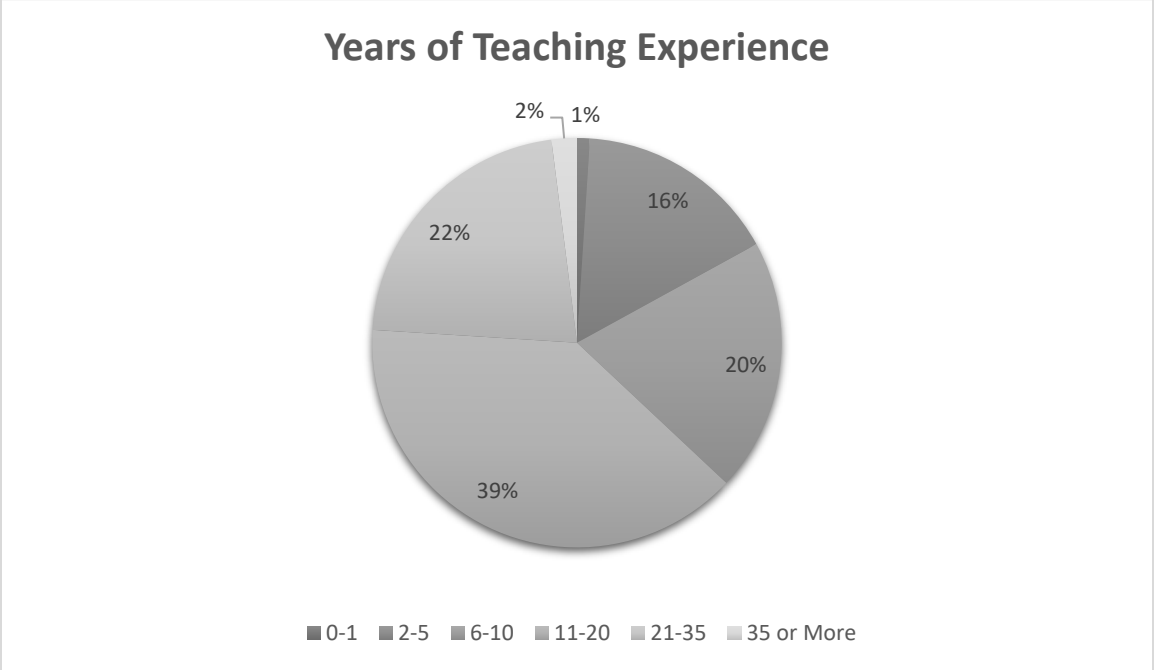
Type of District: Public, Private, or Other



Teachers were asked how many years of teaching experience they had (Figure 3), with 11-20 years being the most common response at just 38%. The remaining respondents' years of teaching experience were broken down at 22% for 21-35 years, 21% for 6-10 years, 16% for 2-5 years, 2% for 35 or more years, and just over 1% for 0-1 years.

Figure 3

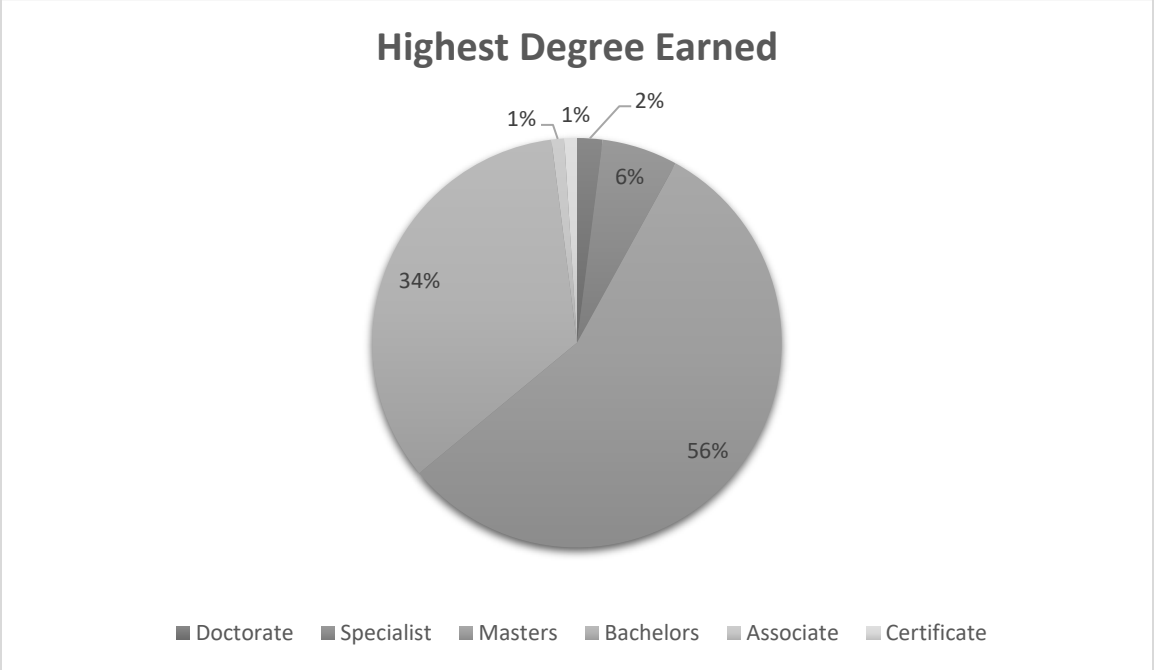
Years of Teaching Experience of Elementary Teacher Participants



As part of the demographic section, teachers were asked what their highest degree earned was (Figure 4). The most common degree earned was a master's degree at just over 56%. The other earned degrees indicated were bachelor's degree at 35%, Specialist degree at 5%, Doctorate at 2%, Associate degree at just over 1% and Certificate at just under 1%.

Figure 4

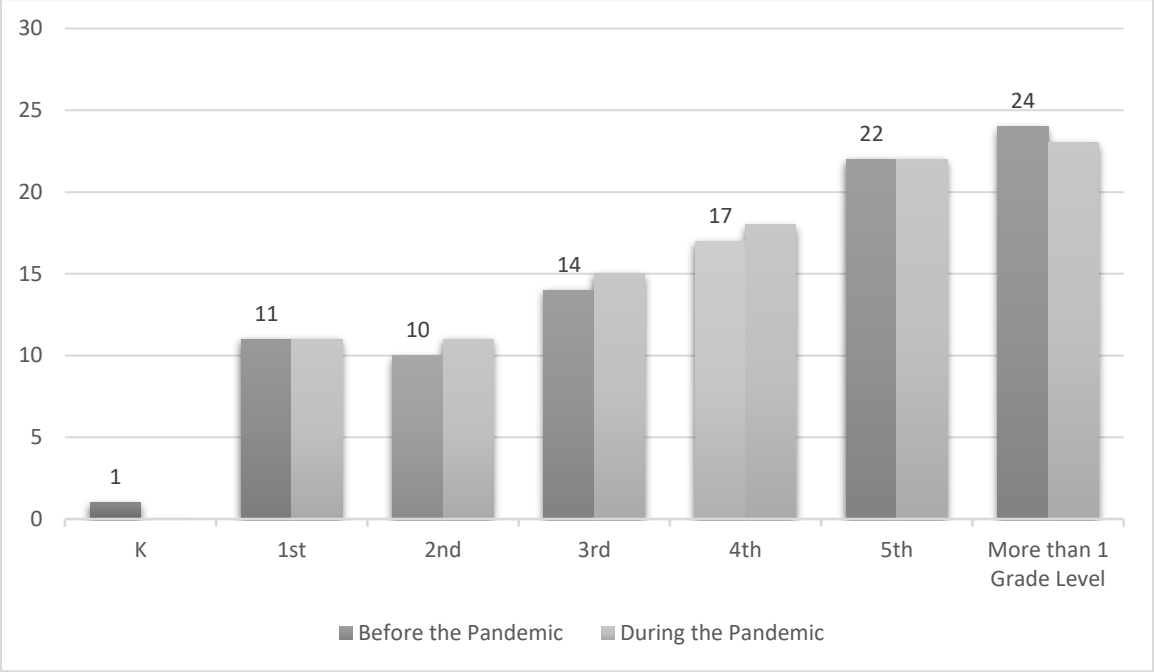
Highest Degree Earned by Elementary Teacher Participants



In order to see if the grade level taught predicted future EdTech use, teachers were asked what grade level(s) they taught before and during the pandemic (Figure 5). During the pandemic, 24% of teachers indicated teaching more than one grade level, 22% taught 5th grade, 17% taught 4th grade, 14% taught 3rd grade, 11% taught 1st grade, 10% taught 2nd grade, and only 1% taught Kindergarten. There were only some slight changes to grade levels taught during the pandemic, with 23% of teachers indicating more than one grade level, 22% taught 5th, 18% taught 4th, 15% taught 3rd, 1st and 2nd were tied at 11%, and 0% taught Kindergarten.

Figure 5

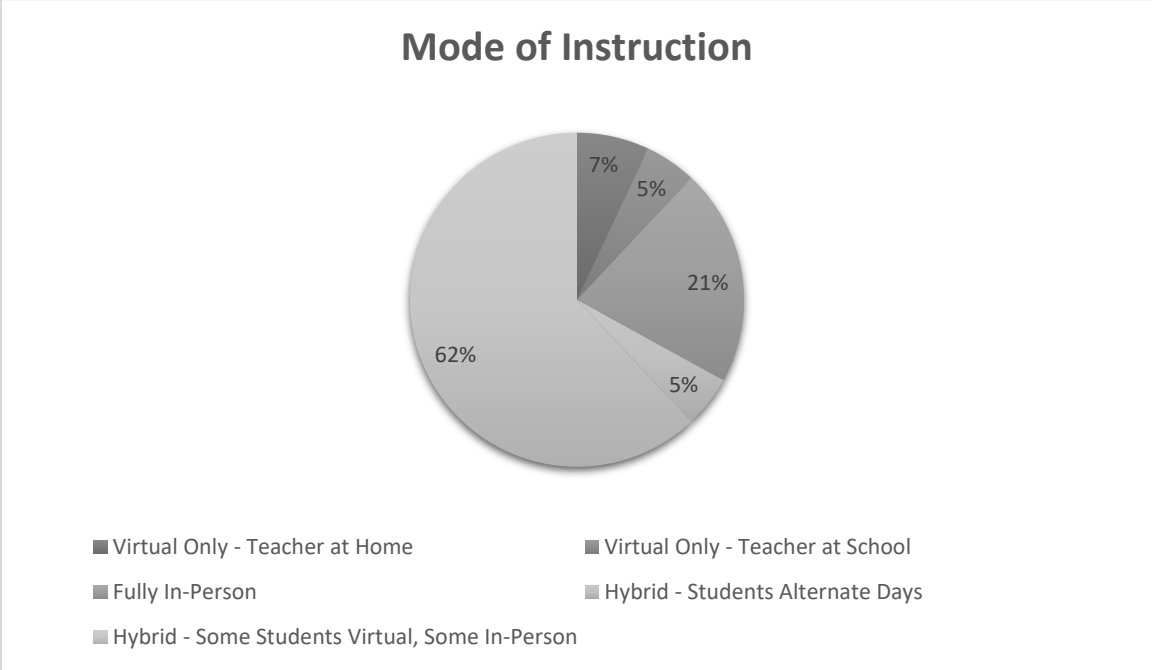
Grade Levels Taught Before and During the Pandemic by Teacher Participants



In order to see if the mode of instruction during the pandemic played a role, participants were also asked how they were delivering instruction during the pandemic (Figure 6). Hybrid – with some students being fully virtual and some students attending in person, was by far the most common mode of instruction at 62%. It was followed by fully in-person at 21%, virtual only with the teacher and students at home at 7%, and then virtual only with the teacher at school and students at home was tied with hybrid – students attend in-person and virtually on alternate days – at 5%.

Figure 6

Current Mode of Instruction by Elementary Teacher Participants



Finally, for personal demographics, respondents were asked about their gender (Figure 7), age (Figure 8), and race (Figure 9). As expected in the teaching profession, the majority, 95%, were women, with 4% indicating male, and the remaining 1% preferring not to answer. The most common age range was 40-49 at 33%, followed by 30-39 at 30%, 50-59 at 20%, 21-29 at 11%, and 60 and over at 6%. Last, the most common race identified was White/Caucasian at 76%, followed by African American at 13%, Hispanic/Latino at 2%, Asian/Pacific Islander at 2%, Other at just under 1%, and the remaining 6% preferring not to answer.

Figure 7

Elementary Teacher Participant Genders

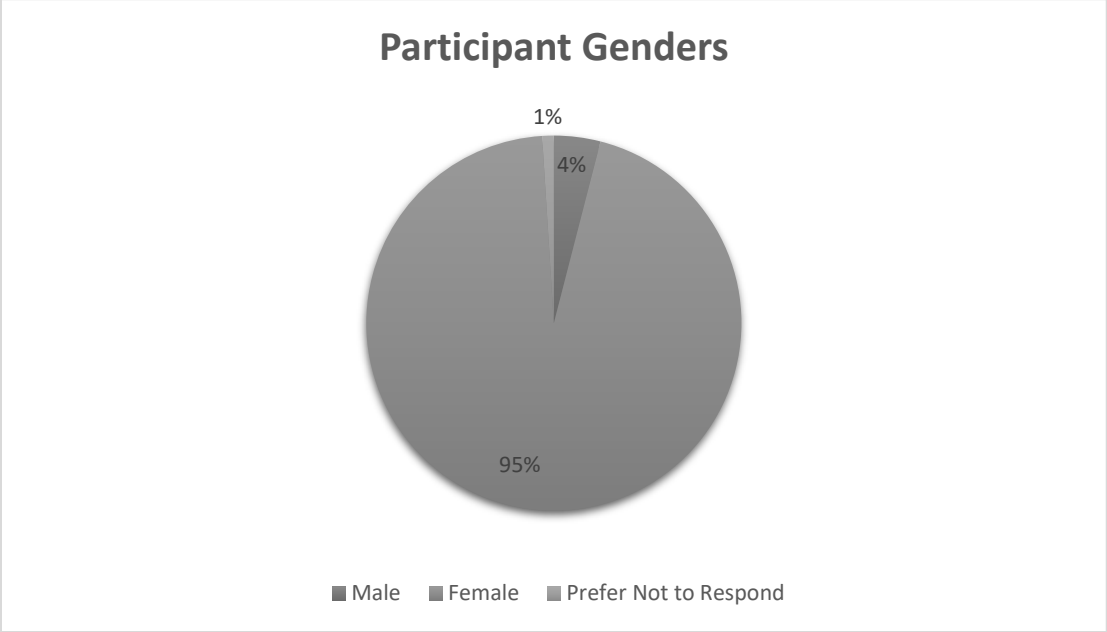


Figure 8

Elementary Teacher Participant Ages

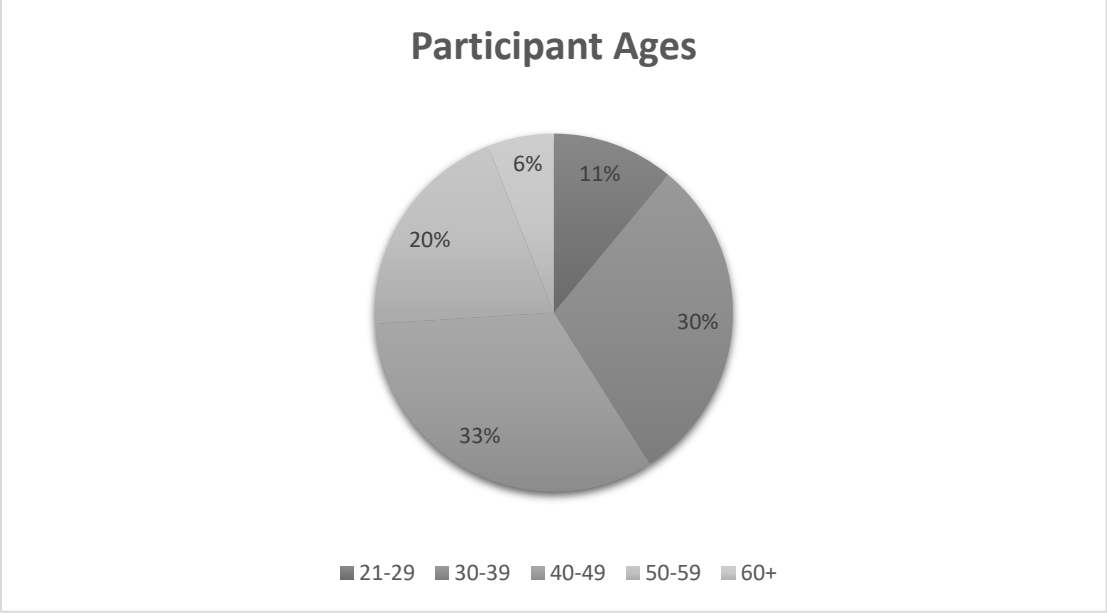
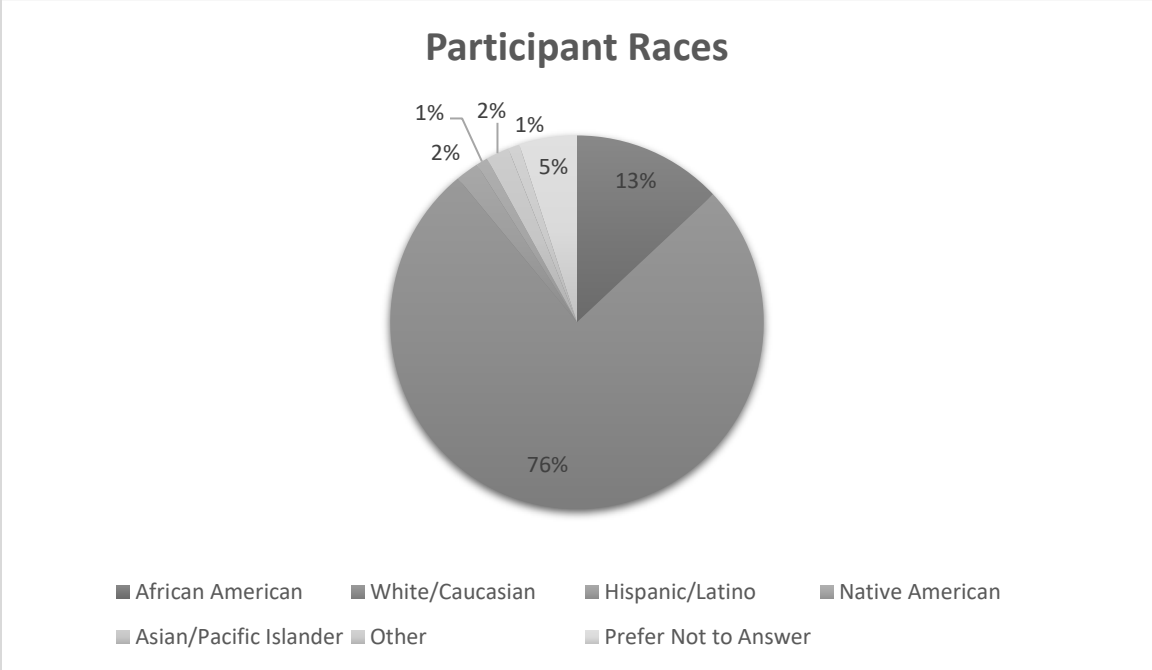


Figure 9

Elementary Teacher Participant Races



Setting

Although the survey instrument was posted on social media and made available to teachers across the U.S., the bulk of respondents were primarily located in a large county of Alabama. This district is the largest in the state, employs just under 8,000 teachers, serves a population of over 61,000 students, of whom are 57% minority enrollments, and has a district budget of nearly $649 million.

Within this district, training requirements for the spring 2020 transition to online learning ranged from a one-hour crash course in the new learning management system, to no training at all. While additional training and professional development were offered, and teachers were required to participate in professional development on a weekly basis,

there were no additional requirements as far as the specific professional development courses or the amount of required hours. Parents were given the option to choose whether to have their child complete a paper packet or to participate in online learning.

Barriers

Initially, I had planned to distribute the Teacher EdTech Usage Survey to two adjacent school districts in Alabama. Unfortunately, after many phone calls, emails, voicemails, and call transfers, I was unable to get in touch with someone in the second district who could approve the survey instrument to be distributed to teachers, so only one Alabama district was used.

A second barrier, specific to the survey, was that many of the submitted surveys were either incomplete or totally blank. Some participants filled out the first few items and then stopped, some filled out random items, and some only completed the demographics section. As such, these responses were essentially unusable, so they were removed from the study, reducing the number of usable responses from 600 to 365.

Finally, while numerous respondents signed up to participate in the follow-up interview, only two participants actually showed up for their scheduled Zoom interviews. As such, this meant that there were not enough data points for the information to be quantified for statistical testing, so the responses were used purely anecdotally in an effort to add more depth and insight to quantitative findings.

Variables

For Research Question #1, the independent variables (IVs) were the number of EdTech programs used before the pandemic and the frequency of use of EdTech programs before the pandemic. Participants selected which programs they used from a

list and had the option to type in programs that were not listed. The number of selected and added programs were totaled to create the variable of number of EdTech programs used. Frequency of use was selected from six options with a range including “Daily,” “2-3 Times per Week,” “1 Time per Week,” “2-3 Times per Month,” “1 Time per Month,” “Less than Once Per Month.” The dependent variables (DVs) were the number of EdTech programs used during the pandemic and the frequency of use of EdTech programs during the pandemic.

For Research Questions #2-6, the dependent variables were the anticipated frequency of use of EdTech programs after the pandemic, the number of EdTech programs anticipated to be used after the pandemic.

The independent variables for Research Questions #2-6 included number of EdTech programs used during the COVID-19 pandemic, participant demographics, personal innovativeness, perceived usefulness, and perceived ease of use. Participant demographics included school district, number of years teaching, highest degree earned, grade level taught before COVID-19 pandemic, grade level taught during COVID-19 pandemic, type of school, gender, age, race, and method of instruction. To generate a score for personal innovativeness, participants responded to twenty five-point rating-scale items. Negatively phrased items were reverse scored. Ratings were then averaged together for a single score. The same process was used to generate scores for perceived ease of use and perceived usefulness. Participants responded to nine items regarding perceived usefulness and seven items regarding perceived ease of use.

The dependent variables for Research Question #7 were comprised of a rating between one and five regarding how teachers felt the use of EdTech affected their

students' motivation, achievement, and behavior. The independent variables were the number of EdTech programs anticipated to be used after the pandemic and the anticipated frequency of use of EdTech programs after the pandemic.

Research Questions

The research questions in this study included the following:

1. Research Question #1: *How did the COVID-19 pandemic affect the use of EdTech among elementary teachers?*
    a. Hypothesis #1: *Use of EdTech among elementary teachers during the pandemic will be greater than the use of EdTech prior to the COVID-19 pandemic.*

       Rationale: Project Tomorrow (2019a) indicated a 12% increase in teacher participation in online conferences and webinars during the pandemic. Likewise, due to the nature of the pandemic and the fact that so many schools across the country were participating in virtual learning, out of necessity, the use of EdTech will be greater during than prior to the pandemic.
2. Research Question #2: *How was the use of EdTech during the pandemic related to teacher intention to use EdTech in the 100% in-person classrooms?*
    a. Hypothesis #2.1: *The number of EdTech programs that teachers use during the pandemic will be positively related to the number of programs they intend to use in the 100% in-person classroom.*

b. Hypothesis #2.2: *The frequency of use of EdTech programs that teachers use during the pandemic will be positively related to the frequency with which they intend to use EdTech in the 100% in-person classroom.* Rationale: According to Hsu (2013), Lee & Lee (2014), Smarkola (2011), and Tondeur et al. (2012), pre-service teachers that participated in technology integration lessons and then created their own lessons were more likely to continue using EdTech once they began teaching. Onal, et al. (2017) also found that pre-service teachers felt that programs were difficult to learn initially, but once learned they were easy to implement and they were more likely to implement them in future teaching jobs. These studies indicate the likelihood that once teachers use new programs during the pandemic and see their benefits, that they are more likely to use them after the pandemic.

3. Research Question #3: *Did demographic factors predict elementary teachers' intentions to continue to use EdTech upon returning to the 100% in-person classroom?*

    a. Hypothesis #3.1: *Age will be negatively related to teacher intention to continue voluntarily using EdTech upon returning to the 100% in-person classroom.*

    b. Hypothesis #3.2: *Years teaching will be negatively related to teacher intention to continue voluntarily using EdTech upon returning to the 100% in-person classroom.*

c. Hypothesis #3.3: *Grade level taught will be positively related to teacher intention to continue voluntarily using EdTech upon returning to the 100% in-person classroom.*

Rationale: Camilleri & Camilleri (2017) indicated in their study that age has shown a positive correlation to teacher's effective use of technology and that gender affected mobile technology integration in the classroom. Since many teachers today are "digital immigrants," or individuals that did not grow up using technology, Blocher, et al. (2011) indicated that this often made older teachers less comfortable integrating technology into the classroom.

4. Research Question #4: *Does personal innovativeness predict whether elementary teachers intend to continue using EdTech upon returning to the 100% in-person classroom?*

a. Hypothesis #4: *Personal innovativeness will be positively related to teacher intention to continue using EdTech upon returning to the 100% in-person classroom.*

Rationale: Individuals with higher levels of personal innovativeness often fall into the early adopter category (Rogers, 2003) and are able to serve as change agents during innovation diffusion (Agarwal & Prasad, 1998), making it more likely that individuals with higher levels of personal innovativeness will be more likely to continue using EdTech in the in-person classroom.

5. Research Question #5: *Does perceived usefulness predict whether elementary teachers intend to continue to use EdTech upon returning to the 100% in-person classroom?*
6. Hypothesis #5: *Perceived usefulness will be positively related to teacher intention to continue using EdTech upon returning to the 100% in-person classroom.*

    Rationale: Davis's 1989 Technology Acceptance Model study found, with high levels of reliability and validity, that perceived usefulness of a user positively correlates to their self-indicated usage.
7. Research Question #6: *Does perceived ease of use predict elementary teachers' intentions to continue to use EdTech upon returning to the 100% in-person classroom?*
    a. Hypothesis #6: *Perceived ease of use will be positively related to teacher intentions to continue using EdTech upon returning to the 100% in-person classroom.*

        Rationale: Likewise, Davis's 1989 Technology Acceptance Model study found, with high levels of reliability and validity, that perceived ease of use of a user positively correlates to their self-indicated usage.
8. Research Question #7: *What are the teachers' anticipated effects of the continuation of the use of EdTech on student attitudes, motivation, and achievement?*
    a. Hypothesis #7.1: *The intended continued use of EdTech after the COVID-19 pandemic will be positively related to student behavior.*

b. Hypothesis #7.2: *The intended continued use of EdTech after the COVID-19 pandemic will be positively related to student motivation.*

Hypothesis #7.3: *The intended continued use of EdTech after the COVID-19 pandemic will be positively related to student achievement.*

Rationale: Horn & Staker (2015) found that students were more interested in school when technology was used and were often bored when it was not, indicating technology as a motivator for students. Evans (2019) reported that students indicated that technology helped them make better grades, indicating that technology has a positive effect on student achievement. Finally, Dinc (2019) found that pre-service teachers felt that student engagement and interactions were positively affected by technology, indicating that it could have a positive effect on behavior as well.

Rationale

The rationale for the aforementioned hypotheses were based on my assumptions and prior experiences with and as an elementary teacher. It was assumed that many of the EdTech programs used during the COVID-19 pandemic were new to the teachers using them. Teachers may not have used or possibly might not have even heard of a particular EdTech program prior to incorporating it into their classroom during the COVID-19 pandemic. As such, I hypothesized that simply by being exposed to these new EdTech products, using them for instruction, and becoming familiar with them, it was likely that teachers would continue to use many of these EdTech products even after returning to 100% in-person instruction.

Based on my experiences and assumptions, it was anticipated that teachers that are older and have more teaching experience would likely be more set in their ways and more resistant towards technology and making changes to their teaching routines. It was therefore anticipated that teachers falling within one or both of these categories would be less likely to continue using EdTech after returning to 100% in-person instruction. In contrast, it was predicted that the grade level taught would positively relate to the retention of EdTech usage. Teachers of students in lower grade levels, such as Kindergarten, 1st, or 2nd, will likely have had many difficulties with having such young students using technology and EdTech, so it was anticipated that teachers of lower grade levels would not have as high levels of EdTech retention. In contrast, teachers of higher grade levels likely had fewer difficulties with students using technology, likely had more EdTech options available for their students' age group and were therefore anticipated to be more likely to continue using EdTech after returning to 100% in-person instruction.

Personal innovativeness has previously been shown to positively correlate with teacher intention to use technology (Akar, 2019). Additionally, organizational members indicating higher levels of innovativeness tend to be early adopters and often adopt new technologies faster and for longer than their less innovative, or laggard, counterparts (Rogers, 2003). As such, it was anticipated that teachers indicating higher levels of personal innovativeness would also indicate higher levels of intention to continue using EdTech upon returning to 100% in-person instruction.

The Technology Acceptance Model has repeatedly shown that higher levels of perceived usefulness and/or perceived ease of use positively correlate with the level of technology acceptance and intention to use technology (Anderson, & Groulx, 2015;

Camilleri & Camilleri, 2017; Davis, 1989; Leem & Sung, 2019). As such, I maintained the assumption that perceived ease of use and perceived usefulness will positively relate to intention to use technology.

Finally, based on my experiences and assumptions, it was anticipated that the intention to use EdTech and how frequently to use it after returning to 100% in-person instruction would be positively related to how teachers rated the effect of EdTech on student motivation, behavior, and achievement. Fullan (2017) indicated that students using technology in the classroom reported higher levels of collaboration with peers, development of college and career readiness skills, problem solving, critical thinking, and taking ownership of their own learning. A similar report from Horn & Staker (2015) indicated that students reported being more interested in school when technology was used. Likewise, Evans (2019) indicated that students felt that technology integration helped them achieve better grades, a better understanding of content, to develop creativity skills, solve practical problems, and made them more likely to complete assignments. Bond and Bedenlier (2019) indicated that the integration of technology results in both short- and long-term social and academic outcomes, ranging from peer collaborations (Zweekhorst & Maas, 2015), a stronger sense of wellbeing (Lear, et al., 2010), increased motivation (Akbari, et al., 2016), increased higher-order thinking skills (Nelson Laird, et al., 2005), and even lifelong learning (Karabulut-Ilgu, et al., 2018).

Instrumentation

A similar study regarding the intended use of technology among pre-service teachers was conducted by Anderson and Groulx at Texas Christian University (Anderson & Groulx, 2015) using an instrument, based on the Technology Acceptance

Model, that addressed self-efficacy, value beliefs, subjective norm, perceived ease of use, and technology integration intentions. The instrument focused on what variables affected the student teachers' intentions to integrate technology into their classrooms in their first year of teaching. It collected quantitative data in the form of a survey, given to early childhood education majors in the time between the completion of their student teaching and their graduation. The researchers noted that the results were primarily generalizable to the population that was studied: post-student teaching, early childhood majors. Since only pre-service teachers participated in the study, it leaves room to explore how in-service teachers might respond to a similar study. Although the instrument itself was not available in the publication, a survey instrument, Teacher EdTech Usage Survey (Appendix B) was developed to rate similar focus areas for in-service teachers before, during, and intentions for after COVID-19 virtual learning.

A 2019 study by Akar used the Individual Innovativeness scale (Hurt, Joseph, & Cook, 2013) to measure whether a teacher's level of innovativeness affected their level of technology acceptance. Participants were primary and secondary school teachers, with most of the participants aligning with the "early majority" adoption category and scoring low levels of innovativeness. Teachers that rated as highly innovative scored significantly higher levels of perceived ease of use and perceived usefulness than lower-rating teachers. Personal innovativeness was shown to ultimately be influential in whether teachers accept technology, with perceived ease of use and perceived usefulness directly determining intentions to use. Additionally, personal innovativeness was also shown to positively affect perceived ease of use and perceived usefulness.

Three sub-sections of the survey instrument (Appendix B) were developed using the Individual Innovativeness Scale (Hurt, et al., 2013) and Technology Acceptance Model items (Davis, 1989) applied to EdTech that participants indicated using, in order to gain more specific insight into participants' perceived use and perceived ease of use. The combination of data from these instruments painted a more detailed picture of what factors, or combination of factors, predicted whether teachers intended to continue or discontinue use of EdTech upon returning to the 100% in-person classroom.

Data collection consisted of two stages. Stage I utilized the Teacher EdTech Usage Survey, based on the Anderson & Groulx (2015) study, to gather information about teacher EdTech usage before, during, and their intended use after virtual learning has concluded. The survey instrument also included sub-sections based on the Technology Acceptance Model, to obtain more detailed information about teacher use and predicted use of EdTech, as well as items from the Individual Innovativeness Scale. Stage II utilized qualitative methods, using a semi-structured interview (Appendix C) to collect more detailed information into teachers' decision-making processes regarding continuing or discontinuing the use of EdTech.

Stage I: Teacher EdTech Usage Survey

The Teacher EdTech Usage Survey (Appendix B) for Stage I was developed by the researcher. It consists of rating scale and multiple selection questions pertaining to the use of EdTech before, during, and after COVID-19 virtual learning. Rating scale questions consist of a five-point scale, including: Never/Strongly Disagree, Rarely/Disagree, Neither Agree nor Disagree, Sometimes/Agree, Always/Strongly Agree. To maintain confidentiality, names were not requested on the survey, however,

participants indicated that they were willing to participate in a follow-up interview by providing their email addresses so they could be contacted with the next survey. Email addresses were kept confidential. The purpose of each question was to determine how the usage of EdTech changed over time before COVID-19 virtual learning, during virtual learning, and what it was predicted to be after returning to 100% in-person instruction. Additional data was collected about the specific usage of each EdTech program that was indicated as being used, such as how much training was received, how often the EdTech was used, whether the EdTech was required by the school or district, whether a license was purchased, or whether teachers were certified in the EdTech. There were 78 total questions, with questions divided into categories of before, during, and after COVID-19 virtual learning. A sub-section of the survey instrument consisted of the final measurement scales for perceived ease of use and perceived usefulness from the Technology Acceptance Model (Davis, 1989). These items had a five-point scale range of extremely likely, slightly likely, neither likely nor unlikely, slightly unlikely, and extremely unlikely. The scales were applied to each EdTech program that participants indicated using either before, during, or intended to use after COVID-19 virtual learning. The purpose of each scale wase to determine the participants' perceptions of usefulness and perceived use for each EdTech program used, and whether those perceptions had a role in whether the participant intended to continue or discontinue using the EdTech once it was no longer required. Included in this section, were questions regarding teacher perceptions of how much they felt that student achievement, behavior, and motivation were influenced by EdTech. There were 9 perceived usefulness and 7 perceived ease of use scale items. Likewise, the Individual Innovativeness (Hurt, et al., 2013) items were

included as a sub-section of the survey instrument to measure if the innovativeness level of teachers predicted their intention to continue using EdTech in the 100% in-person classroom. There were 20 total individual innovativeness questions. The survey instrument concluded with 11 questions pertaining to demographics.

Stage II: Teacher Ed-Tech Usage Follow-Up Interviews

Teacher interviews for Stage II were conducted in a semi-structured format to allow for the collection of both specific data, as well as any additional information that participants felt was relevant. The interview consisted of 14 questions (Appendix C), addressing topics such as what benefits teachers saw from the EdTech they used, what issues they had with it, what their students liked or disliked about it, whether they consider themselves tech-savvy or not, what features they looked for in an EdTech product, and why they chose to continue or discontinue using a particular EdTech. Participants were given additional time to elaborate where they saw fit and additional questions were informally added as the opportunity arose. This qualitative data was used in two ways: first, the information was quantized and used as additional independent variables for statistical analyses, second, the information was used to enhance, and ideally explain the quantitative data, giving more depth to the resulting information.

Data Collection

Before data was collected, IRB approval (Appendix A) was acquired from the University of South Alabama. Before data was collected, district approval was acquired from the participating school districts.

Stage I of the study consisted of the distribution of the Teacher EdTech Usage Survey (Appendix A) and the collection of responses. The survey was distributed by

sharing the link in online teaching groups, by having the USA College of Education send out the survey link to their alumni mailing list, and by having a local school district distribute the link to their elementary faculty via email. Teachers completing the survey were asked to share the link via social media. At the end of the survey, teachers were asked to indicate if they are willing to participate in Stage II.

Stage II consisted of interviews with a smaller number of participants. Participants indicating that they would be willing to participate further were contacted to participate in Stage II. New participants were not accepted in Stage II. These interviews were semi-structured (Appendix C) and sought to gain more qualitative insight into why teachers made the decisions they did regarding which educational technology to use and which ones to continue or discontinue.

Variables

Each stage collected information for different variables that were used for the subsequent data analysis. Stage I consisted of demographic variables as well as EdTech usage data for before, during, and predicted use after virtual learning; perceived ease of use and perceived usefulness data; and individual innovativeness data. Stage II consisted of qualitative information.

Stage I demographics included the variables of years of teaching experience, highest degree earned, highest teaching certification, grade level taught during virtual learning, type of school, state taught in, school district, gender, age, and race. These variables indicated in what ways demographics were predictors of intended EdTech use. Stage I also collected information about the usage of specific EdTech programs before, during, and intended use after virtual learning. The variables used in this study included

frequency of use, ease of use, usefulness, and programs used. A sub-section of the survey instrument consisted of a modified Technology Acceptance Model survey that yielded the variables of perceived ease of use and perceived usefulness, as well as the Individual Innovativeness scale to generate the variable of Innovativeness to see how it predicted future intended use of EdTech. Finally, three questions within the perceived usefulness section collected information regarding teacher perceptions of how EdTech affected their students' motivation, behavior, and achievement.

The variables of frequency of use and number of EdTech products used were collected in the pre-, during, and post-pandemic sections. Frequency of use was a nominal variable, ranging from daily use, 2-3 times per week, 1 time per week, 2-3 times per month, 1 time per month, and less than once per month. The number of EdTech products used and intended to be used were calculated by totaling the number of EdTech products that participants indicated that they had used, were using, or intended to use.

Perceived usefulness, perceived ease of use, and individual innovativeness were all calculated by averaging the ratings from the questions in those sections. There were nine five-point rating scale questions regarding perceived usefulness. Negatively posed questions were reverse scored, then the average rating was calculated and used as the variable. There were seven five-point rating scale questions regarding perceived ease of use. Negatively posed questions were reverse scored, then the average rating was calculated and used as the variable. Finally, there were nineteen five-point rating scale questions regarding personal innovativeness. Negatively posed questions were reverse scored, then the average rating was calculated and used as the variable.

The variables for teacher perceptions of the impact of the use of EdTech in the classroom on student motivation, achievement, and behavior were taken directly from questions within the perceived usefulness section.

Stage II included a qualitative component of a semi-structured interview. Although additional variables were expected to present themselves later, due to the organic nature of interviews, the anticipated variables for this stage were benefits, difficulties, student likes, student dislikes, tech-savviness, and reasons for continuing/discontinuing use.

Data Analysis

Descriptive statistics identifying grade level taught, degree level, gender, type of school, age, and race, collected in Stage I, were analyzed to help contextualize additional data. To answer research questions one and two, a paired t-test was conducted to compare EdTech usage among participants before and after virtual learning to see how COVID-19 virtual learning affected EdTech usage among elementary teachers. Additionally, several linear regressions were run to see which factors best predicted the intention of teachers continuing to use an EdTech product once virtual learning ended, and whether there were any statistically significant relationships between variables. These statistical tests provided the data with which to answer research questions three through six. A final series of linear regressions were run to see which factors best predicted teacher anticipations of the effect of EdTech use in the classroom on student motivation, behavior, and achievement, providing the data with which to answer research question seven. Transcripts from the Stage II interviews were analyzed for trends and themes. Due

to the low response rate for Stage II, the data collected was used as qualitative supporting evidence and was not included in the quantitative analysis.

Summary

This study was a mixed methods study focusing on factors predicting the continued use of EdTech among elementary teachers after the COVID-19 pandemic has ended. Participants included teachers in grades kindergarten through fifth. Participants were based in a large public-school district in Alabama, as well as respondents on social media from around the country.

Research questions included topics such as: how the COVID-19 pandemic affected the usage of EdTech among elementary teachers; how the intention of elementary teachers to continue using EdTech after the COVID-19 pandemic is predicted by demographic factors, personal innovativeness, perceived usefulness, perceived ease of use; and how student motivation and attitudes are predicted to be affected based on the continuation or discontinuation of EdTech after the COVID-19 pandemic.

This study consisted of two stages of data collection. Stage I collected survey data from elementary teachers regarding their use of EdTech before and during the COVID-19 pandemic, as well as demographics and their intended use after the COVID-19 pandemic. Sub-sections of the survey instrument collected additional data using the Individual Innovativeness scale, as well as Technology Acceptance Model survey items. Stage II consisted of a small number of semi-structured interviews to collect qualitative data to give greater insight and ideally explain teachers' decision-making process regarding continuing or discontinuing the use of EdTech.

Data was analyzed using several statistical tests. For research questions one and two, the data was analyzed using the descriptive statistics and a paired t-test to compare the usage of EdTech before and during the COVID-19 pandemic. For research questions three through six, the variables of demographics, teacher innovativeness, perceived ease of use, and perceived usefulness were analyzed using a series of linear regressions to see how well they predicted anticipated teacher use of EdTech after the COVID-19 pandemic has ended. For research question seven, teacher anticipated use of EdTech was analyzed using a series of linear regressions to see how well they predicted teacher anticipated effects of the use of EdTech in the classroom on student motivation, behavior, and achievement.

CHAPTER IV

RESULTS

The data collected are presented and aligned with the Teacher EdTech Usage Survey, which included Perceived Usefulness and Perceived Ease of Use components from the Technology Acceptance Model, and items from the Individual Innovativeness Scale. Participant demographics are presented and discussed with their corresponding data to compare and contrast participant backgrounds. To answer the identified research questions, I first analyzed the results of teacher EdTech usage before the COVID-19 pandemic compared to teacher EdTech usage during the COVID-19 pandemic. Afterward, the identified independent variables were regressed to see how they predicted teacher-intended use of EdTech after returning to the 100% in-person classroom and how intended EdTech use predicted teacher-anticipated student motivation, behavior, and achievement.

Instrumentation

A survey instrument, the Teacher EdTech Usage Survey (Appendix B), was developed based on items from the Technology Acceptance Model (Davis, 1989), and Individual Innovativeness scale (Hurt, et al., 2013). The survey consisted of three sections pertaining to teacher use of EdTech before, during, and intended use after the COVID-19 pandemic has ended. The fourth and final section of the survey instrument pertained to teacher demographics.

The survey instrument was distributed via social media posts, as well as a district-approved mass email in the participating district. Upon completion of the survey, participants were given the option to sign up to participate in a follow-up semi-structured virtual interview. Regardless of whether teachers opted to participate in the interview, they were given the opportunity to sign up for a drawing for an Amazon gift card as thanks for completing the survey. Participants that signed up for the follow-up interview were sent a Zoom link, and then were given the opportunity to sign up for an additional drawing for an Amazon gift card upon completion of the interview.

Data Collection

The first stage of the study consisted of the Teacher EdTech Usage Survey which was developed by the researcher to collect the necessary data for this dissertation. It consists of multiple selection and rating scale questions, broken into seven sub-sections. Additionally, participants were given the option of an open-ended response if they selected "Other" and wanted to list the other items they were referring to. The first three sub-sections asked participants about their use of and attitudes toward EdTech before and during the COVID-19 pandemic, as well as their anticipated use of and feelings toward EdTech after returning to the 100% in-person classroom. The fourth sub-section consisted of 20 rating-scale items from the Individual Innovativeness Scale (Hurt, et al., 2013), which was designed to measure the innovativeness levels of individual teachers. The fifth and sixth sub-sections consisted of items from the Technology Acceptance Model (Davis, 1989), divided into nine items for perceived usefulness, and seven items for perceived ease of use. The final sub-section consisted of basic demographic questions as well as questions regarding teacher placement in grade level, years teaching, type of

school, and highest degree earned. The survey instrument was developed using the Qualtrics program. Skip logic was used so participants would not be given questions not applicable to them, and participants were not required to answer any items – all responses were voluntary. Before distributing the survey instrument, approval was obtained from the University of South Alabama Institutional Review Board, as well as from the large Alabama district surveyed in the study. While there were 600 total responses to the survey, a large amount of responses were mostly or completely unanswered, rendering them unusable. These responses were thrown out, reducing the number of usable responses to 365.

The second stage of the study consisted of a semi-structured follow-up interview via Zoom. Participants were asked to indicate on the survey if they were willing to participate in the follow-up interview. Interested participants were given a link to a Sign-Up Genius page where they could reserve a time slot for their interview. Interview times ranged from 15 to 30 minutes and were recorded with the participants' permission. Audio transcripts were automatically generated and were reviewed and coded for themes and pertinent information. While numerous participants signed up to participate in the follow-up interviews, unfortunately, only two participants actually logged on during their designated times. As such, the data from these interviews were used anecdotally.

Findings

Research Questions

Research Question #1: How did the COVID-19 pandemic affect the use of EdTech among elementary teachers? A paired samples t-test was conducted to evaluate the impact of the COVID-19 pandemic on the number of EdTech programs used

during the pandemic. The four assumptions of independence of observation, normality, homogeneity of variance, and random sampling were met. There was a statistically significant decrease in the number of EdTech programs used from before the COVID-19 pandemic (M = 8.68, SD = 5.22) to during the COVID-19 pandemic (M = 7.69, SD = 4.50), $t(359) = 4.19$, $p < .001$. The mean decrease in EdTech programs used was .99 programs with a 95% confidence interval ranging from .52 to 1.45. The eta squared statistic (.58) indicated a large effect size.

A second paired samples t test was conducted to evaluate the impact of the COVID-19 pandemic on the frequency of EdTech programs used during the pandemic. This was a nominal variable, ranging from "Daily" (1), "2-3 Times per Week" (2), "1 Time per Week" (3), "2-3 Times per Month" (4), "1 Time per Month" (5), and "Less Than Once Per Month" (6), therefore, although the data shows a decrease in numbers, a lower number indicates a higher frequency of EdTech use. There was a statistically significant increase in the frequency of EdTech programs used from before the COVID-19 pandemic (M = 2.32, SD = 1.68) to during the COVID-19 pandemic (M = 1.27, SD = .87), $t(364) = 12.75$, $p < .001$. The frequency increase in EdTech programs used was 1.05 with a 95% confidence interval ranging from .89 to 1.21. The eta squared statistic (.89) indicated a large effect size.

Research Question #2: Did the use of EdTech during the COVID-19 pandemic predict intention to use EdTech in the 100% in-person classroom?

A multiple regression was carried out using the number of EdTech programs teachers intend to continue using post-pandemic as the dependent variable and pre-EdTech (number of programs used before the pandemic), pan-Edtech (number of

programs used during the pandemic), frequency of use of EdTech pre-pandemic, and frequency of use of EdTech during the pandemic as the independent variables. The goal of the analysis was to see if the number of programs used during the pandemic was predictive of post-pandemic numbers, controlling for pre-pandemic values. An alpha level of .05 was used for all statistical tests. The correlations between the dependent variable and all four independent variables were found to be statistically significant (Table 1). Hence, all were included in the regression equation.

Table 1

Correlations Between Four EdTech Variables and Post-EdTech Use

Measure	1	2	3	4
1. Post-Use	—			
2. Pre-EdTech	.59*	—		
3. Pan-EdTech	.70*	.58*	—	
4. Pre-Use	-.11*	-.21*	-.16*	—
5. Pan-Use	-.15*	-.05	-.16*	.39*

*Statistically significant correlation

Table 2 shows the results of the regression analysis. The overall R-squared of .54 was statistically significant, $F(_{4, 355}) = 105.42$, $p < .0001$. The number of programs used during the pandemic predicts the number of programs teachers intend to use after the pandemic, controlling for pre-pandemic numbers of programs. As can be seen in Table 2, the number of programs used during the pandemic (Pan-EdTech) is a significant predictor of intended post-pandemic use. The number of programs used during the pandemic is strongly and positively correlated with the number used post-pandemic (Post-Use) partialling out the other predictors, including their use prior to the pandemic (partial r of

.53, the strongest of any of the predictors). Thus, these results suggest that the number of EdTech programs used during the pandemic had an impact.

Table 2

Multiple Regressions for the Predictive Power of Pre-EdTech, Pan-EdTech, Pre-Use, and Pan-Use on Post-EdTech

Model	Unstandardized Coefficients		Standardized Coefficients			Partial Correlations
	B	Std. Error	Beta	t	Sig.	
(Constant)	1.99	.59		3.56	<.001	
Pre-EdTech	.28	.05	.29	6.37	<.001	.32
Pan-EdTech	.61	.05	.53	11.86	<.001	.53
Pre-Use	.20	.122	.07	1.63	.104	.09
Pan-Use	-.44	.23	-.07	-1.89	.06	-.10

A second multiple regression was conducted using the frequency with which teachers intend to continue using EdTech post-pandemic as the dependent variable. An alpha level of .05 was used for all statistical tests. As can be seen in Table 3, the correlations between the dependent variable and all four independent variables were found to be statistically significant. Consequently, all were included in the regression analysis. Again, the goal was to see if the frequency of use during the pandemic was predictive of post-pandemic frequency, independent of pre-pandemic frequency.

Table 3

Correlations Between Four EdTech Variables and Post-Frequency

Measure	1	2	3	4
1. Post-Use	—			
2. Pan-Use	.73*	—		
3. Pre-Use	.47*	.38*	—	
4. Pan-EdTech	-.18*	-.16*	-.16*	—
5. Pre-EdTech	-.14*	-.05	-.21*	.58*

*Statistically significant correlation

Table 4 shows the results of that regression analysis. The overall R-squared of .58 was statistically significant, $F(_{4,355}) = 124.02$, $p < .0001$. As can be seen in Table 4, the frequency of use during the pandemic predicts the frequency with which teachers intend to use EdTech after the pandemic, controlling for pre-pandemic frequency of use. The frequency of use during the pandemic is positively and strongly correlated with post-pandemic frequency of use (partial correlation of .67), independent of pre-pandemic use. Thus, pandemic frequency of use had an impact on post-pandemic intention of use.

Table 4

Multiple Regressions for the Predictive Power of Pre-EdTech, Pan-EdTech, Pre-Use, and Pan-Use on Post-Frequency

Model	Unstandardized Coefficients		Standardized Coefficients			Partial Correlations
	B	Std. Error	Beta	t	Sig.	
(Constant)	.37	.10		3.79	<.001	
Pan-Use	.69	.04	.64	17.18	<.001	.67
Pre-Use	.12	.02	.22	5.70	<.001	.29
Pan-EdTech	-.00	.01	-.01	-.22	.823	-.01
Pre-EdTech	-.01	.01	-.06	-1.08	.171	-.07

Research Question #3: Did demographic factors predict elementary teachers' intentions to continue using EdTech upon returning to the 100% in-person classroom?

A multiple regression was conducted to examine which factors are statistically significant predictors of the number of programs and frequency with which teachers intend to use of EdTech products after the COVID-19 pandemic has ended. The predictor variables (IVs) were school district, years teaching, highest degree earned, grade level taught before COVID-19 pandemic, grade level taught during COVID-19 pandemic, type of school, gender, age, race, and method of instruction. The DVs were the number of programs and the frequency with which teachers intend to use EdTech products after the COVID-19 pandemic has ended. The variable of school district was recoded as a dichotomy of "Alabama School District" or "Not Alabama School District." The variable of gender was recoded as a dichotomy of "Male" and "Female," since the number of respondents choosing "Other" was negligible. The variable of race was recoded as a dichotomy of "White" and "African American," since the number of respondents identifying as other races were negligible. The variable of highest degree earned was recoded as a dichotomy of "Undergraduate" and "Graduate" since the number of respondents choosing a degree below undergraduate was negligible. The variable of type of school was recoded as "Public" and "Private." Finally, the remaining variables, which had more than two options, were dummy coded. The model was tested for multicollinearity, outliers, normality, and homoskedasticity. I ran the model and found that no predictor variables were statistically significant.

Research Question #4: Does personal innovativeness predict whether elementary teachers intend to continue using EdTech upon returning to the 100% in-person classroom?

A linear regression was conducted to examine if personal innovativeness is statistically significant predictor of the frequency teachers intend to use of EdTech products after the COVID-19 pandemic has ended. The predictor variable (IV) was personal innovativeness. The DV was the frequency teachers intend to use EdTech products after the COVID-19 pandemic has ended. I ran the model and found that the predictor variable of personal innovativeness was statistically significant.

The predictor of personal innovativeness explained 4.9% of the variance. The final regression model was statistically significant, $F(1,355)=18.077, p< .001$. The unstandardized regression equation for predicting the number of EdTech programs teachers intend to use after the COVID-19 pandemic is:

$$\hat{Y} = 2.821 - .357X_1$$

A second linear regression was conducted to examine if personal innovativeness is a statistically significant predictor of the number of EdTech products teachers intend to use after the COVID-19 pandemic has ended. The predictor variable (IV) was personal innovativeness. The DV was the number of EdTech products teachers intend to use after the COVID-19 pandemic has ended. I ran the model and found that the predictor variable of personal innovativeness was statistically significant.

The predictor of personal innovativeness explained 7.8% of the variance. The final regression model was statistically significant, $F(1,353=29.721, <.001$. The

unstandardized regression equation for predicting the number of EdTech programs teachers intend to use after the COVID-19 pandemic is:

$$\hat{Y} = -.764 + 2.463X_1$$

Research Question #5: Does perceived usefulness predict whether elementary teachers intend to continue to use EdTech upon returning to the 100% in-person classroom?

A linear regression was conducted to examine if perceived usefulness is a statistically significant predictor of the frequency teachers intend to use of EdTech products after the COVID-19 pandemic has ended. The predictor variable (IV) was perceived usefulness. The DV was the frequency teachers intend to use EdTech products after the COVID-19 pandemic has ended. I ran the model and found that perceived usefulness was a statistically significant predictor.

The predictor of perceived usefulness explained 9.6% of the variance. The final regression model was statistically significant, $F(1,361)=38.125, p<.001$. The unstandardized regression equation for predicting the number of EdTech programs teachers intend to use after the COVID-19 pandemic is:

$$\hat{Y} = 2.788 - .335X_1$$

A second linear regression was conducted to examine if perceived usefulness is a statistically significant predictor of the number of EdTech products teachers intend to use after the COVID-19 pandemic has ended. The predictor variable (IV) was perceived usefulness. The DV was the number of EdTech products teachers intend to use after the COVID-19 pandemic has ended. I ran the model and found that perceived usefulness was a statistically significant predictor.

The predictor of perceived usefulness explained 9.4% of the variance. The final regression model was statistically significant, $F(1,360)=37.293, p<.001$. The unstandardized regression equation for predicting the number of EdTech programs teachers intend to use after the COVID-19 pandemic is:

$$\hat{Y} = 1.445 + 1.840X_1$$

Research Question #6: Does perceived ease of use predict whether elementary teachers intend to continue to use EdTech upon returning to the 100% in-person classroom?

A linear regression was conducted to examine if perceived ease of use is a statistically significant predictor of the frequency teachers intend to use of EdTech products after the COVID-19 pandemic has ended. The predictor variable (IV) was perceived ease of use. The DV was the frequency teachers intend to use EdTech products after the COVID-19 pandemic has ended. I ran the model and found that perceived ease of use was a statistically significant predictor.

The predictor of perceived usefulness explained 6.8% of the variance. The final regression model was statistically significant, $F(1,361)=26.163, p<.001$. The unstandardized regression equation for predicting the number of EdTech programs teachers intend to use after the COVID-19 pandemic is:

$$\hat{Y} = 2.520 - .272X_1$$

A second linear regression was conducted to examine if perceived ease of use is a statistically significant predictor of the number of EdTech products teachers intend to use after the COVID-19 pandemic has ended. The predictor variable (IV) was perceived ease of use. The DV was the number of EdTech products teachers intend to use after the

COVID-19 pandemic has ended. I ran the model and found that perceived ease of use was a statistically significant predictor.

The predictor of perceived usefulness explained 12.3% of the variance. The final regression model was statistically significant, $F(1,359)=50.363, p<.001$. The unstandardized regression equation for predicting the number of EdTech programs teachers intend to use after the COVID-19 pandemic is:

$$\hat{Y} = .656 + 2.062X_1$$

Research Question #7: What are the teacher-anticipated effects of the continuation of the use of EdTech on student attitudes, motivation, and achievement?

A linear regression was conducted to examine if frequency of use and number of EdTech products intended to be used are statistically significant predictors of the level of motivation teachers believe EdTech has on their students. The predictor variable (IV) was the frequency with which teachers intend to use EdTech in their classrooms after the COVID-19 pandemic has ended and how many EdTech programs teachers intend to continue using after the COVID-19 pandemic has ended. The DV was the level of motivation teachers believed that EdTech had on their students (rated from 1 to 5).

The predictors of frequency of use and number of EdTech programs intended to use explained 10.7% of the variance. The sr2 for each predictor was calculated and frequency of use contributed a total of 7.2%, followed by number of EdTech programs at 5.7%. The final regression model was statistically significant, $F(2,358)=21.353, p<.001$. The unstandardized regression equation for student motivation is:

$$\hat{Y} = 3.902 + .044X_1 - .203X_2$$

A second linear regression was conducted to examine if frequency of use and number of EdTech products intended to be used are statistically significant predictors of the level of effect teachers believe EdTech has on their students' behavior. The predictor variable (IV) was the frequency with which teachers intend to use EdTech in their classrooms after the COVID-19 pandemic has ended and the number of EdTech programs teachers intend to use after the COVID-19 pandemic has ended. The DV was the level of effect that teachers believed that EdTech had on their students' behavior (rated from 1 to 5).

The predictor of frequency of use explained 8.3% of the variance. The final regression model was statistically significant, $F(2,359)=16.123, p<.001$. The unstandardized regression equation for student motivation is:

$$\hat{Y} = 3.858 + .036X_1 - .206X_2$$

A third linear regression was conducted to examine if frequency of use and number of EdTech products intended to be used are statistically significant predictors of the level of effect teachers believe EdTech has on their students' achievement. The predictor variable (IV) was the frequency with which teachers intend to use EdTech in their classrooms after the COVID-19 pandemic has ended and the number of EdTech programs teachers intend to use after the COVID-19 pandemic has ended. The DV was the level of effect that teachers believed that EdTech had on their students' behavior (rated from 1 to 5).

The two predictors explained 13% of the variance. The sr^2 for each predictor was calculated and the number of EdTech programs contributed a total of 8.2%, followed by frequency of use at 7.6%. The final regression model was statistically significant,

$F(2,359)=26.643, p<.001$. The unstandardized regression equation for student motivation is:

$$\hat{Y} = 3.944 + .044X_1 - .230X_2$$

Summary

To answer the seven research questions in this study, a survey instrument was developed by the researcher consisting of questions about the use of EdTech before, during, and intended use after the COVID-19 pandemic; items regarding personal innovativeness; items regarding perceived usefulness and perceived ease of use; and demographic items. The survey was distributed via email to teachers at a large public school district in Alabama as well as on various teacher social media pages. At the end of the survey, participants were asked to participate in a follow-up Zoom interview to collect qualitative data and gain more insight into teachers' decision-making process regarding EdTech. Although a gift card drawing was offered for both the survey and the interview, only three teachers participated in the interviews, so the resulting data could not be used as planned.

Since the survey was distributed to teachers directly in a specific district in Alabama, the largest number of responses were from Alabama, with the remainder of responses coming from various other states. Participants were, unsurprisingly, mostly female, with the most common age range being 40-49 (33%) and the most common race being White/Caucasian (76%). The majority of participants (94%) taught in public schools, held a Master's degree (56%), and have been teaching for 11-20 years (38%). It was most common for respondents to be teaching more than one grade level both before

(24%) and during (23%) the COVID-19 pandemic. The most common single grade level taught was 5th grade at 22% both before and during the pandemic.

The second school district that I intended to distribute the survey to was non-responsive, therefore the study had to be reduced to one school district plus the social media responses. Although 600 survey responses were received, many of them were unusable due to being partially or totally incomplete, bringing the total of usable survey responses to 365. Additionally, participants were not responsive regarding the follow-up interviews, as initially 25 interviews were planned for but only two teachers participated. As such, the information will be used anecdotally and will not be quantified and included in statistical testing.

The variables for this study included dependent variables of number of EdTech programs used during the pandemic, number of EdTech programs intended to be used after the pandemic, intended frequency of use of EdTech programs after the pandemic, and the teacher-rated amount of effect of EdTech on student motivation, behavior, and achievement. Independent variables included the amount of EdTech programs used before the pandemic, the amount of EdTech programs used during the pandemic, the frequency of EdTech use before the pandemic, the frequency of EdTech use during the pandemic, participant demographics (district, grade level, degree, mode of instruction, years teaching, age, race, and gender), personal innovativeness, perceived ease of use, perceived usefulness, intended frequency of use after the pandemic, and intended number of EdTech programs after the pandemic.

While many of the statistical tests resulted in statistically significant output, several did not. The paired samples t test for Research Question #1 had a large effect size

for both frequency of use and number of EdTech programs used. Research Question #2 resulted in the number of EdTech programs used during the pandemic being a statistically significant predictor variable, with the frequency of use during the pandemic not being statistically significant. For Research Question #3, none of the demographic predictor variables were statistically significant. For Research Question 4, personal innovativeness was a statistically significant predictor variable for number of EdTech programs intended to use and intended frequency of use. For Research Question #5, perceived usefulness was a statistically significant predictor variable for number of EdTech programs intended to use and intended frequency of use. For Research Question #6, perceived ease of use was a statistically significant predictor variable for both dependent variables of number of EdTech programs intended to use and intended frequency of use. Finally, for Research Question #7, both predictor variables of number of EdTech programs intended to use and intended frequency of use were statistically significant predictors regarding all three dependent variables of teacher-rated effect of EdTech on student motivation, behavior, and achievement.

CHAPTER V

DISCUSSION

Overview of the Study

This study was conducted to see how the COVID-19 pandemic has affected the current use of EdTech among elementary teachers, as well as what factors predict the anticipated continued use of EdTech after the pandemic has ended. A survey instrument was distributed among elementary teachers in a southeastern district of Alabama, as well as nationally through various social media sources. Participants responded to a variety of questions including those regarding demographics, use of EdTech before the pandemic, use of EdTech during the pandemic, anticipated use of EdTech after the pandemic, individual innovativeness, perceived usefulness, and perceived ease of use.

The main theoretical foundation for this study was the Technology Acceptance Model (Davis, 1989), specifically the focus on perceived ease of use and perceived usefulness and how they can be used to predict actual or anticipated technology usage among participants. The Experiential Learning Theory (Culatta, 2020) and Discovery Learning Model (Pappas, 2014) provided theoretical background information on the learning situations that participants were in during the COVID-19 pandemic, when they were forced to take much of their learning regarding EdTech into their own hands in order to successfully teach in either hybrid or virtual classrooms during the pandemic. Finally, the Diffusion of Innovation Theory (Rogers, 2003) provided insight into the various adopter categories and what characteristics affected the likelihood of participants choosing to adopt a particular technology.

Discussion of the Findings

Research Question 1

Significant Findings

Although the paired t test that was run for Research Question 1 yielded statistically significant results, the result of the first test was the opposite of that which were previously hypothesized. I hypothesized that the use of EdTech among elementary teachers during the COVID-19 pandemic would be greater than their use prior to the COVID-19 pandemic. Instead, there was a statistically significant decrease in the number of EdTech programs used among elementary teachers during the COVID-19 pandemic. The eta squared statistic for number of programs used indicated a large effect size of .58, along with a mean decrease of just under one (.99) program.

The results of the second t test, however, did indicate an increase in frequency of use of EdTech among elementary teachers during the COVID-19 pandemic. The eta squared statistic for frequency of use indicated a large effect size of .89 with a mean frequency of use decrease of 1.05. Although the results show a quantitative decrease, the variable was nominal, with the lower numbers indicating a higher frequency of use. As such, the results indicate that, on average, teachers increased their frequency of use by one rating-scale point, i.e. from “1 Time per Week” to “2-3 Times per Week.”

Discussion

Due to the fact that many students, or even teachers, may have been virtual, it is not surprising that there was an increase in the frequency of use of EdTech among elementary teachers during the COVID-19 pandemic. Even if not virtual or hybrid, teachers had to be prepared for the possibility of quarantine or for shifting to virtual

learning, meaning that many activities or assignments were posted online or included virtual components in order to make a potential shift smoother.

Teachers themselves indicated an increase in participation in online conferences and webinars, up from 28% prior to the COVID-19 outbreak, to 40% during the pandemic (Project Tomorrow, 2019a). This is not surprising, since teachers largely had to participate in virtual learning and training during the COVID-19 pandemic as it was not possible for in-person training in most cases. Rogers' Experiential Learning Theory fits well with this situation, since most learning at that time had to be self-initiated, was relevant to the learners, and provided new perspectives for teachers that may have been unfamiliar with virtual learning or technology (Culatta, 2020). It was also very experiential for learners, with the teacher often ending up assuming the role of the student in order to learn how to navigate new technologies.

Likewise, Bruner's Discovery Learning Model builds on past experiences and knowledge to discover and actively seek new information, problems, and solutions (Pappas, 2014). Learners using this model identify problems and seek their own solutions using newly acquired knowledge. They typically work independently and at their own pace, as many teachers likely had to do during the pandemic. This model also encourages learners to analyze and interpret information so that it is more meaningful and useful to them so that they are better able to apply it (Pappas, 2014). During the pandemic, teachers were faced with the problem of converting their classrooms to virtual learning, a very real problem that they had to find a very real solution to, likely on their own. Teachers likely had to seek out training on their own as well, likely also virtual, so that they were able to find and participate in learning opportunities that fit their needs.

As for the decrease in number of EdTech products used during the COVID-19 pandemic, without additional research, I can only make an educated guess based on my own experience as an elementary teacher during the COVID-19 pandemic. I posit that since virtual learning and teaching itself may have created more of a strain on teachers, they addressed this by using fewer digital components in their instruction. Additionally, it is possible that some teachers may not have implemented as many EdTech programs if they were virtual or hybrid because it may have been more difficult to train students how to use these programs when the students were not present in the classroom. Finally, equity of internet and device access among students was a common issue, with many students not having access to reliable internet or potentially having to share devices between multiple students in a household.

Research Question 2

Significant Findings

The two independent variables for this research question were number of EdTech programs used and frequency of EdTech used during the pandemic. The two dependent variables were the number of EdTech programs intended to be used (Figure 11) and the intended frequency of EdTech use upon returning to the 100% in-person classroom. Both models had statistically significant correlations between the dependent variable and the four independent variables.

Discussion

While all three models were statistically significant, it is interesting to note that the variables that had a smaller correlation were the ones that were more unrelated to the dependent variables. For example, when predicting the intended number of EdTech

products to be used, the frequency of EdTech did not correlate as strongly. Likewise, when predicting the intended frequency of use, the number of EdTech products used during the pandemic did not correlate as strongly. Ultimately, makes sense that independent variables not strongly related to the dependent variable are likely to not be significant predictors. As an elementary teacher myself, I can also see how there is likely to be a diversity in the possible combinations of these two variables among teachers, and that one does not necessarily hold sway over the other.

A collection of research by Hsu (2013), Lee & Lee (2014), Smarkola (2011), and Tondeur et al. (2012), claimed that having pre-service teachers design, implement, and reflect on technology integration lessons, they would be more likely to continue using EdTech upon entering the teaching workforce. In a similar vein, Ertmer & Ottenbreit (2010), Perkmen and Pamuk (2011), and Tondeur, et al. (2012) claimed that modeling of technology and positive experiences using technology integration can lead to higher confidence levels and higher post-graduation use. Additionally, another study by Onal, et al. (2017) using pre-service teachers found that participants indicated that it was difficult to learn to use the technology initially but once learned, it was easy to implement. While these studies focused on pre-service teachers and their intentions to use technology upon joining the workforce, in-service teachers were placed in a similar situation during the pandemic. They had the opportunity to design, implement, and reflect on their own technology lessons and they likely saw modeling of effective technology integration, both of which likely affected their intention to continue to use EdTech after the pandemic has ended. They also may have had difficulty learning some of these technologies during the pandemic, but still carried on out of necessity. Once learned, however, teachers likely

found these tools easier to implement and are probably more likely to continue using them even after the pandemic has ended.

Research Question 3

Significant Findings

Along with the traditional demographic variables of age, race, and gender, the independent variables for research question 3 also included school district, years teaching, highest degree earned, grade level taught before COVID-19 pandemic, grade level taught during COVID-19 pandemic, type of school, and method of instruction. The two dependent variables were the number of EdTech products teachers intend to use after the COVID-19 pandemic, and the intended frequency of use of EdTech products after the COVID-19 pandemic. Contrary to the hypothesis, none of the predictor variables were found to be statistically significant for either of the dependent variables.

Discussion. I hypothesized that age, years teaching, and grade level taught would be the most important demographic factors in predicting continued use of EdTech in the elementary classroom. I hypothesized that age and years teaching would be negatively related, and that grade level taught would be positively related to the intention to continue to use EdTech after the COVID-19 pandemic. My prior experience as a teacher and working with other teachers led me to believe that teachers who were older or had been teaching longer were likely to be more set in their ways and less likely to continue using EdTech once it was no longer required. I also hypothesized that teachers of younger grade levels would be less likely to continue using EdTech once it was no longer required because it is likely more difficult to train younger students to use technology than it is with older students. The data, however, showed that these demographic factors are not

statistically significant predictors of future use of EdTech among elementary teachers, meaning that schools and districts should probably not take them into account when planning for future EdTech initiatives.

According to Sanford (2018), early majority, the level at which most of the respondents in this study scored, are *not* necessarily the youngest or most tech-savvy. This was reiterated by Rogers (2003) stating that there is typically not a difference in age between early and late adopters. A conflicting study by Camilleri & Camilleri (2017) indicated that age *had* been shown to positively correlate with teachers' perceived usefulness and effective use of technology in the classroom, and that gender was shown to affect the integration of mobile technology into the classroom. Likewise, Blocher, et al., (2011) noted that many of today's veteran classroom teachers did not grow up with technology, dubbed "digital immigrants," and were therefore often not as comfortable using technology in the classroom. Noh, et al. (2016) also found demographics to affect personal innovativeness levels, for instance, teachers with higher levels of education being more likely to implement technology in the classroom. This was found in this study as well, as the majority of participants indicated having a master's degree.

Research Question 4

Significant Findings

The predictor variable for research question 4 was personal innovativeness, and the dependent variables were the frequency that teachers intend to use EdTech products in the classroom after the COVID-19 pandemic has ended, and the number of EdTech products teachers intend to use after the COVID-19 pandemic has ended. Personal innovativeness was a statistically significant predictor for both the intended frequency of

EdTech use and the number of EdTech products intended to be used after the COVID-19 pandemic has ended. While these two dependent variables were statistically significant, neither had a large amount of their variance explained by personal innovativeness. The predictor of personal innovativeness explained 4.9% of the variance for the frequency that teachers intend to use EdTech after the COVID-19 pandemic, and 7.8% of the variance for the number of EdTech products teachers intend to use after the COVID-19 pandemic has ended.

Discussion

According to Figure 10, no teachers scored an average of 1 or 2 for their level of personal innovativeness, with the majority scoring an average of 4. Although the individual teacher responses for level of personal innovativeness and intended frequency of use of EdTech after the COVID-19 pandemic were not identified for this study, by looking at the data in graphic form in Figure 10, I am led to believe that it is likely that participants scoring a 4 or 5 on the personal innovativeness scale were also likely to indicate intention to use EdTech in the classroom with a daily frequency, meaning that it is likely that those teachers that scored a personal innovativeness average of 3 were likely the ones that indicated an intention to use EdTech with a frequency ranging from 2-3 times per week all the way down to less than once per month. Additional analysis of the data would be required to see how closely the personal innovativeness average matches the intended frequency of use data.

While the hypothesis was mostly correct, with two-thirds of the statistical tests proving to be statistically significant, the amount of variance explained was not as high as

would have been originally anticipated which, given the distribution of scores, is not surprising.

According to Rogers (2003), individuals are categorized based on how quickly they adopt a technology, ranging from innovators, early adopters, early majority, late majority, and laggards. Innovators tend to actively seek out new ideas or even adopt new technologies before required, while laggards are the last to adopt a new technology, and usually, grudgingly only do so because it is a requirement. In this study, no one scored as a laggard or late majority (a rating of 1 or 2), with the majority scoring along the lines of early adopters (a rating of 4). Early adopters are often sought out for information when a new innovation is in question (Rogers, 2003), so it makes sense that most of the respondents to a survey such as the one in this study would fall mostly under the category of early adopters.

Rogers (2003) defines innovativeness as how early an individual is in adopting new ideas relative to other members of their social system. According to Agarwal and Prasad (1998), individuals with higher levels of personal innovativeness can serve as change agents during a diffusion of innovation. Since many teachers were also delivering training and instruction to other teachers on using new technologies during the pandemic, these teachers were likely those that had higher levels of personal innovativeness and that fell into the early adopter category. Finally, Akar's 2019 study revealed that teachers that have higher levels of personal innovativeness also tend to have higher levels of perceived usefulness and perceived ease of use.

Figure 10

Personal Innovativeness of Elementary Teacher Participants

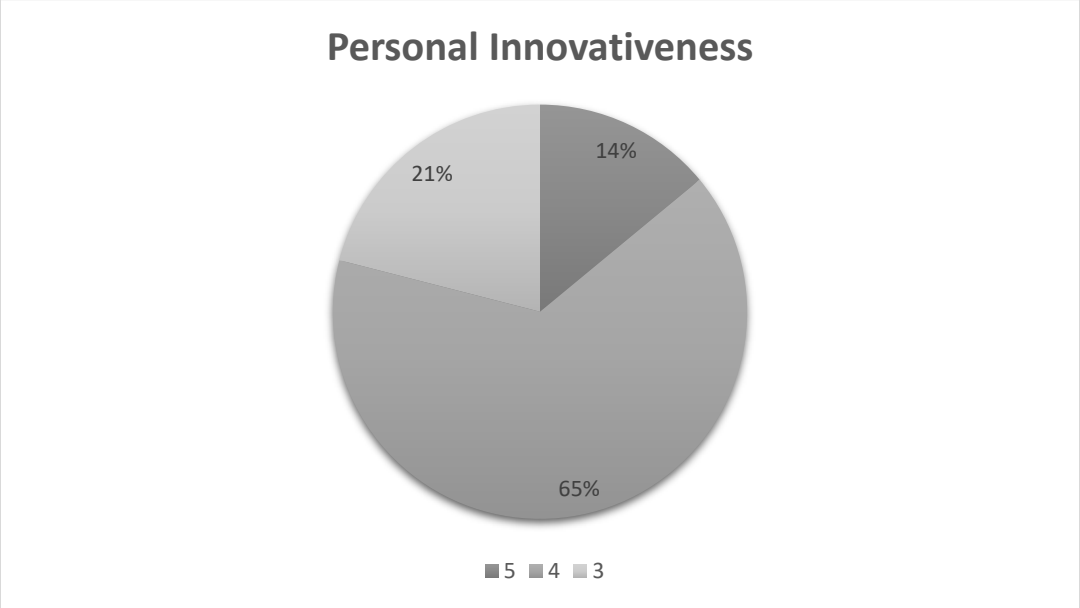


Figure 11

Number of EdTech Programs Teacher Participants Intend to Use Post-Pandemic

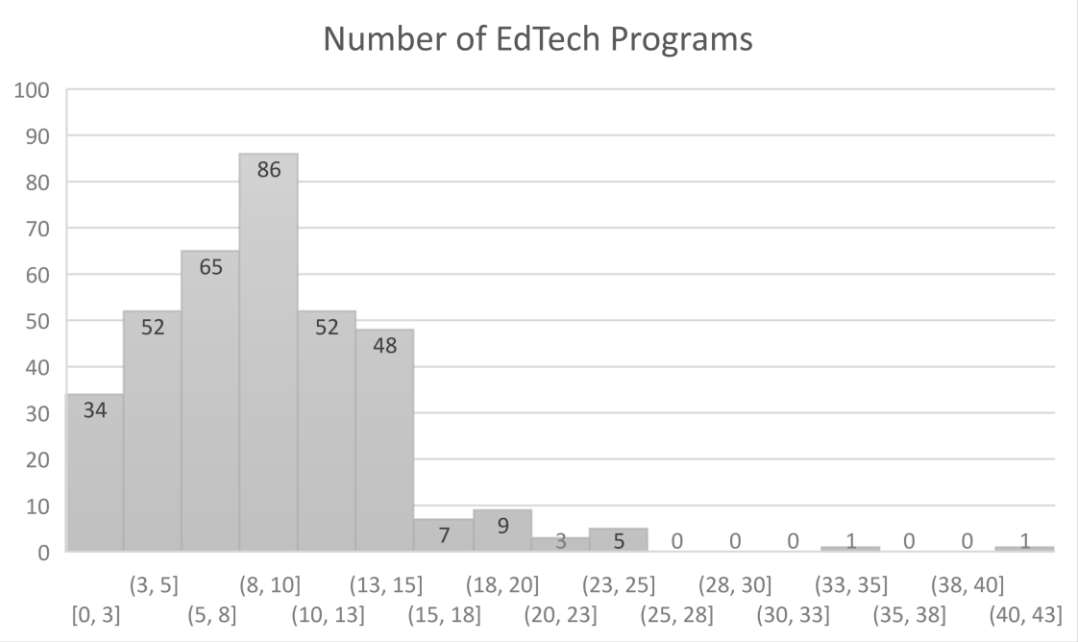
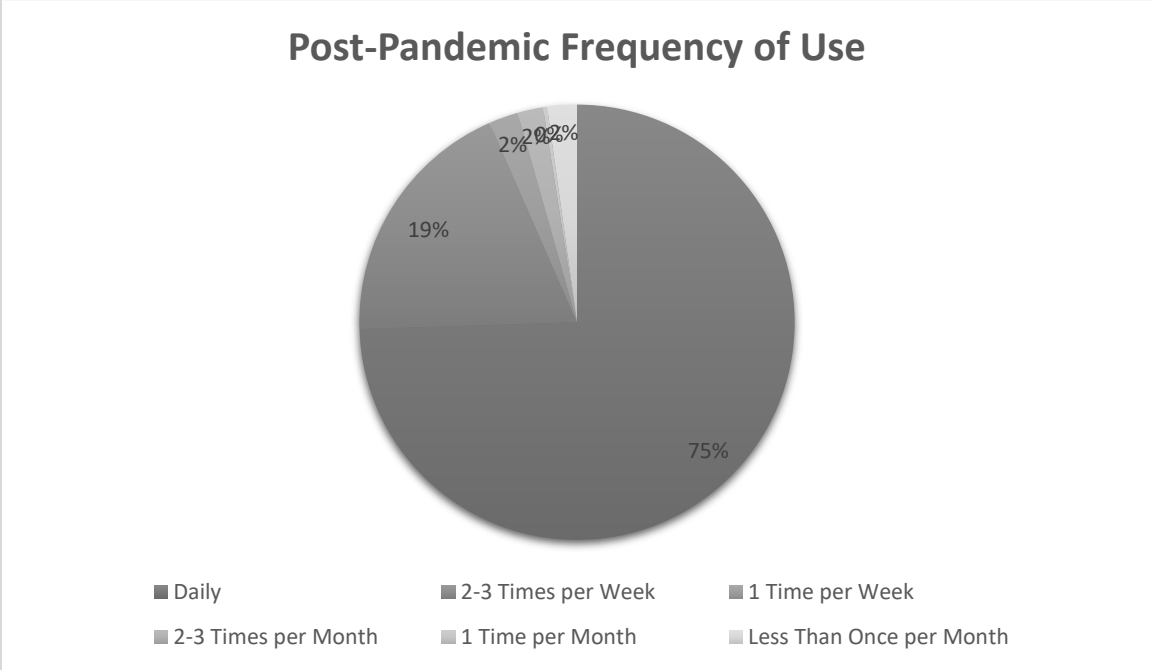


Figure 12

Teacher Participant Intended Frequency of Post-Pandemic EdTech Usage



Research Question 5

Significant Findings

Similar to the results for research question four, the predictor variable of perceived usefulness was a statistically significant predictor for the frequency teachers intend to use EdTech products after the COVID-19 pandemic has ended and the number of EdTech products teachers intend to use after the COVID-19 pandemic has ended. Likewise, the percentages of variances explained were also low, with perceived usefulness explaining 9.6% of the variance for the intended frequency of use and 9.4% of the variance for intended number of EdTech products to be used.

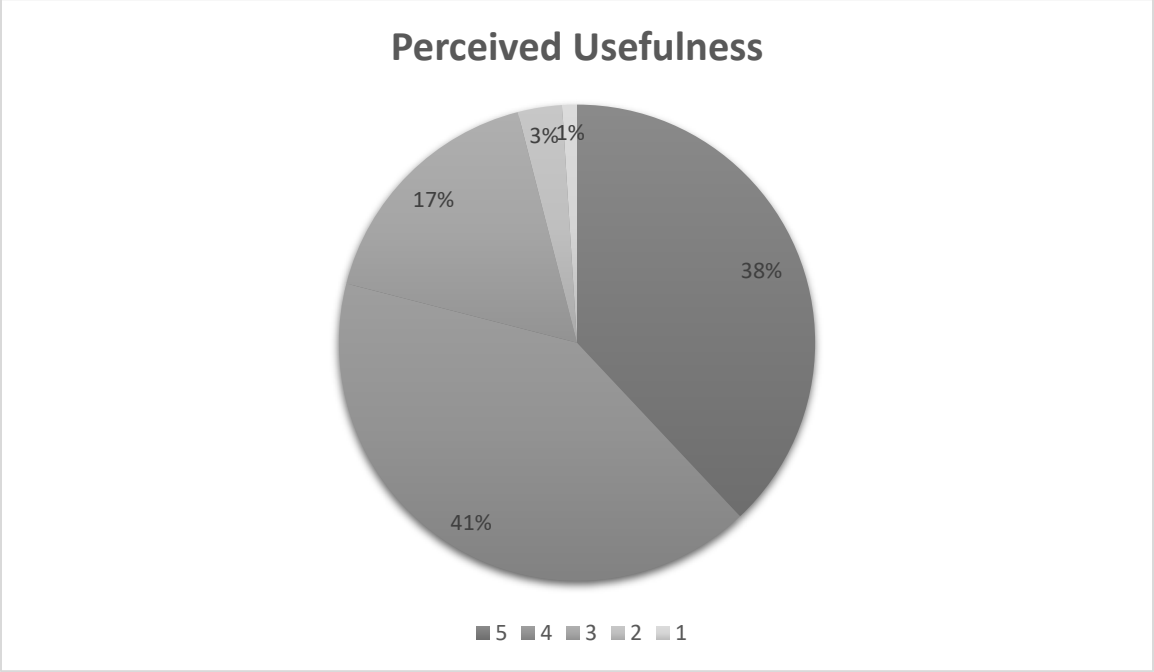
Discussion

Unlike the scores for teacher innovativeness, a small percentage of teachers (21%) scored an average of 3 or below regarding their perceived usefulness of technology (Figure 13). Even so, when compared graphically, the percentage of teachers scoring a 4 or 5 for average perceived usefulness almost mirrors the percentage of teachers indicating intention to use EdTech daily after the COVID-19 pandemic has ended. The data summary indicates a general assumption that teachers who perceive technology to be very useful are more likely to use it on a daily basis.

Davis' 1989 study on the Technology Acceptance Model identified perceived usefulness, how useful a person feels a particular technology is to them. This study resulted in a Cronbach alpha reliability for perceived usefulness of .97 with 95.6% of the correlations being significant. His second study yielded a Cronbach alpha of .98 with a validity of 97.22%, indicating a high discriminant validity to this model and its associated items.

Figure 13

Elementary Teacher Participants' Perceived Usefulness of EdTech



Research Question 6

Significant Findings

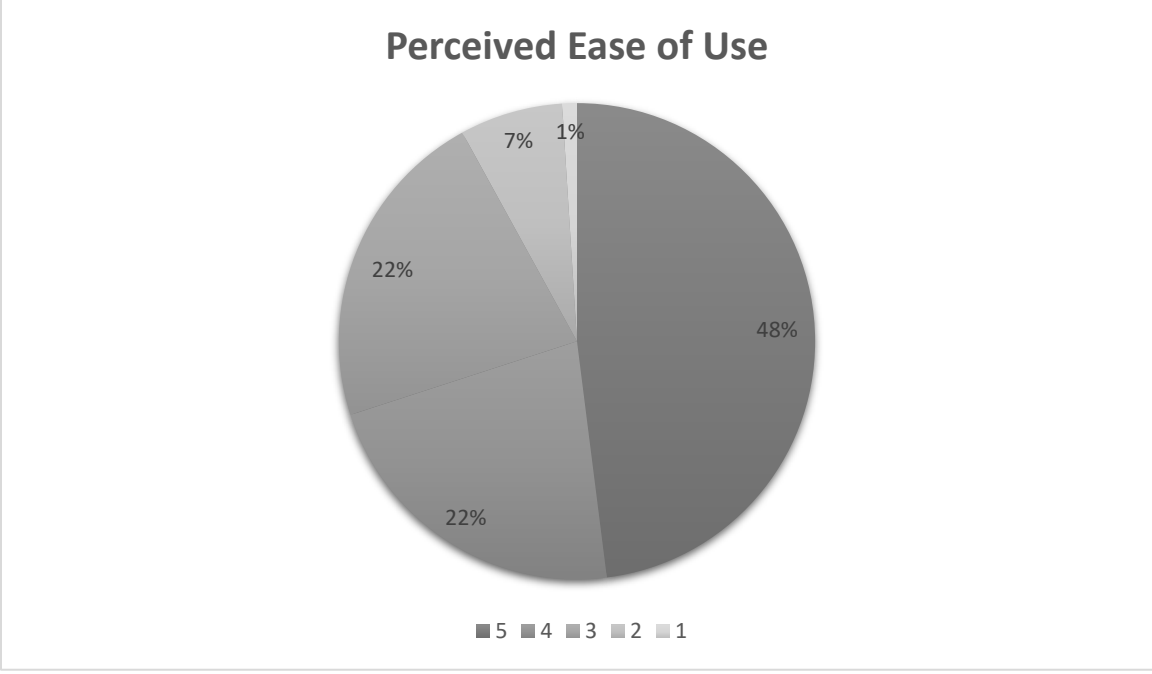
Although the percentage of variance explained still remained rather low, the predictor of perceived ease of use was statistically significant for both tests. Perceived ease of use explained 6.8% of the variance of the frequency teachers indicated intending to implement EdTech and 12.3% of the variance for the number of EdTech products teachers indicated intending to use after the COVID-19 pandemic has ended. Additionally, both the intended frequency of use and number of EdTech products both had a *p* value of less than .001.

Discussion

As seems to have been the case thus far, the data for perceived ease of use appears to line up with intended frequency of use, with the percentage of teachers scoring an average of 4 or 5 on the perceived ease of use scale nearly aligning with the percentage of teachers intending to use EdTech products on a daily basis, as shown in Figure 11, after the COVID-19 pandemic has ended. Logically, this conclusion would make sense, since it is likely that teachers that perceive technology as being easier to use are more likely to use it at higher frequencies. As hypothesized, both tests indicated a positive relationship between perceived ease of use and the two dependent variables of frequency of use and number of EdTech programs intended to be used after the COVID-19 pandemic has ended.

Figure 14

Elementary Teacher Participants' Perceived Ease of Use of EdTech



Research Question 7

Significant Findings

Regarding how intended use of EdTech after the COVID-19 pandemic predicts the level of motivation teachers believe EdTech has on their students, the number of EdTech programs and frequency of use of EdTech programs were both found to be significant predictors, with frequency of use explaining 7.2% of the variance and number of EdTech programs explaining 5.7% of the variance. Likewise, the number of EdTech programs and intended frequency of use of EdTech explained 8.3% of the variance.

Figure 15

Elementary Teacher Participants' Perceived Level of Student Motivation

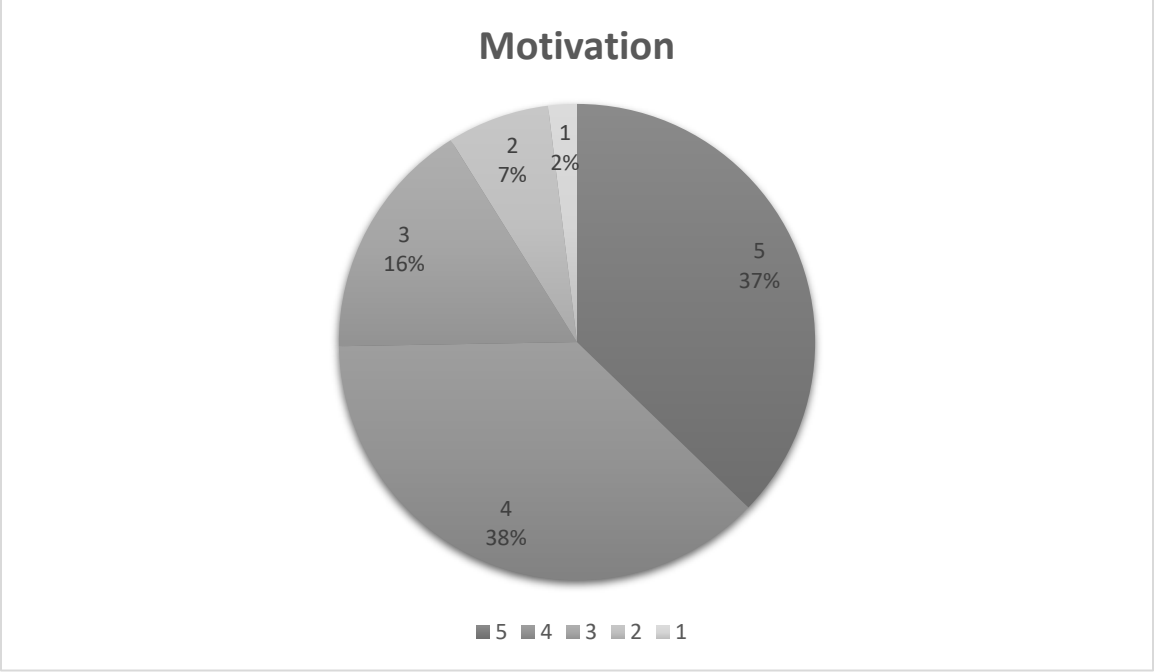
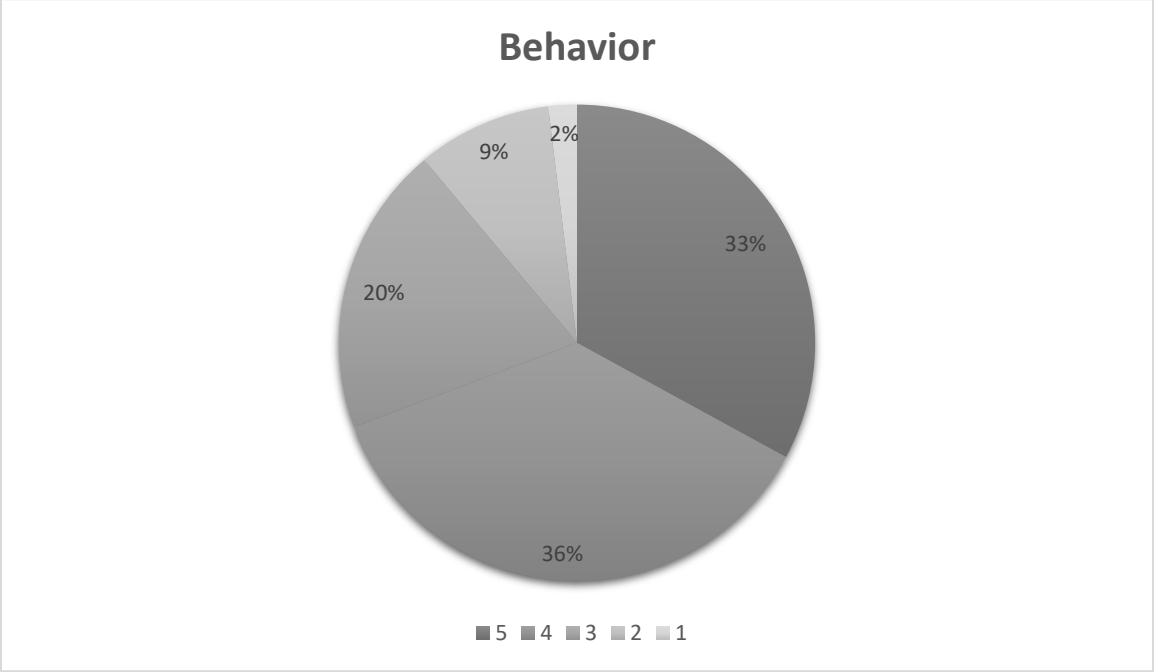


Figure 16

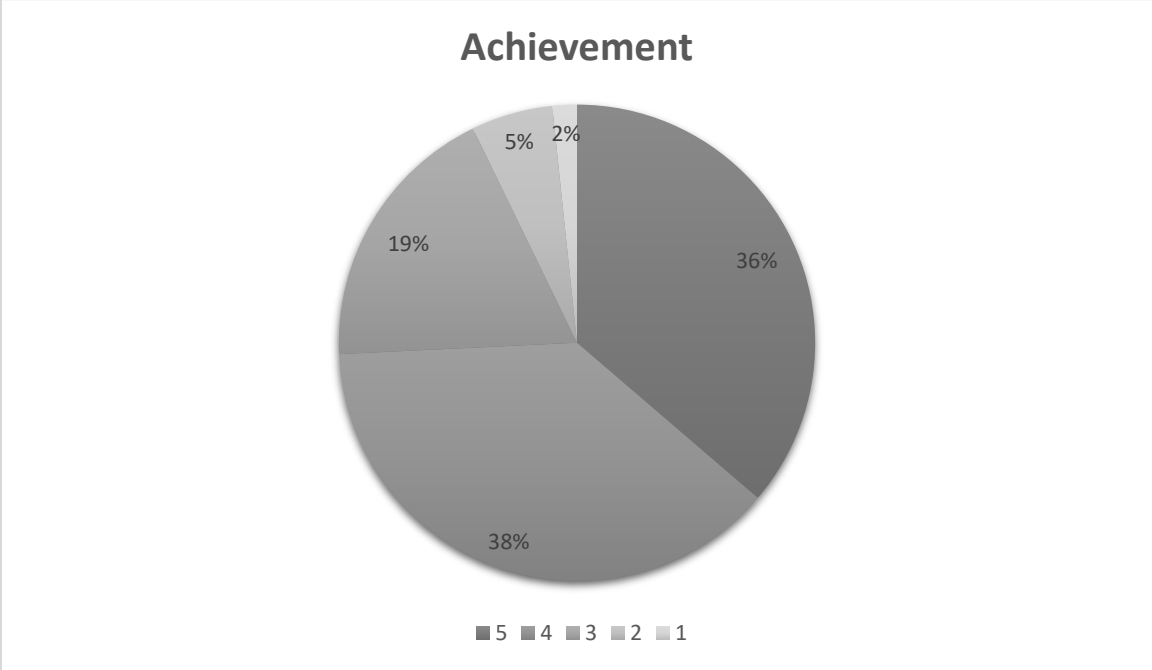
Elementary Teacher Participants' Perceived Level of Student Behavior



Finally, the remaining variables explained a combined 13% of the variance with the number of EdTech programs having an sr^2 value calculated at 8.2% and frequency of use having an sr^2 value calculated at 7.6%.

Figure 17

Elementary Teacher Participants' Perceived Level of Student Achievement



Discussion

Students themselves have also voiced that using technology allows them to apply knowledge to practical problems as well as develop problem-solving and critical thinking skills (Fullan, 2017), so it is unsurprising that teachers also feel that the use of technology has a positive effect on student achievement. Middle school students participating in Horn & Staker's "Speak Up Project" (2015) indicated that they were more interested in school when technology was used, that they liked having some control over their learning, and that they were often bored in school when technology was not used and wished it were more interesting, indicating that the use of technology also likely has a positive effect on student behavior. Even the students themselves indicated that

technology integration helped them to achieve better grades and feel more in control of their own learning (Evans, 2019). Finally, Akbari, et al., (2016), found that technology increased student motivation and Karabulut-Ilgu, et al., (2018) found that technology promoted lifelong learning among students.

In Karsenti and Bugmann's 2017 study on Minecraft for Education with 118 elementary students, they found that some of the main benefits were increased student motivation, increased reading and writing skills, increased problem-solving skills, higher understanding of math and science concepts, and improved reasoning skills. Similarly, Kurvinen, et al., (2020) found that their treatment group for using technology in math lessons had a higher mean, higher median, and made fewer errors than the control group.

Dinc (2019) found that pre-service teachers felt that technology helped to increase student motivation, engagement, and interaction with peers, in turn affecting student achievement, specifically test scores and writing skills (Gulek & Demirtas, 2005), and 49% of in-service teachers indicated students were more motivated as a result of technology integration (Fullan, 2017). Even parents agree that the use of EdTech can help their children develop college and career readiness skills (Fullan, 2017).

One of the interview participants reiterated this during her interview (Appendix D), citing engagement as a benefit of EdTech use. She explained that students were able to collaborate online which helped to foster critical thinking, gave them ownership of their learning, gave them opportunities to present their learning, and gave them more options to choose their learning path. They also enjoyed the social-emotional aspect of engaging and communicating with each other online when they were away from the classroom, using programs such as FlipGrid. She also indicated that if teachers were to

stop using the programs that they used during the pandemic, there might be a negative effect on student behavior and motivation.

Although the percentage of variance explained is still somewhat low, once again, roughly three-fourths of respondents rated a 4 or 5 for each of the dependent variables tested for this research question, mirroring the three-fourths of participants who indicated intending to use EdTech on a daily basis after the COVID-19 pandemic has ended, leading me to believe that teachers who intend to use more EdTech programs with greater frequency, also typically believe that EdTech has a greater effect on student achievement, motivation, and behavior.

Implications for Elementary Education

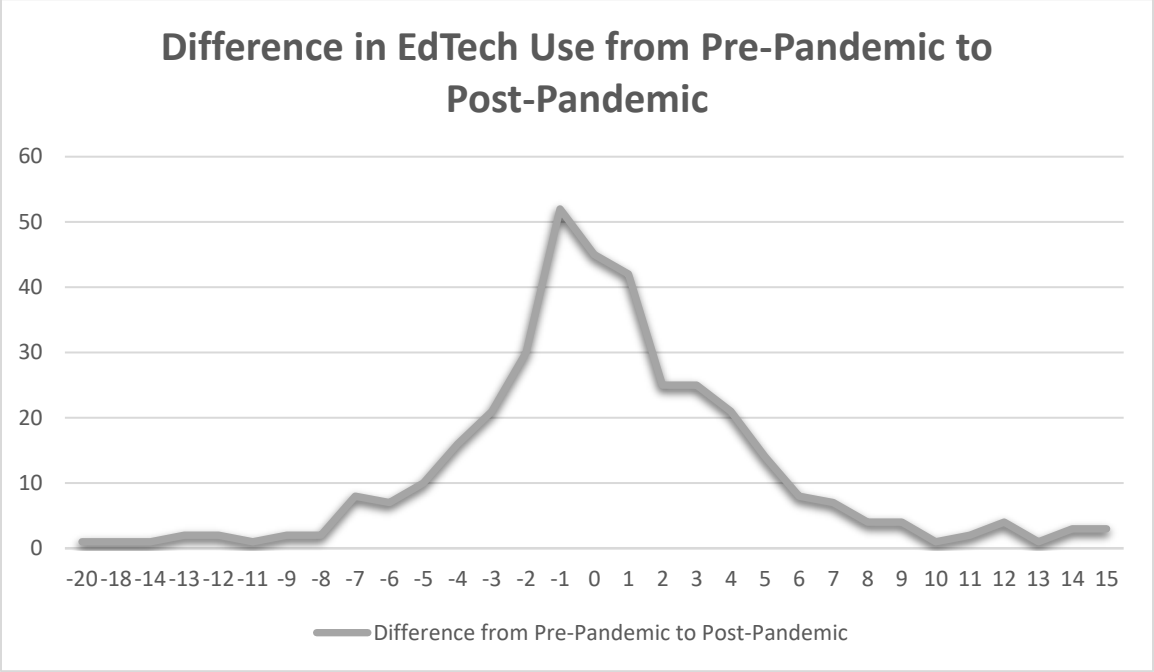
Post-Pandemic EdTech Usage

Based on the data from participants regarding their intended use of technology after the pandemic has ended, there are several implications for post-pandemic elementary education, including the number of EdTech products teachers will likely be using, the frequency with which teachers will be using EdTech, and even a change in their own perceptions of EdTech.

Interestingly, according to Table 1 the number EdTech programs teachers indicated that they plan to continue using after the pandemic has ended presents a fairly normally distributed curve, with the majority of participants indicating a change in number of programs between -8 and 8, with the mean right around 0.

Figure 18

Difference in EdTech Use from Pre-Pandemic to Post-Pandemic



Although the majority of participants are limited to one district and the restraints that come with it, based on these findings overall, administrators should probably expect to see roughly the same amount of EdTech programs being used, with the majority of teachers indicating a plus or minus change of roughly 1 to 2 programs, and with more tech-savvy teachers, or those scoring higher on the personal innovativeness scale, adopting more programs to use as less tech-savvy teachers, or those scoring lower on the personal innovativeness scale, drop them. While this is only an assumption from a current elementary teacher, additional research would be required to identify if there is a direct correlation between the tech-savviness of teachers and their change in the number of EdTech programs they intend to use. Additionally, since it was anticipated that the

COVID-19 pandemic would be over in time to study the actual post-pandemic teacher usage, as opposed to intended usage, these numbers are only a prediction, and not actual post-pandemic usage data.

Post-Pandemic EdTech Frequency of Use

While there is likely to not be much of a change in overall EdTech usage among elementary teachers, what does show to have a significant change is the frequency with which teachers intend to use EdTech in their classrooms (Table 1). It is interesting to note that the only category of frequency that increased, and increased significantly, was that of daily usage. All other categories showed rather drastic decreases from pre-pandemic reported numbers. Although the intended daily frequency does decrease somewhat from the pandemic daily frequency, it remains significantly higher than the pre-pandemic numbers, an increase from 163 teachers reporting daily usage to 272 teachers reporting their intention to use EdTech daily after the pandemic has ended, a difference of 109 teachers. The category that saw the next largest change was a decrease of 38 teachers indicating using EdTech less than once a month, meaning that after the pandemic, those teachers intend to use EdTech more than they had initially been using EdTech prior to the COVID-19 pandemic, with only 8 teachers, out of the 365 respondents, still intending to only use EdTech less than once per month.

Table 5

Changes in Frequency of EdTech Use

Frequency	Pre-Pandemic	Pandemic	Post-Pandemic
Daily	163	319	272
2-3 Times Per Week	91	23	69
1 Time Per Week	39	11	8
2-3 Times Per Month	22	4	7
1 Time Per Month	4	0	1
Less Than Once Per Month	46	8	8

Recommendations for Elementary Education

Now that teachers across the United States have experienced virtual learning and likely experimented with multiple new EdTech programs, administrators should seize this opportunity to discuss these experiences with their faculty and students. Administrators should poll faculty or create focus groups to discuss what products were used during the pandemic including specifics such as what faculty liked or didn't like about them, what sort of features they felt were helpful, best practices, and why they may have preferred one similar program over another. Likewise, students should also be polled to gather information from their perspectives about the use and features of EdTech. Administrators can then use this information to reexamine their school- or district-paid EdTech subscriptions to see if their library can be updated to better suit student and faculty needs and preferences.

Since the Technology Acceptance model has a history of proven validity and has been shown, through this study, to similarly predict anticipated EdTech use after a global

pandemic, administrators should begin to make more use of it within their schools and districts, using this tried and true instrument to gauge faculty perceptions after using a new product for a designated amount of time, as this will be a good indicator whether or not they will continue to actually use it.

Although it was not specifically studied in this research, the use of online learning or online meeting programs for professional development was an important factor in the success of online learning during the pandemic. Districts should examine what sort of online learning faculty participated in or what they would desire to participate in, as this is one of the main first-order barriers to technology integration, and they should expand their online or on-demand professional development catalog to accommodate teacher needs and interests.

Finally, administrators should also attempt to assess the personal innovativeness levels of their faculty. This will be important, not only for identifying how quickly and how likely faculty are to adopt a new technology, but it will also identify faculty members that could serve as change agents for introducing new technologies, or even serve as testers or scouts for identifying new technologies.

Recommendations for Future Research

A great deal of information was collected during this study that was not used to test the actual research questions. As such, there is room for additional research to be done using the already-collected data, as well as collecting additional data to add to it.

Self-Efficacy Data

Information was collected from participants based on their feelings before, during, and anticipated feelings after the pandemic. Questions included how much participants

liked EdTech, how adept they were at using it, how easy they found it to use, and how useful they found it to use. While some of this information was addressed in the perceived usefulness and perceived ease of use portions of the survey, the changes from before, to during, to anticipated feelings after the pandemic were not addressed in this study and might provide interesting insight into at which point teacher perceptions may have changed.

Specific EdTech Usage

Information was collected from participants regarding specific EdTech programs that they had either heard of or used before the pandemic, which of these programs they used during the pandemic, and which they plan to continue using after the pandemic has ended. While this information was used in a general overview, i.e., the number of programs teachers intend to use after the pandemic, it does not give a good picture of the specific programs that were used.

An extensive list of 39 EdTech programs was listed for teachers to indicate whether they had heard of the program or used it. Additionally, teachers were given the option to type in any additional programs that they had heard of or used that were not on the list, an option which 17 teachers responded to. It would be both an interesting and informative study in and of itself to examine, in detail, the specific programs that were, or were not, used before, during, and intended to be used after the pandemic. I would also recommend looking for trends in these responses such as common types of programs that tend to be used more or less than others and the frequency with which specific programs are used. Finally, since many of the participants indicated that they had not heard of many of the programs listed in the survey, it would be interesting to see which programs,

upon being given additional information about them, teachers would indicate intention to use in the classroom.

Hsu (2013), Lee & Lee (2014), Smarkola (2011), and Tondeur et al., (2012) indicated that designing, implementing, and reflecting on technology lessons would make pre-service teachers more likely to use technology. Ertmer & Ottenbreit (2010), Perkmen & Pamuk (2011), and Tondeur, et al. (2012) indicated that positive experiences and modeling of technology integration lead to higher use. Finally, Onal, et al., (2017) found that even though participants may find technology difficult to learn at first, it was easy to implement once learned. The unspoken prerequisite, however, to all of these situations, is that participants must have at least heard of, and preferably interacted with, a technology in order to be more likely to use it in the future. As such, I would recommend introducing new EdTech programs to the teachers that had not even heard of them before, and analyzing what factors affect whether teachers intend to use a program afterward as well as which programs, or types of programs, teachers indicate intending to use or not use after having learned about them for the first time.

Actual Post-Pandemic Use

My original plan for this research was to include data on actual teacher usage after the pandemic had ended, however, when the data was collected, virtual learning was still occurring across the country, so the study was changed to reflect anticipated use of EdTech after the pandemic has ended. As such, my final suggestion for future research is to collect actual post-pandemic EdTech use among elementary teachers and to compare that data to the findings in this study regrading anticipated post-pandemic use of EdTech.

Conclusion

The COVID-19 pandemic caused major disruptions to classrooms across the United States, including the closure of schools across the entire country by March 25th, 2020 (EdWeek, 2020). Some schools transitioned to virtual learning in the spring and many followed suit the following fall, forcing teachers across the country to learn how to teach in this new setting. This study focused on determining how the COVID-19 school closures affected EdTech use among elementary teachers, what factors predicted how many EdTech products and how often teachers intended to continue using upon returning to in-person instruction, and how teachers believed the use of EdTech affects student achievement, motivation, and behavior. Since the research questions focused on factors affecting anticipated continued use of EdTech among teachers after returning to in-person instruction, the Technology Acceptance Model (Davis, 1989) and Diffusion of Innovation Theory (Rogers, 2003) served as the main theoretical framework. The Experiential Learning Theory (Culatta, 2020) and Discovery Learning Model (Pappas, 2014) provided further theoretical framework and insight into the mindset of teachers across the country learning how to use new EdTech programs as well as how to transition teaching to hybrid or even virtual.

Data collection consisted of a survey instrument, compiled from items from the Technology Acceptance Model and the Individual Innovativeness Scale (Hurt, et al., 2013), as well as a follow-up semi-structured interview. Questions focused on the use of EdTech before, during, and anticipated use of EdTech after the pandemic, with a final section on demographics. Participants included elementary classroom teachers across the country, with the majority of the teachers from a large district in Alabama. Variables

included demographics; number of EdTech programs used before, during, and intended use after the pandemic; frequency of EdTech use in the classroom before, during, and intended frequency after the pandemic; perceived ease of use; perceived usefulness; individual innovativeness; and anticipated effects on student motivation, achievement, and behavior.

Data analysis included a variety of statistical tests. Descriptive statistics were analyzed to help contextualize information. A paired t-test was conducted to compare EdTech usage among elementary teachers before and during the COVID-19 pandemic to gauge the impact of the pandemic on teacher usage. A series of linear regression tests were then conducted to identify how well the variables of demographics, individual innovativeness, perceived usefulness, and perceived ease of use predicted anticipated teacher use of EdTech upon returning to the in-person classroom. A final series of linear regression tests were conducted to identify the impact of frequency and number of EdTech programs used predicted how teachers felt the use of EdTech affected student motivation, achievement, and behavior.

Results for the paired t-tests indicated a large effect size for both frequency of use and number of EdTech programs used. Demographic predictor variables were not found to be statistically significant for either test. The number of EdTech programs used during the pandemic was a statistically significant predictor of anticipated use after the pandemic, while the frequency of EdTech use was not. Statistically significant predictors for the intended frequency of use and intended number of programs to be used after the pandemic were personal innovativeness, perceived usefulness, and perceived ease of use.

Both predictor variables regarding the intended use of EdTech after the pandemic were found to be statistically significant predictor variables for teacher perceived effects on student motivation, behavior, and achievement.

The data collected from this study indicates, unsurprisingly, that there was a significant increase in the use of EdTech programs and frequency during the COVID-19 pandemic. As far as intended post-pandemic use of EdTech, the tested models explained 48.9% of the variance for number of EdTech programs intended to be used post-pandemic and 52.5% of the variance for intended frequency of use after the pandemic has ended. Personal innovativeness explained 4.9% of the variance for intended frequency of use and 7.8% of the variance for number of EdTech products intended to be used post-pandemic. Perceived usefulness explained 9.4% of the variance for number of EdTech products intended to be used post-pandemic and 9.6% of the variance for intended frequency of use. Perceived ease of use explained 6.8% of the variance of intended frequency of use and 12.3% of the variance for intended number of EdTech products to be used post-pandemic. Frequency of use was found to explain 7.2% and number of EdTech programs intended to be used 5.7% of the variance for teacher beliefs regarding the effect of EdTech use on student motivation. The number of EdTech programs intended to be used and the intended frequency of use explained 8.3% of the variance for teacher beliefs regarding the effect of EdTech use on student behavior and 13% of the variance for teacher beliefs regarding the effect of EdTech use on student achievement.

As far as implications for elementary education, administrators should anticipate little to no change in the number of programs used by teachers, but should anticipate a significant increase in the frequency of EdTech use from pre-pandemic numbers. It is

recommended that administrators collect important data upon returning to in-person instruction regarding teacher experiences with EdTech during the pandemic in order to better gauge how to move forward with technology.

To get a more complete picture of the information regarding this study, additional recommended research includes identifying direct correlations between individual participants and their responses, a more in-depth look at teacher self-efficacy regarding EdTech usage, more information regarding specific programs that were used during the pandemic and their features, and finally, following up with actual post-pandemic use upon returning to in-person classrooms.

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APPENDICES

Appendix A

IRB Approval

irb@southalabama.edu

UNIVERSITY OF SOUTH ALABAMA

TELEPHONE: (251) 460-6308
AD 240 · MOBILE, AL. 36688-0002

INSTITUTIONAL REVIEW BOARD
April 8, 2021

Principal Investigator:	Jessica Freeland, B.S., M.Ed.		
IRB # and Title:	IRB PROTOCOL: 21-090 [1679124-2] Pedagogy After a Pandemic: Predicting Continued Elementary Teacher Usage of EdTech After the COVID-19 Pandemic		
Status:	APPROVED	Review Type:	Limited Review
Approval Date:	April 5, 2021	Submission Type:	New Project
Initial Approval:	April 5, 2021	Expiration Date:	
Review Category:	2iii: 45 CFR 46.104 (d)(2): Research that only includes interaction involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior (including visual or auditory recording): iii. The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can be readily ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by 45 CFR 46.111(a)(7)		

This panel, operating under the authority of the DHHS Office for Human Research and Protection, assurance number FWA 00001602, and IRB Database #00000286 or #00011574, has reviewed the submitted materials for the following:

1. *Protection of the rights and the welfare of human subjects involved.*
2. *The methods used to secure and the appropriateness of informed consent.*
3. *The risk and potential benefits to the subject.*

The regulations require that the investigator not initiate any changes in the research without prior IRB approval, except where necessary to eliminate immediate hazards to the human subjects, and that **all problems involving risks and adverse events be reported to the IRB immediately!**

Subsequent supporting documents that have been approved will be stamped with an IRB approval and expiration date (if applicable) on every page. Copies of the supporting documents must be utilized with the current IRB approval stamp unless consent has been waived.

Notes:

There are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of data

Appendix B

Teacher EdTech Usage Survey Instrument

Q1
This survey will collect information about which Educational Technology (EdTech) products you have used or plan to use in your classroom.

It focuses on Educational Technology as programs or websites where teachers can create and assign tasks or lessons for students to turn in (i.e. EdPuzzle), not just a website where students can do activities on their own (i.e. PBS Kids). "Learning Management System" (LMS) is defined as a platform on which online teaching is carried out (i.e. Schoology).

This survey is intended for classroom elementary teachers teaching grades K-5th.

This survey will take roughly 15 minutes to complete.

Q2 For this section of the survey, please respond regarding what Educational Technology products you used BEFORE the COVID-19 pandemic.

Q3 BEFORE the pandemic, how frequently did you use EdTech in your classroom?

- ○ Daily (1)
- ○ 2-3 times per week (2)
- ○ 1 time per week (3)
- ○ 2-3 times per month (4)
- ○ 1 time per month (5)
- ○ Less than once a month (6)

Q39 Please answer the following questions in regard to EdTech BEFORE the pandemic, with 1 being the least and 5 being the most.

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)
How much did you like EdTech? (1)	○	○	○	○	○
How adept were you at using EdTech? (2)	○	○	○	○	○
How easy did you find it to use EdTech? (3)	○	○	○	○	○
How useful did you find EdTech? (4)	○	○	○	○	○

Q8 Please respond regarding Learning Management Systems (LMSs) BEFORE the pandemic.

	Google Classroom (1)	Schoology (2)	Canvas (3)	Moodle (4)	Blackboard (5)	Seesaw (6)	Other (7)
Which LMSs had you heard of BEFORE the pandemic? (1)	☐	☐	☐	☐	☐	☐	☐
Which LMSs had you used BEFORE the pandemic? (2)	☐	☐	☐	☐	☐	☐	☐

Q9 If you selected "Other," please list what LMSs you had heard of or used BEFORE the pandemic.

_____

Q24 Please respond regarding Educational Technology BEFORE the pandemic.

	Which EdTech programs had you heard of before the pandemic? (1)	Which EdTech programs had you used before the pandemic? (2)
Book Creator (1)	☐	☐
Blooket (2)	☐	☐
BrainPop (3)	☐	☐
BreakoutEDU (4)	☐	☐
Buncee (5)	☐	☐
Canva (6)	☐	☐
CK-12 (7)	☐	☐
Classcraft (8)	☐	☐
Classkick (9)	☐	☐

Clever (10)	☐	☐

Q43 Please respond regarding Educational Technology BEFORE the pandemic.

	Which EdTech programs had you heard of before the pandemic? (1)	Which EdTech programs had you used before the pandemic? (2)
Duolingo (1)	☐	☐
Edmodo (2)	☐	☐
EdPuzzle (3)	☐	☐
Elementari (4)	☐	☐
eSpark (5)	☐	☐
FlipGrid (6)	☐	☐
Flocabulary (7)	☐	☐
Formative (8)	☐	☐
Gimkit (9)	☐	☐

Gizmos (10)	☐	☐

Q10 Please respond regarding Educational Technology BEFORE the pandemic.

	Which EdTech programs had you heard of before the pandemic? (1)	Which EdTech programs had you used before the pandemic? (2)
GoNoodle (1)	☐	☐
Insert Learning (2)	☐	☐
Kahoot! (3)	☐	☐
Nearpod (4)	☐	☐
Newsela (5)	☐	☐
Padlet (6)	☐	☐
Parlay (7)	☐	☐
Pear Deck (8)	☐	☐
Powtoon (9)	☐	☐

Prodigy (10)	☐	☐

Q44 Please respond regarding Educational Technology BEFORE the pandemic.

	Which EdTech programs had you heard of before the pandemic? (1)	Which EdTech programs had you used before the pandemic? (2)
Quizizz (1)	☐	☐
Quizlet (2)	☐	☐
Soundtrap (3)	☐	☐
Stemscopes (4)	☐	☐
Storyboard That (5)	☐	☐
Symbaloo (6)	☐	☐
Wakelet (7)	☐	☐
WeVideo (8)	☐	☐
XtraMath (9)	☐	☐

Other (10)	☐	☐

Q13 If you selected "Other," please list what EdTech programs you had heard of or used BEFORE the pandemic.

_____

Q11 For this section of the survey, please respond regarding what Educational Technology products you used or are using DURING the COVID-19 pandemic.

Q15 How are you *currently* delivering instruction?

- ○ Virtual only - teacher and students at home (1)
- ○ Virtual only - teacher at school, students at home (2)
- ○ Fully in-person (3)
- ○ Hybrid - all students alternate days that they attend in person or virtual (4)
- ○ Hybrid - some students are fully virtual and some are fully in-person (5)

Q16 CURRENTLY, how frequently did you use EdTech in your classroom?

- ○ Daily (1)
- ○ 2-3 times per week (2)
- ○ 1 time per week (3)
- ○ 2-3 times per month (4)
- ○ 1 time per month (5)
- ○ Less than once a month (6)

Q41 Please answer the following questions in regard to EdTech CURRENTLY, with 1 being the least and 5 being the most.

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)
How much do you like EdTech? (1)	○	○	○	○	○
How adept are you at using EdTech? (2)	○	○	○	○	○
How easy do you find it to use EdTech? (3)	○	○	○	○	○
How useful do you find EdTech? (4)	○	○	○	○	○

Q21 Please respond regarding CURRENT Learning Management Systems (LMSs) use.

	Google Classroom (1)	Schoology (2)	Canvas (3)	Moodle (4)	Blackboard (5)	Seesaw (6)	Other (7)
Which LMSs do you use CURRENTLY? (1)	☐	☐	☐	☐	☐	☐	☐
Which LMSs are CURRENTLY required by your school or district? (2)	☐	☐	☐	☐	☐	☐	☐
Which LMSs did you receive training in, either from your district or your school? (3)	☐	☐	☐	☐	☐	☐	☐
Which LMSs did you seek out training for on your own? (4)	☐	☐	☐	☐	☐	☐	☐
For which LMSs did you receive certification or a badge? (5)	☐	☐	☐	☐	☐	☐	☐

Q23 If you selected "Other," please list.

_____

Q14 Please respond regarding CURRENT Educational Technology use.

	Currently using (1)	Required by school/district (2)	Received training from school/district (3)	Sought out training on my own (4)	Earned certification or badge (5)
Book Creator (1)	☐	☐	☐	☐	☐
Blooket (2)	☐	☐	☐	☐	☐
BrainPop (3)	☐	☐	☐	☐	☐
BreakoutEDU (4)	☐	☐	☐	☐	☐
Buncee (5)	☐	☐	☐	☐	☐
Canva (6)	☐	☐	☐	☐	☐
CK-12 (7)	☐	☐	☐	☐	☐
Classcraft (8)	☐	☐	☐	☐	☐
Classkick (9)	☐	☐	☐	☐	☐

Clever (10)	☐	☐	☐	☐	☐

Q37 Please respond regarding CURRENT Educational Technology use.

	Currently using (1)	Required by school/district (2)	Received training from school/district (3)	Sought out training on my own (4)	Earned certification or badge (5)
Duolingo (1)	☐	☐	☐	☐	☐
Edmodo (2)	☐	☐	☐	☐	☐
EdPuzzle (3)	☐	☐	☐	☐	☐
Elementari (4)	☐	☐	☐	☐	☐
eSpark (5)	☐	☐	☐	☐	☐
FlipGrid (6)	☐	☐	☐	☐	☐
Flocabulary (7)	☐	☐	☐	☐	☐
Formative (8)	☐	☐	☐	☐	☐
Gimkit (9)	☐	☐	☐	☐	☐

Gizmos (10)	☐ ☐ ☐ ☐ ☐

Q25 Please respond regarding CURRENT Educational Technology use.

	Currently using (1)	Required by school/district (2)	Received training from school/district (3)	Sought out training on my own (4)	Earned certification or badge (5)
GoNoodle (1)	☐	☐	☐	☐	☐
Insert Learning (2)	☐	☐	☐	☐	☐
Kahoot! (3)	☐	☐	☐	☐	☐
Nearpod (4)	☐	☐	☐	☐	☐
Newsela (5)	☐	☐	☐	☐	☐
Padlet (6)	☐	☐	☐	☐	☐
Parlay (7)	☐	☐	☐	☐	☐
Pear Deck (8)	☐	☐	☐	☐	☐
Powtoon (9)	☐	☐	☐	☐	☐

Prodigy (10)	☐	☐	☐	☐	☐

Q38 Please respond regarding CURRENT Educational Technology use.

	Currently using (1)	Required by school/district (2)	Received training from school/district (3)	Sought out training on my own (4)	Earned certification or badge (5)
Quizizz (1)	☐	☐	☐	☐	☐
Quizlet (2)	☐	☐	☐	☐	☐
Soundtrap (3)	☐	☐	☐	☐	☐
Stemscopes (4)	☐	☐	☐	☐	☐
Storyboard That (5)	☐	☐	☐	☐	☐
Symbaloo (6)	☐	☐	☐	☐	☐
Wakelet (7)	☐	☐	☐	☐	☐
WeVideo (8)	☐	☐	☐	☐	☐
XtraMath (9)	☐	☐	☐	☐	☐

Other (10)	☐	☐	☐	☐	☐

Q26 If you selected "Other," please list.

_____

Q12 For this section of the survey, please respond regarding what Educational Technology products you intend to use AFTER the COVID-19 pandemic.

Q28 AFTER the pandemic, how frequently do you INTEND to use EdTech in your classroom?

- ○ Daily (1)
- ○ 2-3 times per week (2)
- ○ 1 time per week (3)
- ○ 2-3 times per month (4)
- ○ 1 time per month (5)
- ○ Less than once a month (6)

Q42 Please answer the following questions in regard to how you think you will feel regarding EdTech AFTER the pandemic, with 1 being the least and 5 being the most.

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)
How much will you like EdTech? (1)	○	○	○	○	○
How adept will you be at using EdTech? (2)	○	○	○	○	○
How easy will you find it to use EdTech? (3)	○	○	○	○	○
How useful will you find most EdTech? (4)	○	○	○	○	○

Q32 AFTER the pandemic, which Learning Management Systems do you intend to use?

- ☐ Google Classroom (1)
- ☐ Schoology (2)
- ☐ Canvas (3)
- ☐ Moodle (4)
- ☐ Blackboard (5)
- ☐ Seesaw (6)
- ☐ Other (7)

Q33 If you selected "other," please list.

_____

Q34 AFTER the pandemic, which EdTech programs do you intend to use?

- [ ] Book Creator (1)
- [ ] Blooket (2)
- [ ] BrainPop (3)
- [ ] BreakoutEDU (4)
- [ ] Buncee (5)
- [ ] Canva (6)
- [ ] CK-12 (7)
- [ ] Classcraft (8)
- [ ] Classkick (9)
- [ ] Clever (10)
- [ ] CoSpaces (11)
- [ ] Duolingo (12)
- [ ] Edmodo (13)
- [ ] EdPuzzle (14)

- [ ] Elementari (15)
- [ ] eSpark (16)
- [ ] FlipGrid (17)
- [ ] Flocabulary (18)
- [ ] Formative (19)
- [ ] Gimkit (20)
- [ ] Gizmos (21)
- [ ] GoNoodle (22)
- [ ] Insert Learning (23)
- [ ] Kahoot! (24)
- [ ] Moby Max (25)
- [ ] Nearpod (26)
- [ ] Newsela (27)
- [ ] Padlet (28)
- [ ] Parlay (29)

- [ ] Pear Deck (30)
- [ ] Powtoon (31)
- [ ] Prodigy (32)
- [ ] Quizizz (33)
- [ ] Quizlet (34)
- [ ] Soundtrap (35)
- [ ] Stemscopes (36)
- [ ] Storyboard That (37)
- [ ] Symbaloo (38)
- [ ] Wakelet (39)
- [ ] WeVideo (40)
- [ ] Xtramath (41)
- [ ] Other (42)

Q35 If you selected "other," please list.

_____

Q45 Please respond regarding your overall beliefs about the usefulness of EdTech.	Strongly Disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Using EdTech in my classroom enables me to accomplish tasks more quickly. (1)	○	○	○	○	○
Using Edtech has a positive impact on my job performance. (2)	○	○	○	○	○
Using EdTech in my classroom has a positive impact on my productivity. (3)	○	○	○	○	○

Using EdTech in my classroom has a positive impact on my effectiveness. (4)	○	○	○	○	○
Using Edtech makes it easier to do my job. (5)	○	○	○	○	○
Using EdTech has a positive impact on my students' achievement. (6)	○	○	○	○	○
Using EdTech has a positive impact on my students' behavior. (7)	○	○	○	○	○
Using EdTech has a positive impact on my students' motivation. (8)	○	○	○	○	○

I find EdTech useful in my classroom. (9)	○	○	○	○	○

Q46 Please respond regarding your overall beliefs about the ease of use of EdTech.	Strongly Disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Learning to operate EdTech is easy for me. (1)	○	○	○	○	○
I find it easy to get EdTech programs to do what I want them to do. (2)	○	○	○	○	○
My interaction with EdTech programs is typically clear and understandable. (3)	○	○	○	○	○
I find EdTech programs flexible to interact with. (4)	○	○	○	○	○

It is easy for me to become skillful at using EdTech programs. (5)	○	○	○	○	○
I find EdTech easy to use. (6)	○	○	○	○	○
My students find EdTech easy to use. (7)	○	○	○	○	○

Q47 Please rate the following items regarding your personal innovativeness.	Strongly Disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
My peers often ask me for advice or information. (1)	○	○	○	○	○
I enjoy trying new ideas. (2)	○	○	○	○	○
I seek out new ways to do things. (3)	○	○	○	○	○
I am generally cautious about accepting new ideas. (4)	○	○	○	○	○
I frequently improvise methods for solving a problem when an answer is not apparent. (5)	○	○	○	○	○

I am suspicious of new inventions and new ways of thinking. (6)	○	○	○	○	○
I rarely trust new ideas until I can see whether the vast majority of people around me accept them. (7)	○	○	○	○	○

Q48 Please rate the following items regarding your personal innovativeness.	Strongly Disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I feel that I am an influential member of my peer group. (1)	○	○	○	○	○
I consider myself to be creative and original in my thinking and behavior. (2)	○	○	○	○	○
I am aware that I am usually one of he last people in my group to accept something new. (3)	○	○	○	○	○
I am an inventive kind of person. (4)	○	○	○	○	○

I enjoy taking part in the leadership responsibilities of the group I belong to. (5)	○	○	○	○	○
I am reluctant about adopting new ways of doing things until I see them working for people around me. (6)	○	○	○	○	○

Q49 Please rate the following items regarding your personal innovativeness.	Strongly Disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I find it stimulating to be original in my thinking and behavior. (1)	○	○	○	○	○
I tend to feel that the old way of living and doing things is the best way. (2)	○	○	○	○	○
I am challenged by ambiguities and unsolved problems. (3)	○	○	○	○	○
I am receptive to new ideas. (4)	○	○	○	○	○
I am challenged by unanswered questions. (5)	○	○	○	○	○

I often find myself skeptical of new ideas. (6)	○	○	○	○	○

Q56 In what state do you teach?

▼ Alabama (1) ... Other U.S. Territory (51)

Q57 Do you teach in either of the following school districts?

- Mobile County Public School System - Alabama (1)
- Baldwin County Public School System - Alabama (2)
- Neither (3)

Q50 How many years have you been teaching?

- 0-1 (1)
- 2-5 (2)
- 6-10 (3)
- 11-20 (4)
- 21-35 (5)
- 35 or more (6)

Q51 What is your highest degree earned?

- Doctorate (1)
- Specialist (2)
- Masters (3)
- Bachelors (4)
- Associate (5)
- Certificate (6)

Q52 What is your highest teaching certification?

- AA (1)
- A (2)
- B (3)
- Emergency (4)
- Provisional (5)

Q53 What grade level(s) did you teach during the 2019-2020 and 2020-2021 school years?

	K (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)
2019-2020 (1)	☐	☐	☐	☐	☐	☐
2020-2021 (2)	☐	☐	☐	☐	☐	☐

Q54 In what type of school do you teach?

- ○ Public (1)
- ○ Private - Religious (2)
- ○ Private - Other (3)
- ○ Charter (4)

Q55 What is your gender?

- ○ Male (1)
- ○ Female (2)
- ○ Non-binary / third gender (3)
- ○ Prefer not to answer (4)

Q56 What is your age?

- ○ 21-29 (1)
- ○ 30-39 (2)
- ○ 40-49 (3)
- ○ 50-59 (4)
- ○ 60+ (5)

Q57 What is your race?

- ○ African American (1)
- ○ White/Caucasian (2)
- ○ Hispanic/Latino (3)
- ○ Native American (4)
- ○ Asian/Pacific Islander (5)
- ○ Other (6)
- ○ Prefer not to answer (7)

Appendix C

Interview Questions

1. Which EdTech programs did you use during the COVID-19 pandemic?
2. Which ones were required, which ones were necessary, and which ones were elective?
3. What benefits did you see for you from these programs?
4. What benefits did you see for your students from these programs?
5. What issues/difficulties did you have from these programs?
6. What issues/difficulties did your students have from these programs?
7. What did your students like about these programs?
8. What did your students dislike about these programs?
9. Do you consider yourself tech-savvy? Why or why not?
10. Which EdTech programs will you continue using after the pandemic? Why?
11. Which EdTech programs will you not continue using after the pandemic? Why not?
    a. How do you think it might affect your students' academic performance?
    b. How do you think it might affect your students' behavior?
    c. How do you think it might affect your students' motivation?

Appendix D

Interview Transcripts

Participant 1

Jessica Freeland: Okay, all right, so it is recording so I'm too, I know you did the survey, but just to kind of review and have it all in one place, so what.

Jessica Freeland: organs, did you use during the pandemic so like last spring, when the schools shut down currently if you're not fully face to face, I mean we're still kind of independent mix, so what programs, have you used.

Participant 1: So, we have shifted completely to see saw for our pre K through fourth grade and Google classroom for our fifth through eighth grade are our main tools were also using near pod and paired up I'm your pod is mostly in our middle school and paradox is with our three, four, we are using.

Participant 1: Will creator a ton with our three third through sixth grade.

Participant 1: The math learning Center bridges created a whole bunch of Apps that are K, for us, for the math curriculum supplement we are using storyboard that in our middle school, we are using co spaces in our middle school.

Participant 1: Google meet is our main tool for when we are remote zoom is for guest speakers.

Participant 1: There is so much.

Jessica Freeland: Right.

Participant 1: There, that I, the whole Google suite of tools.

Participant 1: We are teachers like Kahoot and quiz length and quizzes and, recently, our school has discovered look it, even though I introduced it to them in November they're all on a look at cranes right now.

Participant 1: Our older grades use gimp kit.

Participant 1: And most of these, the only ones we really used prior to the pandemic were book creator seesaw on Google everything else was added and cooked everything else was pretty much added because of the Panda.

Jessica Freeland: Right.

Jessica Freeland: Right, and I think it's interesting, you said that you had to introduce them into was it book it.

Before.

Participant 1: But they were so wow so yet.

Jessica Freeland: mm hmm.

Participant 1: That they like.

Jessica Freeland: So that was one of the things I’m.

Jessica Freeland: Thinking of like people may have mentioned it, or they may have heard of it, but until they really needed to use it, they didn't use it, but now that they've used it it's like Oh, this is great.

Participant 1: And what I really what what and I don't know if you'll get to these challenges of the tech, one of the things that was challenging for my whole staff was in the spring, when everything went down all of these amazing companies were offering free access to their tool.

Right.

Participant 1: Right and the challenge was the teachers were getting inundated because they were getting these emails and they would say what does this program can we use it and I kept going back to don't try anything new yet.

Participant 1: get into a routine be comfortable with the tools that we have and then we'll add it.

Participant 1: So, it was great, but it was also overwhelming oh epic they love our for our clay K six is loving using epic for reading.

Participant 1: And we have been using that a little bit before, but it became the main source of shared texts, because it was it's not like we could get books to every kid right that.

Participant 1: So.

Participant 1: yeah, I think that's the bulk of them sign up genius vs but yeah I think that's the bulk of them.

Jessica Freeland: Okay.

Jessica Freeland: So, um so out of the ones you mentioned that you use which ones were required by your district, which ones weren't required, but you had to use them in order to teach and which ones were just kind of optional elective that you liked.

Participant 1: So, Google classroom and Google tools were required and see saw was required Google meet was part of Google the Google sweet, that was a required what those were the required tools.

Participant 1: Necessary ones became things like quizzes and quizzes lit and pare back and near pad because that was a that way, the teachers were able to have interactive activities when they can't have the kids come up and write on the board, they can have them.

Participant 1: write on your back.

Participant 1: or on a near pot all of those were necessities, but not required, and then we looked at things to add in to build engagement and that's where.

Participant 1: Look at finally jumped on board and storyboard bad and co spaces those became a book creator those became um we have this unit, we want to do something really fun, how can we, what can we use and that's where different teachers came to me and we found different tools to fit their meat.

Participant 1: But the requirement ones will.

Participant 1: See saw and the Googles.

Jessica Freeland: Okay.

Jessica Freeland: See I so um what benefits, did you see for you or for the teachers from the programs that y'all were using.

Participant 1: So, one of the things that's interesting is, in my role as tech educational tech coordinator, I have been training teachers and providing workshops on these tools for six years.

Participant 1: They did not take to them until they didn't have a choice so coven force the teachers to start using tools that they should have been using all along.

Participant 1: And the bet the biggest benefit is the teachers, because of that felt confident and comfortable and became adept in all of these programs.

Participant 1: Mainly again our lower school is doing amazing things with see so now our upper school is very fluent in Google classroom Google meets all of the Google tools.

Participant 1: The fact that all of our teachers, now we just our eighth grade was remote for a couple of days, because they're going on a trip type Program.

Participant 1: And I didn't have to remind teachers to use Google calendar to set up the classes, they all everyone has become more comfortable with using these tools.

Participant 1: And programs like book creator are here to stay and Kahoot a bunch of these programs are now part of their every day, and what is interesting is we were just talking about how.

Participant 1: Our fifth graders get their own chromebooks at the beginning of the year, and they usually keep them in school, for the first semester.

Participant 1: And when talking to my fifth-grade teachers, they were concerned about doing that because they have shifted so much of their content and their lessons.

Participant 1: On to technology and for the kids not to be able to take their devices home for the first four and a half months of school, they were really freaking out about that because they'd become.

Participant 1: So reliant on it, which is a huge benefit to me, because now, the technology has truly become integrated into what my teachers are.

Participant 1: doing so.

Participant 1: We modified in the chromebooks will stay at school for a month, and then the kids will be taking them home and the teachers are like we can they can adjust and make things work so again book see sauce here to stay book creator paradox Google tools.

Participant 1: The game of five like Kahoot and block it, and quizzes and quiz split.

Participant 1: And then, some of the teachers, because they didn't have access to our maker space this year that's where co spaces came in and they're really, they're like we really.

Participant 1: want to keep this, this was a great activity, I don't want to shift back to doing it, the way we used to because this works really well.

Jessica Freeland: Right.

Jessica Freeland: Well, so on the are for the students okay so um so what benefits, did you see your did they mention to you for their students using these programs.

Participant 1: So, I have we have a quiet our school has been in person, since the start, but we have a one class one section of kindergarten first, second, third and fourth that have been exclusively remote.

Participant 1: And then we had students in fifth through eighth grade that were exclusively remote, and they just joined their middle school classes via Google meet, so it was like zoom in the room is a lot of people say but, in our case, for they had their own teacher, they were fully remote.

Participant 1: One of the biggest benefits is those younger kids are so much more comfortable and able to use technology for more than just going on to play games when they're at home.

Participant 1: And our third graders because typing started the first week of school are almost fluent typewriters already and that's something that we usually have to keep practicing through fourth and fifth grade.

Participant 1: Because the students have devices and we're using Google and we're using seesaw and we're introduced to the math learning Center Apps earlier there.

Participant 1: Ownership of those tools is now so much more solid because again they kind of didn't have a choice and now means that they can use them for deeper learning.

Participant 1: So a huge benefit the students, the skill set that they have gained by being forced into this is now something that we won't have to spend the first month the fourth grade reviewing the basics of their chromebooks and the basics of these tools, because they already know how to do it.

Now, when kids get.

Participant 1: Second, when they get to first grade first grade second grade they'll have already had a solid year or two of using seesaw under their belt.

Participant 1: For learning so they're used to it, and we can the teachers can go even farther and the kids are even more comfortable.

Participant 1: it's very cool to see actually it's been it's been neat to watch this whole transformation.

Participant 1: Difficulties so.

Jessica Freeland: One of I would eat this.

Participant 1: Yes, one of the biggest difficulties for everyone was the training, because it was thrown into it and in the spring, I was working 18 hour days responding to students emails and parent emails of teachers.

Participant 1: I had on hours two or three times a day for teachers to drop in with with questions.

Participant 1: And connectivity like Google went down a couple times or.

Participant 1: See saw see, I have to say Suzanne has been so responsive to the pandemic within two weeks of going remote they created a whole new way for students to login to make it way easier and then they add they've been adding features almost monthly to make thing to smooth out the difficulties.

Participant 1: A huge challenge, especially in the spring, when everyone was remote was students and teachers at home didn't have a robust enough Internet.

Participant 1: So the programs they couldn't even get to some of the programs, that we need it.

Participant 1: And over the summer we encouraged everyone upgrade your Internet make sure you've got good bandwidth everything, and that has helped.

Participant 1: However, it's technology so when a program goes down it's, not even the Internet it's they're having technical difficulties on their end and to help students and teachers understand.

Participant 1: That, yes, we know that this isn't working right now, as soon as it's back you'll be able to get to it it's okay don't worry.

Participant 1: And again, I think I mentioned at the beginning, more towards the beginning at the beginning of the pandemic all of these amazing platforms and companies were offering their tools for free, and it was overwhelming to choose.

Participant 1: To say no let's we know this works you've had a little training on it use this one stick with this one, and then we'll explore adding.

Participant 1: Google meet post a lot of challenges we did upgrade to the paid version, so we got some more features.

Participant 1: We had a handful of issues and see saw with things that saving and.

Participant 1: And in scratch with things not saving different we're using I do coding with our fourth graders a whole unit on that, but overall it's been fairly consistent that the biggest challenges were user error, lack of user training and connectivity issues.

Jessica Freeland: Right.

Jessica Freeland: So um what issues, then you mentioned some of it, too, but um the students specifically what issues or difficulties, did they have.

Participant 1: The biggest challenge that students had was forgetting how to login we have Google, so we everywhere, it was possible it's click the login with Google.

Participant 1: And in seesaw especially I would get emails my email isn't working and I have pictures of it that I would just reply showing supreme quickness Barton crossing out don't put your email here remember you have to click login with Google.

Participant 1: Most of the tools we use the kids don't have a book creator account or a seesaw account.

Participant 1: They have a Google account that they have to log in with so that was the biggest challenge for students was knowing how to log remembering how to log in.

Participant 1: And at the beginning of all of this, reminding students that you need to go to your Google calendar, make sure the correct calendars are checked that's where you'll find your links to get to your classes.

Participant 1: yeah it was smoother for the students and the teachers at first, and then, once the students got.

Participant 1: Over those hurdles that it was, and I still like last week I got an email from a parent whose child had gotten a new iPad.

Participant 1: And couldn't remember how to log in, and I said click the login with Google and they said we did, but that it didn't work and I’m like no you clicked it once you have to anywhere, you see login with Google you click.

Jessica Freeland: Alright, so what did the students like about these programs.

Participant 1: um.

Participant 1: They one of the things that they liked about seaside in the lower grades is they got the feedback from their teachers was mostly an audio so they didn't need help reading or help with anything so it was very user friendly.

Participant 1: They loved and the older grades, the independence that they had everything was just posted in Google classroom and they could click on it, oh I didn't mention flipboard we use flipboard a ton.

Participant 1: flip grid.

Participant 1: um they the ability to record themselves on flip grid and I'm seesaw made it so that.

Participant 1: kids when, especially when they couldn't have a conversation with their teacher, they could just record the conversation and send it to their teacher.

Participant 1: So it was really nice um.

Participant 1: Because we did in one to one devices with our lower school we didn't have a choice they loved the ability to pick up their device and work on their work at any time, instead of having wait for technology or go get the chromebook from the person who had it and whatnot.

Participant 1: Oh spaces, it was the kids really enjoyed the gamification aspect of it and how they were designing their own type of game be engagement.

Participant 1: into like look at Kahoot quizzes given kit quiz let all of that, the engagement that kids loved because it gave me five things.

Participant 1: The younger grades, and some of our older kids that needed the extra support love the ability to voice type in Google docs when they were writing.

Participant 1: Like responding writing essays or whatnot and I think that the kids really enjoyed the creativity that the tools allowed and especially something like see some flip grid.

Participant 1: or Google classroom where they could do their work on pencil paper or draw and then take a picture of it to share so those two the tools allowed them to do book.

Participant 1: Oh, and the virtual manipulative is from the programs.

Participant 1: That was really helpful.

Participant 1: The Briton math learning Center and sea salt put in virtual manipulative into their platform, so it just that was really helpful when they couldn't have the base 10 blocks or the pattern blacks in front of them.

Participant 1: Okay next question.

Jessica Freeland: Okay, so what did they dislike.

Participant 1: They didn't like when their devices weren't working they didn't like the platform didn't save their work they didn't like when they were in the middle of recording something on seesaw and their computer froze or their iPad froze they didn't like how slow things sometimes wet and.

Participant 1: I think, and no one came out and said I think they really didn't like when they had to.

Participant 1: continue like their teachers would give them feedback in a Google Doc there'll be a comment, can you please elaborate.

Participant 1: That the speed in which the feedback was like we're normally they write their essay or whatever write a paragraph turn it in the teacher A week later, would give it back and said, like you to redo this and do.

Participant 1: It was it was more effortful on the student part because they have it was everything was more immediate and I think that may have been a little bit of a challenge at times for them, but the biggest thing that kids didn't like is when the programs and devices were not working properly.

Jessica Freeland: So, mostly technical.

Participant 1: is yes, technical issues.

Participant 1: And when they weren't in the building we couldn't support those as readily as I mean we have a help desk so if there's a technical issue when we're at school it's easy.

Participant 1: When they're the technical issue and their home it's challenging and frustrating because their parents can only help so much sure the parents aren't available because they're working.

Participant 1: yeah it was the technical stuff that was the challenge.

Jessica Freeland: Right so to be do you do you as well, being in the tech coordinator, I would assume you consider yourself tech savvy, but if you want to elaborate.

Participant 1: I do consider myself tech savvy and what I tell people is I have had very little training and technology, I got my first computer when I was tablet and I play.

Participant 1: I mean my degree, is an elementary education, with an emphasis on language arts and social studies, I took two technology courses in college.

Participant 1: The joke amongst all of my friends and my colleagues is I would love to go get a masters in technology, but it would be very challenging because I could be teaching the courses in the masters in technology and to pay $30,000 to do what I already do.

Participant 1: I don't want that money but yes, I am very comfortable with tech very, very tech savvy and I think the reason I am is because I.

Participant 1: am not afraid to play and I know you know, two decades ago if you mess something up on a computer it was like the yet.

Participant 1: Now, if you mess something up almost everything is fixable so it's like if that didn't work okay we'll fix it and we'll try again, so the approach of it as we, as you know, toddlers with toys playing with it, what can you figure out.

Participant 1: that's when my comfort level is that I just have a running list of tools, I want to explore when I hear something I'm clubhouse or see something on Twitter, whatever it is, I write it down on a Google keep.

Participant 1: And that way I can go look at it and learn more about it when I have the chance.

Jessica Freeland: Right right yeah I'm the same way I just like to go in and click and play on it and experiment with it.

Participant 1: yeah that's why that's why I'm self-taught on most things, and thanks to YouTube and.

Participant 1: it's less frustrating, and thanks to Facebook so enclosed space is one of the kids asked me a question and I didn't know the answer, so I went to the coast basis group on Facebook and someone in that group posted.

Participant 1: A how to video, for me, and it was fantastic but that's yes very comfortable with it with technology.

Jessica Freeland: Right.

Jessica Freeland: So, which of these programs, do you think you will continue using after the pandemic once everybody's face to face there's no virtual learning which ones, do you think you will continue using and why.

Participant 1: We will continue with seesaw because of the communication that it provides it's amazing because it gives parents and instant glimpse into student what their students are doing.

Participant 1: will modify it so students have specific things that they need to post every month, so we can watch their progress.

Participant 1: We will continue to use Google and Google tools, because they're just easy and again the kids can access it from anywhere from any device, it makes it easy for the teachers to be able to provide support.

Participant 1: The gamification platforms, we will continue with coo and block it, and given kid and quizzes not necessarily on the paid platforms of those like we will continue with the paid seesaw we will probably continue with the paid Google the Google for education upgrade or whatever it is.

Participant 1: But Creator, we will continue to use the collaboration feature for students and the artifacts that they were able to create were amazing and it's very affordable.

Participant 1: Most of the tools that we use, we will continue to use just not necessarily the paid platform and.

Participant 1: or not necessarily.

Participant 1: For the broadness we may like use them for specific you'd so.

Participant 1: This this tool storyboard that was amazing for the.

Participant 1: narrative unit in sixth grade will keep it and use it for that unit and book creator was great for this unit and co spaces was great for this unit.

Participant 1: So we will continue with a lot of them and also hope we continue adding because the teachers have become so much more comfortable with the technology tool integration into their content.

Participant 1: That they'll want to keep using even more.

Jessica Freeland: Right.

Jessica Freeland: um So this has a couple little follow ups after it so basically which will you not continue using or expect to not continue using once everybody's back face to face, why not.

Jessica Freeland: And then kind of the follow ups or how do you think it might affect the students academic performance behavior motivation.

Participant 1: um, it is highly.

Participant 1: it's highly unlikely that we will continue using Google meet.

Participant 1: We use Google meet mostly because of the security.

Participant 1: feature, because it was built in you couldn't get you can't get into the Google meets the way we have it set up unless you are a student and have a Hello email address have an email address for school.

Participant 1: And we will probably not use that because it was a little clunky or then zoom um and we won't need it.

Participant 1: Because.

Participant 1: Everything will be able to go back to doing things in groups we didn't where kids were on Google meets with each other in different classrooms because we weren't allowed to mix the classes.

Participant 1: They stayed with the same are all debt we won't need that anymore, I think it will improve student behavior because they'll be able to be together again and they won't have to do everything on a screen.

Participant 1: That that we relied a lot on flip grid for responses, I think that will still be used, but not as much because, again, the amount of screen time students had to have, and one of the challenges with all of the remote learning was having kids cameras up and.

Participant 1: That was not so great, so I think kids will be excited to be able to be face to face again their behavior will be able to I hope.

Participant 1: continue to be positive and become more positive because it's been tiring to be behind the screen.

Participant 1: I think there'll be more motivated because they won't have the out of I'm just going to log in on Google meet today and I'm not going to school.

Participant 1: they'll be more motivated to be back in the building and back with their classmates because they won't have to be staring at their screen all day we had a handful of teachers that taught remotely so that meant the kids were sitting in the building still on a screen.

Participant 1: I think their academic performance will not change by the lack of tools that we stopped by the tools that we choose not to use, I think that the ones we're choosing to

keep we're keeping because they were helpful and the ones that we cut, which will, I think, mostly bb.

Participant 1: Like the online test taking will hopefully be a little less and a lot of that was in Google forms will still keep using Google and forums and all of that, but it'll just hopefully be.

Participant 1: More engaging for the kids because there'll be able to enter interact in person versus the screen.

Jessica Freeland: Right.

Participant 1: I don't know if I got a question clearly answered but that's what I got.

Okay.

Jessica Freeland: Alright, so that is it, let me put this link in the chat for you to enter the the raffle or whatever let's.

See.

Jessica Freeland: For the Amazon card.

Participant 1: club way.

Participant 1: I.

Participant 1: will never say no to Amazon.

Jessica Freeland: Right.

Jessica Freeland: Yes, it's a teacher.

yeah.

Jessica Freeland: Alright, so there's that just let me know if it doesn't work or anything.

Jessica Freeland: And while you're filling that out just thank you for participating in the survey and in the follow up interview, so I get some more qualitative feedback on kind of my teachers are making these decisions.

Participant 1: hey I love, I mean this is your whole progress project your whole.

Participant 1: is fascinating and I I'm hoping to see more of these, because this was such a unique time in in the educational world that what we learn from it it's fantastic.

Participant 1: So, I think there's a.

Jessica Freeland: lot of lasting changes.

yeah.

Participant 1: I know I know other schools are talking about maintaining a remote option type program a hybrid I know that we are hoping, not to have to do that.

Participant 1: We are a smaller school, we have 500 right around 505 students preschool through eighth grade, and so we are lucky in that regard, but it is there is a lot, like the ability to work from home now, instead of.

Participant 1: I have workers in my house I can't be in the building, I can just work from home now, instead of having to take a day off it's better for the kids better for the teachers better for the school, so it will definitely be interesting to see what continues.

Jessica Freeland: Right.

Jessica Freeland: All right, well, thank you again, and good luck with the rest of the year.

Participant 1: Thank you good you too good luck with your work and this this adventure you're on.

Jessica Freeland: Right, thank you.

Participant 1: Welcome take care.

Jessica Freeland: All right, you too.

Participant 2

Jessica Freeland: Alright, so it is now recording, you said you were Okay, with it being recorded alright so which ED tech programs, did you use during the pandemic so in the spring, when they first booth bars closed currently so like vocabulary near pod that sort of thing.

Participant 2: We mostly used seesaw and Google classroom and.

Participant 2: achieve 3000 I’m trying to think of all the other things that we've used.

Jessica Freeland: That one what is that.

Participant 2: She 3000 is a reading I think they have math, but our district only bought into the reading portion that used to be just.

Participant 2: informational text would definitely add friction texts are in are trying to make that more robust and What it does is we give the kids a pre mid and a posttest and it levels them by Lexile level, and then we can give them, we can have the.

Participant 2: company or the program pump out whatever articles they suggest, or we can schedule our own articles based on whatever we're doing and science social studies math whatever.

Participant 2: And then we can use it as a teaching tool and then.

Participant 2: For station teaching and things like that, when we're putting groups and.

Participant 2: So very robust informational text reading.

Participant 2: supplemental resources, certainly not our core instructional resource.

Jessica Freeland: Okay sounds interesting.

Participant 2: They also have a lower-level phonics portion that is called.

Participant 2: Smart yes as well that we use for our K to even K three.

Participant 2: We do have us from Eureka on the online portion especially wrapping it up for this past year and a half to.

Participant 2: we've used to flip grid you.

Participant 2: Words their way has an online portion just recently we're actually piloting that for them.

Participant 2: it's only can come up with off the top of.

Jessica Freeland: Okay.

Jessica Freeland: Alright, so out of the ones you mentioned, which ones were required by your district, to which ones were just kind of necessary for the purpose of teaching either virtually or hybrid and which ones did just kind of like to you try to use just kind of on your own.

Participant 2: The only one that was required, as far as an LM s was seesaw Google classroom was optional.

Participant 2: The other requires what achieved 3000 and smarty answer required as supplemental free la.

Participant 2: Eureka was required math.

Participant 2: I believe the rest were just optional extra.

Jessica Freeland: Okay.

Jessica Freeland: So, um what.

Jessica Freeland: Benefits did you see for you as a teacher from the programs that you mentioned.

Participant 2: Engagement especially oh I forgot one in the list paradigm, especially with back and then Google tools, where we were able to be.

Participant 2: All together on the same time, like see a jam board.

Participant 2: And kids interacting and.

Participant 2: Doing collaboration and critical thinking that those.

Participant 2: Especially for the students who, when we did come back into the building, whose parents chose to stay fully remote, So these are the fully remote students at every good grade level the, especially the upper grade levels and.

Participant 2: interactive tools, where kids were able to be live and interact with the lesson made huge difference with engagement.

Participant 2: Even we have a couple of special programs in our building, and we have a challenge program and even some of those students are only remote and even with those students that are exceptional students, they it was a big difference in our fifth grade, in particular in engagement.

Jessica Freeland: Right okay.

Jessica Freeland: So, I think that can answer this question to unless you have anything to add about what benefits you saw for the students from the programs.

Participant 2: A little bit more ownership of their learning to.

Participant 2: Waste and choice and what they're doing.

Participant 2: And how they're presenting their learning.

Jessica Freeland: Right.

Jessica Freeland: So, what issues or difficulties, did you from the teacher ends have from using these programs.

Participant 2: me personally, or our building.

Jessica Freeland: Well, if you know of any other issues, teachers, had to.

Participant 2: Okay I'm more on the pre tape tech savvy and spectrum, so I really enjoy digging into the programs that I don't know about and learning all about it, how to use it, but there was.

Participant 2: Just struggles with learning how to in general.

Participant 2: To use certain programs or even being resistant.

Participant 2: to certain programs from some teachers, not all.

Jessica Freeland: Right.

Jessica Freeland: Okay, so about from the students what issues or difficulties, did you notice from them Chinese these programs.

connectivity.

Participant 2: Are some students, that would add still even happening today because we still have fully remote students some students that are.

Participant 2: dropping in and out of zoom calls or dropping in and out of whatever you know web-based program we're using so they're not able to participate or fill their learning that's the biggest issue of just connectivity.

Right.

Participant 2: And we have multiple kids in the same household trying to use a band that doesn't support that many kids in one household that's a big issue.

Jessica Freeland: So, what did your students like about these ED tech programs.

Participant 2: I think they liked interacting with each other, because that is something that has been missing for quite some time, especially again for the fully remote kids who don't even get to physically interact with their peers.

Participant 2: So, I think the collaboration we're talking about the four seasons, and specifically the collaboration and for those kids even for kids that are in the building now.

Participant 2: it's just fun for them engaging for them to interact, I was in third grade classroom using flip grid with them.

Participant 2: And they're all in the same room together physically socially distance but.

Participant 2: They were still super engaged with flip grid and using the tool to interact with each other and just different way of collaborating and responding to each other, just really, really enjoyed it.

Right.

Jessica Freeland: So, what did they dislike about any of the programs.

Participant 2: Maybe just the frustration when they don't work because of issues that's, the only thing I can think of.

Participant 2: And then any device issues.

Participant 2: And devices aren't working properly, you have wonder what chromebooks and tablets.

Participant 2: device issues and then connectivity issues frustrations for students.

Jessica Freeland: Right yeah, we had near pod die on this, a couple times in the middle of.

Jessica Freeland: All right, so you did mention that you consider yourself tech savvy so um if you want to elaborate on that some.

Participant 2: um I think ever since our district became well back then, it was called Google Apps for education, ever since we became a Google district.

Participant 2: And I was in middle school at the time, teaching I think it's just been super interesting to me and what it can do to supplement engagement in particular and supporting students who might want to represent their learning in a different way.

Participant 2: And then, ever since then I've just.

Participant 2: taken it upon myself to learn everything I can about friend tools and resources that.

Participant 2: Teachers can use, especially since I've stepped into the instructional coach and technology cultural it's just a passion of mine.

Jessica Freeland: Right.

Jessica Freeland: So, which ED tech programs, will you continue using after the pandemic and why, like will it still be required by the district, or why would you elect to continue using it.

Participant 2: I think I'll continue using all of them, because I used all of them before the pandemic, but the seesaw did not use that prior to the pendant like I did use Google classroom LM S, though.

Participant 2: But I think I will continue using seesaw.

Participant 2: Post endemic, even if the district does not require it.

Participant 2: I think it's just a different tool that you can use to supplement learning and again support.

Participant 2: Different.

Participant 2: modalities for kids to show how they what they've learned.

Jessica Freeland: Right.

Jessica Freeland: So, um I think you said you would continue using them, so I guess, this would be more of a hypothetical question if there was anything that you did not continue using, how do you think it might affect your students' academic performance behavior motivation.

Participant 2: I'm not sure that it would change academic performance but it might change behavior and motivation.

Participant 2: Because your core instruction should be strong, with or without ED tech tools.

Participant 2: But.

Participant 2: behavior in the means of engagement might change a little bit, especially when we have that you know spring fever or fever in the winter, where we are.

Participant 2: I think it's good to bring in those tools to kind of support engagement and motivation.

Participant 2: That might take a dip if we chose not to use them during the cabin fever winter and spring fever.

Participant 2: At the end of the school year.

Jessica Freeland: Right, so that is all the questions and I'm going to give you this link.

Jessica Freeland: Where the Amazon gift card raffle.

Jessica Freeland: Okay, thank you for participating.

Participant 2: No problem.

BIOGRAPHICAL SKETCH

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Name of Author:	Jessica Freeland
Graduate and Undergraduate School Attended:	University of South Alabama Mobile, Alabama
Degrees Awarded:	Bachelor of Science, 2006 Master of Education, 2012 Doctor of Philosophy, 2022
Awards and Honors:	Kappa Delta Pi Education Honor Society Omicron Delta Kappa Honor Society Phi Eta Sigma Honor Society ETS Recognition of Excellence Dean's List Outstanding Graduate Student, Instructional Design & Development PhD Program, 2022
Publications:	Freeland, J. (2022). *Pedagogy after a pandemic: Predicting continued elementary teacher usage of edtech after the covid-19 pandemic.* [Unpublished doctoral dissertation]. University of South Alabama. Freeland, J. (2012, April 1). *Take testing back to the basics.* AL.com. https://www.al.com/press-register-commentary/2012/04/take_testing_back_to_the_basic.html