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Student Engagement With One-To-One Devices In The Classroom And Reading Achievement

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Abstract

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Jennifer Hignite

Archived student reading achievement data and teacher perceptions of a one-to-one technology implementation were studied at a small, rural public school in northwest Arkansas. This study looked at data collected prior to and during an unprecedented time in education, the COVID-19 pandemic. The purpose of this study was to determine if a one-to-one computer program impacted student achievement, specifically in reading. This study also utilized teacher survey and interview data to determine whether additional factors can contribute to student reading achievement. Results from the archived student reading achievement data showed the mean growth for student achievement decreased from the 2018-2019 school year to the 2020-2021 school year. During the 2018-2019 school year, Sample School did not have a one-to-one device program. The program was implemented during the 2020-2021 school year. The data shows that from two years prior to implementation to the year of the one-to-one device implementation, student achievement decreased. Results showed a statistically significant difference between school year and reading growth as well as cohort and reading growth, but there was no statistically significant difference when socioeconomic status and gender were taken into consideration. Additionally, the results indicate multiple factors, not just technology, can affect student achievement and COVID-19 is a factor that must be considered when looking at the results of this study.

Keywords: One-To-One; Technology; Student Achievement; Device; COVID-19

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Chapter I: Introduction

Technology continues to permeate our lives on a daily basis. Expectations for technology competence, both for students and educators, have drastically increased due to online learning during the COVID-19 pandemic (Bushweller, 2020; Starkey et al., 2021; Winter et al., 2021; Yan, 2020). When the COVID-19 pandemic swept across the globe in 2020, schools closed and education shifted to an online platform (Starkey, 2020; Yan, 2020; Zhao, 2021). As a result, schools across the world faced an unprecedented challenge of an abrupt move to online learning (Reimers & Schleicher, 2020; Zhao, 2021). Due to the abrupt shift to online learning, many educators found themselves lacking the knowledge and training to effectively provide virtual instruction (Reimers & Schleicher, 2020; Winter et al., 2021). This change in practice was, in essence, an overnight occurrence. "Change is usually done in small steps, testing what works and what does not, however, the speed of response to the COVID-19 pandemic did not allow for a slow and steady approach" (Winter et al., 2021, p. 236).

Current research suggests the shifts in education as seen throughout the COVID-19 pandemic have revealed a digital divide in American society and education that is far greater than many anticipated (Bushweller, 2020; Reimers & Schleicher, 2020; Starkey et al., 2021; Winter et al., 2021; Zhao, 2021). This digital divide refers to both the wide range of instructional approaches potentially affecting the quality of instruction students received and the challenges for students from families living in poverty to have access to digital devices and wireless internet at home as opposed to their wealthier peers (Bushweller, 2020; Reimers & Schleicher, 2020; Starkey et al., 2021; Winter et al., 2021). The emergency situation created by the pandemic in public schools provides

insight to the notion that education systems across the world were not prepared to take on the challenges of implementing online learning in schools (Reimers & Schleicher, 2020; Starkey et al., 2021). COVID-19 will have many far-reaching consequences on education, but it will be many years before the full impact of this pandemic becomes evident (Winter et al., 2021).

With many recent initiatives in public education involving technological and informational literacy, educational leaders are purchasing technology at increasingly high rates to meet these needs. A popular initiative to increase the amount of technology in schools is the one-to-one device program that puts devices in the hands of all students (Horn & Staker, 2015). Providing one-to-one technology requires both a considerable financial obligation and a commitment to training from a school district, but many schools have been willing to make this obligation with the intent of increasing student achievement; however, technology alone is not the only factor that can increase student achievement (Gallamore, 2017; McClung, 2019). With schools facing accountability standards, educators are looking for assurance that one-to-one technology programs are worth the financial investment by providing students an educational advantage versus a non-one-to-one educational environment (Clemensen, 2018).

The topic for this study, student use of one-to-one devices in the classroom and student achievement, came from the researcher's professional experience working as a middle school literacy teacher and instructional facilitator in a school implementing a one-to-one technology program as a response to the COVID-19 pandemic. The school issued devices to students the summer prior to implementation. The motivation behind the study was to find out if immersing teachers and students into a one-to-one program

had any impact, positive or negative, on students' reading achievement as measured by the Renaissance Star Reading assessment.

The focus of this chapter will be to identify the problem under investigation, the purpose of the study, and research questions guiding the scope of the study in relation to a one-to-one technology program. This study provides valuable knowledge to school leaders and policymakers as they make future instructional decisions in schools. This work serves as a notable contribution to the field of existing knowledge concerning educational technology.

Background of the Problem

The emergence of personal computers in the educational setting can be dated back to the 1980s (Cuban, 1992; Grimes & Warschauer, 2008). The launch of the World Wide Web in the early 1990s is often cited as a factor that led to the popularity of schools purchasing computers for instructional purposes (Bayyan, 2016). The first one-to-one laptop program took place in 1990 at the Methodist Ladies' College, an independent girls' school in Melbourne, Australia (Watters, 2015; Zucker & Light, 2009). The program consisted of three teachers, 82 fifth grade students, and a basic monochrome laptop with no hard drive, nor mouse. Subsequently, educational decision makers visited Australia in the early 1990s to learn from the Australian-based program and figure out how to bring one-to-one programs stateside. Early initiatives in the United States included Microsoft's Anytime, Anywhere Learning program in the mid-1990s, which envisioned a world where all students and teachers had access to a personal computer and the internet twenty-four hours a day, seven days a week (Penuel, 2006).

The United States Government has assumed a central role in passing legislation to promote the use of technology in schools due to the potential impact technology can have on education (Cate, 2017; Elizondo, 2018; Falck et al., 2018; Harris et al., 2016; McClung, 2019). In 1994, President Bill Clinton signed the Goals 2000: Educate America Act, which involved technology and education (H. Resolution 1804, 1994). The Telecommunications Act of 1996 helped to guarantee high speed internet services would be both affordable and available in rural areas as well as in schools and libraries (Cate, 2017). In 2009, the Federal Communications Commission developed a plan, per Congress, to guarantee that everyone in America had the capability to access broadband internet (Federal Communications Commission (2021). In 2009, President Barak Obama signed the American Recovery and Reinvestment Act, which provided $4.35 billion for the Race to the Top Fund for education innovation and reform (Harris, 2016). In 2013, President Barak Obama joined with the Federal Communications Commission to ensure that 99% of all American students would have high-speed internet access in their schools by 2017 (Cate, 2017). This became known as the ConnectEd initiative, which not only promised internet connectivity, but adequate training for all teachers using technology to improve student achievement. Accountability measures such as No Child Left Behind [NCLB], and now the Every Student Succeeds Act [ESSA] cite technology as an imperative source of support for teaching and learning. As varying government-backed initiatives and presidential administrations have continued to target the issue of unequal access to technology because of its potential impact on student achievement, there has been a continued increase in the number of individuals who not only have a computer, but internet access as well (Attewell, 2001; Mossberger et al., 2003).

In March 2020, Governor Asa Hutchinson of Arkansas announced the closure of on-site learning citing the COVID-19 pandemic (Associated Press, 2020; Blackmon, 2020; Governor Asa Hutchinson, 2020; Roberts, 2020; Schmidt, 2020; Scott, 2020; THV 11 Digital, 2020). Schools were temporarily closed for on-site instruction, but on April 6, 2020, Governor Hutchinson extended the closure through the remainder of the academic year citing the continuing spread of COVID-19 (Governor Asa Hutchinson, 2020). As a response to building closures, school districts were left to decide the best approach to continue educating students through the remainder of the 2019-2020 school year.

As a result of the pandemic and concerns from varying stakeholders over face-to-face school during the height of the COVID-19 pandemic, the Arkansas Department of Education (2020) released a guide to help school districts determine levels of response regarding reopening for the 2020-2021 school year. Both the overall level of community spread as determined by the Arkansas Department of Health and the level of virus transmission within the school were important considerations when determining how to respond to school outbreaks (Arkansas Department of Education, 2020). The three response levels were limited, moderate, and critical. The critical response level warranted online learning with a one-to-one device due to the percentage of affected students and staff substantially disrupting the delivery of on-site instruction to the extent that a district-wide closure was necessary for an extended period of time (Arkansas Department of Education, 2020). In order to be prepared for each level of response, many school districts across the state turned to one-to-one computer initiatives so that students would have access to learning whether they were at school or at home. Levels of technology implementation varied amongst school districts prior to the pandemic, but the shift in

teaching and learning through blended and virtual learning options left many non-one-to-one districts with no other option than to provide a one-to-one device for every student in the district. COVID-19 relief funding provided by the federal government allowed many of these districts to purchase additional devices, but due to the suddenness of many initiatives, teachers, administrators, and students did not receive appropriate training on how to implement these devices.

When schools in Arkansas closed in March 2020, Sample School, a small, rural public school in northwest Arkansas, responded by utilizing their alternative methods of instruction (AMI) days granted by the Division of Elementary and Secondary Education. The Division of Elementary and Secondary Education partnered with Arkansas PBS to support teachers, families, and students by providing Arkansas AMI Learning Guides associated with PBS education programming (Division of Elementary and Secondary Education, n.d.). On March 30th, Arkansas PBS began altering its regular television programming to provide age-appropriate educational content for three specific grade bands, pre-kindergarten to second grade, third to fifth grade, and sixth to eighth grade (Division of Elementary and Secondary Education, n.d.). According to the Division of Elementary and Secondary Education (n.d.):

> The Arkansas AMI Learning Guides have been developed to support home-based instruction in association with the PBS educational television programs to promote activities that students and families may use to practice existing skills, learn new topics, and interact with one another in a meaningful way.

Sample School did not utilize the partnership between Arkansas AMI and Arkansas PBS. Instead, teachers were asked to provide multiple days of instruction so

that it could be posted to the website (L. Spence, personal communication, March 13, 2020). Families who did not have internet access or a printer to print work could request physical copies through the school's secretary. Students who did not have adequate internet at home had access to Wi-Fi buses parked at designated locations throughout the district and district provided Wi-Fi accessible from any school's parking lot (Sample School, n.d.). Certified staff were required to check-in through daily email correspondence with their building principal for attendance verification. Certified staff were asked to be available between the hours of 8:00 a.m. and 3:30 p.m. to respond to emails from parents and/or students.

Sample School implemented a one-to-one device program the summer prior to the 2020-2021 school year. Implementation of the program went quickly. A single date during the summer was set for all faculty to train on how to create short instructional videos to then upload into Google Classroom. Other than this training, no formal training nor professional development were provided. Educators were told that Google Classroom would be the learning management system, but several teachers across campus had never used, nor created a Google Classroom on their own. Parents of virtual students were given a date to come to the school to pick up school supplies, textbooks, and a device shortly before school began. Governor Asa Hutchinson allotted $10 million from the Governor's Emergency Education Relief Fund to the Division of Elementary and Secondary Education, which allowed for approximately 20,000 Children's Internet Protection Act (CIPA) compliant internet hotspots to be distributed to school districts to support the reopening and continuation of learning for Arkansas schools (Key, 2020). Sample School was allotted seventy hotspots by Arkansas' Division of Elementary and

Secondary Education (Key, 2020). District administration determined which students and teachers would be allowed to check out a hotspot. Blended students who showed up on-campus the first day of school were given their device by their first-hour teacher on the first day of the 2020-2021 school year. Due to the structure and lack of guidance on how to implement the one-to-one device program properly and effectively at Sample School, many educators did not buy-in to the program. The lack of buy-in ultimately lead to varying comfortability and interpretations of one-to-one device usage within classrooms across campus.

Problem Statement

Though several studies have been conducted concerning one-to-one student device use within the classroom and its impact on student achievement, there is no consensus on the influence of the device use and student achievement with the possible exception of writing. Research has shown that writing is the most positively impacted subject when a one-to-one program is implemented (Deloatch et al., 2014; Goodwin, 2011; Hanover Research Council, 2010; Herold & Kazi, 2017; Higgins, 2018; Kirkpatrick et al., 2018; Lowther et al., 2006; Sauers & McLeod, 2012; Olson, 2016; Silvernail & Gritter, 2007; Zucker & Light, 2009). Generally, however, the research regarding student reading achievement when one-to-one programs are implemented provide mixed results (Copeland, 2018; Zheng et al., 2016). Decision makers who want to implement a one-to-one program in their schools are often hampered by inconsistent and inconclusive results from previous studies (Copeland, 2018). Despite this, schools across the country are still increasing their spending on technology to support one-to-one initiatives (Chang, 2017). Consequently, it behooves us to conduct additional research to

determine the impact on student achievement when a one-to-one initiative is implemented. This information can impact school leaders as they look to continue or discontinue these types of programs within their districts.

Purpose of the Study

The purpose of this nonexperimental, mixed-methods study was to explore the relationship between one-to-one student device use and reading achievement on the norm-referenced STAR reading assessment for middle school students at a rural, public school in Northwest Arkansas. Additionally, this study utilized survey and interview data to determine whether additional factors can contribute to student reading achievement.

This study was designed to investigate if there was a connection between a one-to-one computer initiative and improved reading achievement as measured by the Renaissance Star Reading assessment by analyzing student performance data two years prior to the initiative and the year following the initiative. It was designed to compare two years of archived Star Reading assessment data when one-to-one devices were not implemented with Star Reading assessment data at the end of the first year of one-to-one device implementation. Essentially, does access to technology through a one-to-one initiative show a measurable change in students' performance on the Renaissance Star Reading assessment, a norm-referenced reading assessment, in grades six, seven, and eight?

The researcher anticipated there to be a relationship between one-to-one technology and student reading achievement, but it is imperative to understand that a relationship between the two variables does not fundamentally equate causation. According to McClung (2019):

> Due to the complexity of student achievement, it was expected that it would be difficult to measure the impact of all potential variables related to student achievement. Additional factors can contribute to achievement data that have no relationship to technology. (p. 24)

In order to accurately address the research question, it was vital to include both quantitative and qualitative data. A survey and interviews were also utilized to collect data regarding technology use both prior to and after the implementation of the one-to-one initiative during the 2020-2021 school year. As McClung (2019) indicated in his study, "the more difficult component to measure in this study is the role that many variables can play in the impact on student achievement" (p. 52). To better assess the impact of one-to-one technology on student reading achievement, multiple data sets were utilized to provide a more comprehensive understanding of the correlation between the two variables.

Definition of Terms

Several terms relative to technology in education appear throughout the study; therefore, the following section will clarify any unfamiliar terminology for the reader.

- ACT Aspire: "ACT Aspire is an interactive assessment system for students in grades 3–10 that provides deep and rich insights into student performance in English, reading, mathematics, science, and writing in the context of college and career readiness" (ACT, n.d.).
- Alternative Methods of Instruction (AMI): AMI days are instructional days for students when the district is closed for reasons such as inclement weather, an

emergency, or other exceptional circumstances (Arkansas Department of Education, 2020).

- Blended Learning: Describes a mix of face-to-face instruction and activities mediated by technology that enables student control over the pace, path, and place of instruction (McGraw-Hill, 2021).
- Causal-Comparative Study: "A causal-comparative design is a research design that seeks to find relationships between independent and dependent variables after an action or event has already occurred. The researcher's goal is to determine whether the independent variable affected the outcome, or dependent variable, by comparing two or more groups of individuals" (Salkind, 2010, p. 124).
- Digital Divide: "The economic, educational, and social inequalities between those who have computers and online access and those who do not" (Merriam-Webster, n.d.).
- Implementation Fidelity: Implementation fidelity refers to the degree to which an intervention and/or program is delivered as it was intended (Carroll et al., 2007). It is only by understanding and measuring whether an intervention has been implemented with fidelity that researchers and practitioners can gain a better understanding of how and why an intervention worked or did not work, and the extent to which outcomes can be improved. "It has been demonstrated that the fidelity with which an intervention is implemented affects how well it succeeds" (Carroll et al., 2007, p. 1).
- Informational Literacy: According to the American Library Association (2000), information literacy is the ability to recognize when information is needed and

locate, evaluate, and use the information effectively when needed. In other words, a person is considered to be information literate when they know what they want (i.e. information) and how to get it (i.e. through research).

- National Assessment of Educational Progress: According to the U.S. Department of Education (2014), the National Assessment of Educational Progress (NAEP), also known as The Nation's Report Card, has been administered since 1969 and is the only nationally representative and continuing assessment of what students in America know and can do in various subject areas such as math and reading. The national NAEP reports information for the nation as well as specific regions of the country, including students from both public and nonpublic schools, and reports results for student achievement in grades 4, 8, and 12.
- Norm-Referenced Assessment: A norm-referenced assessment measures a student's knowledge to the knowledge of the norm group of their peers, but does not indicate whether or not the student met or exceeded a specific standard or criterion (Renaissance, n.d.).
- One-to-One Technology: One-to-one technology refers to every child in the classroom having direct access to a personal computing device to use as a learning tool (Clemensen, 2018; Conant, 2016; Copeland, 2018, Elizondo, 2018; Hanover Research Council, 2010; Harris et al., 2016; Hull & Duch, 2018; Islam, 2016; Stone, 2016; Williams, 2014; Zheng et al., 2016).
- Pedagogy: Pedagogy refers to the method of how a teacher chooses to teach, both in theory and practice.

- Professional Development: Professional development refers to ongoing learning opportunities required of educators to renew their educator's license. Some professional development may be required, while other learning opportunities are chosen by the educator.
- Renaissance Star Reading Assessment: A norm-referenced computer-adaptive test that measures students' reading skills (Renaissance, n.d.).
- Socioeconomic Status: Socioeconomic status is the social standing or class of an individual or group and is often measured through a combination of income, education, and occupation (American Psychological Association, n.d.).
- Technical Infrastructure: A technical infrastructure is composed of the hardware, software, network resources, and services required for the existence, operation, and management of a technology-based environment (Techopedia, n.d.).
- Technological Literacy: Technology literacy is the ability to safely, responsibly, creatively, and effectively use appropriate technology to communicate; access, collect, manage, integrate, and evaluate information; endeavor to predict future needs, solve problems and innovatively create solutions; build and share knowledge; improve and enhance learning in all subject areas and experiences; apply technology and critical thinking to real-world experiences; develop the knowledge and skills to adapt to changing technologies; and use technology to meet personal needs, interests, and learning styles (Estrella Mountain Community College, n.d.).
- Ubiquitous: Refers to existing or being everywhere at the same time (Merriam-Webster, n.d.). The word also refers to something being widespread.

- Virtual Learning: A virtual learning environment is a setting where technology replaces the physical classroom environment. Virtual learning requires a learning management system since it offers an online-based learning platform instead of the traditional classroom approach.

Research Question/Hypotheses

The following research questions guided this mixed-methods study:

Research Question One: Is there a significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of cohort, year, gender, and socioeconomic status?

a. H_0: There is no significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of cohort, gender, and socioeconomic status.

b. H_1: There is a significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of cohort, gender, and socioeconomic status.

Research Question Two: Is there a relationship between teachers' perceptions of technology and student reading achievement?

a. H_0: There is no impact on student reading achievement when teachers have positive perceptions of technology and student reading achievement.

b. H_1: There is a positive impact on student reading achievement when teachers have positive perceptions of technology and student reading achievement.

Research Question Three: Are there specific factors of a one-to-one technology implementation that impact student reading achievement?

a. H_0: There are no specific factors of a one-to-one technology implementation that positively impact student reading achievement.
b. H_1: There are specific factors of a one-to-one technology implementation that positively impact student reading achievement.

Specifically, the study examined Renaissance Star Reading scores of students in grades six, seven, and eight before and after implementation of the one-to-one student device program. Detailed analysis of each grade was conducted to determine if implementation of the one-to-one student device program had a significant impact on reading achievement scores of students based on the student's gender or socioeconomic status.

The independent variable is the device, while the dependent variable is reading scores. According to Creswell & Creswell (2018), "Independent variables are those that influence, or affect outcomes in experimental studies. They are described as independent because they are variables that are manipulated in an experiment and thus independent of all other influences" (p. 50). In this study, the device is the independent variable since it is anticipated that the device will influence or affect student reading achievement as seen on the Renaissance Star Reading assessment. According to Creswell & Creswell (2018), "Dependent variables are those that depend on the independent variables; they are the outcomes or results of the influence of the independent variables" (p. 50). In this study, student achievement on the Renaissance Star Reading assessment is the dependent variable since the score, it is anticipated, will be dependent upon the influence of the device.

Significance of the Study

The growth of technology as well as the decline in the cost of devices has resulted in educational leaders purchasing new technology for districts in an effort to increase student achievement (Copeland, 2018; Elizondo, 2018; Gulek & Demirtas, 2005; Islam, 2016; McClung, 2019; Olson, 2016; Penuel, 2006). One-to-one technology initiatives in school districts are a popular trend amongst decision makers trying to deliver education to 21st century learners. The 21st century skills movement arose from international, national, state, and local discussions about how to improve student achievement and define what types of skills students will need to succeed and thrive in the 21st century (Kulow, 2014). "Business leaders, policy makers, and educators realized the importance of incorporating essential skills into education so that students could function in today's rapidly changing technological world" (Kulow, 2014, p. 39). According to Partnership for 21st Century Skills (2003), the 21st century skills should promote students to be: critical thinkers, problem solvers, good communicators (written, oral, and virtual delivery methods), good collaborators (teamwork), information and technology literate (application of technology), flexible and adaptive, innovative and creative, globally competent, and financially literate (Kulow, 2013). However, the question still remains as to whether or not this technology promotes learning and student achievement.

This study is significant in that it examines the impact on student achievement when a one-to-one initiative is implemented. More specifically, it determines the impact on student reading achievement on a norm-referenced assessment. Although there is a breadth of information on existing studies concerning one-to-one technology and student achievement, this study contributes to previous research that has been conducted

regarding a one-to-one technology approach in schools and student achievement, specifically in a rural setting in northwest Arkansas. Much of the previous research has been carried out in urban school districts, and little research exists specifically within schools in Arkansas.

Decision makers who want to implement a one-to-one program in their schools are hampered by inconsistent and inconclusive results from previous studies (Copeland, 2018). Despite this, schools across the country are still increasing their spending on technology to support one-to-one initiatives (Chang, 2017). Consequently, it is appropriate to conduct additional research to determine the impact on student achievement when a one-to-one initiative is implemented. This information can impact school leaders as they look to continue or discontinue these types of programs within their districts.

Nature of the Study or Research Design

This purpose of this study was to determine if there is a significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of grade, gender, ethnicity, and socioeconomic status. This mixed-methods study utilized both quantitative and qualitative data. The quantitative component is causal-comparative in design, utilizing archived data with no random assignment provided to variables. The researcher compared two or more groups in terms of a cause that has already happened (i.e., one-to-one student device usage). The two variables found within this study are one-to-one student device use and student reading achievement as measured by the Renaissance Star Reading assessment over the course of the first year of one-to-one device implementation in

grades 6, 7, and 8. The independent variable is the device, while the dependent variable is reading scores.

Assumptions

1. All students involved in this study have proficient technological literacy skills.
2. All teachers at Sample School implemented one-to-one devices with fidelity.
3. The Renaissance Star Reading assessment did not change through the years identified within this study.
4. The Renaissance Star Reading assessment accurately measures students' grade-level equivalency.

Limitations

1. The level of training individual classroom teachers provided to students regarding how to use the one-to-one device for educational purposes.
2. The level of training and readiness of teachers to implement instruction that would prepare students for the Renaissance Star Reading assessment.
3. Consequences students received for improperly using the device in classroom.
4. The level of internet access students have outside of school to complete homework.
5. The varying levels of one-to-one device implementation by teachers within the school.
6. The study was conducted in a rural school district in northwest Arkansas with an enrollment of approximately 500 students; therefore, the sample size is too small to make any generalizations based upon the data.

7. It is impossible to know prior school district information regarding one-to-one device implementation of students who moved into the district during this research study.
8. This research study utilized data obtained during the COVID-19 pandemic. It is unknown at this time the effect the pandemic had on student achievement during the 2020-2021 school year.
9. Due to schools being shut down in March 2020, there is no end-of-the-year data for students' reading achievement levels on the Renaissance Star Reading assessment.
10. Since the researcher could not manipulate the independent variable, a causal-comparative study was chosen. This type of study does not allow the researcher to examine a correlation between the independent and dependent variables.
11. Sample School District dissolved the one-to-one technology initiative the year following the 2020-2021 school year, so the researcher cannot compare more than one year of data after the implementation of the initiative.

Delimitations

1. A delimitation to this study is the cohorts involved. Only three cohorts, grades 6, 7, and 8, were selected for this study instead of all cohorts K-12 within the district. Within the school involved, not all grade levels assess reading using the Renaissance Star Reading Assessment, so participants within this research study are purposefully limited.

2. A second delimitation to this study is the students who have moved into the district and do not have Renaissance Star Reading assessment data to compare. These students were removed from the sample population because they do not have data to compare prior to one-to-one device implementation and after the devices were implemented.

Summary and Organization of the Study

Technology continues to be purchased in increasing quantities by school districts everywhere. With so much emphasis placed upon implementing technology in the classroom, many school districts are shifting to a one-to-one classroom environment, which means there is a device for every student. With little previous research to look at in Arkansas, there is a need to understand the impact that increased technology is having on student achievement, specifically in relation to reading achievement.

In Chapter 2, a review of literature relevant to the study is organized around five themes identified through research. Additionally, Chapter 2 provides the theoretical framework from which the study is constructed. Chapter 3 identifies the research methodology used for this study. Additionally, this chapter provides in-depth information regarding the sources and procedures for the design of the study, participants involved, data collection, and analysis of the data.

Chapter II: Literature Review

Technology continues to permeate classrooms everywhere. The need to prepare students for 21st century learning as well as more legislation being passed emphasizing the use of technology in schools has educational leaders increasing the number of devices in school districts across the country. Additionally, improving students' reading skills is a priority in education. In Arkansas, the Division of Elementary and Secondary Education (DESE) developed rules for the various components of reading legislation (Division of Elementary and Secondary Education, 2021). With the continued increase of technology in classrooms as well as the need for improving students' reading skills, a gap in research exists as to whether one-to-one student device use impacts reading achievement of middle school students in northwest Arkansas. This literature review will look at the growth of technology, one-to-one technology in education, implementation of technology in schools, previous research surrounding technology and student achievement, and the need for improved reading skills.

Growth of Technology

In 1964, Professor Marshall McLuhan presented to the world his global village theory (Chell, 2018). McLuhan's theory is a theory to describe the phenomenon of the world's culture shrinking and expanding at the same time due to technological advances that allow for instantaneous sharing of culture. He foreshadowed the globalization of communication media that would bring the world closer together like a village in which everyone is interconnected (Chell, 2018). McLuhan compared the media to an electronic nervous system that integrated the planet. Today, McLuhan's theory is not theory; it is

reality. A few examples of this current reality include YouTube, Facebook, Instagram, and live television coverage of events happening around the world (Chell, 2018).

Less than five decades ago, people barely knew what a computer was, much less readily had access to one. A decade ago, purchasing a plane ticket, booking an Uber, or renting an Airbnb could not be done on a cell phone (L., 2021). Needless to say, the last few decades have brought countless life-changing technological innovations and the disruptive nature of technology continues to transform the world around us (L., 2021).

In 1984, only 8.2% of households in the United States owned a personal computer, and the World Wide Web had yet to be invented (L., 2021). By 2000, 54 million households or 51% of households in the United States owned one or more computers (L., 2021). Today, the internet is growing at a pace off eleven new users per second, which equates to approximately one-million users daily (Bulao, 2021; Eira, n.d.). Now, there are over 4.54 billion active internet users out of the 7.76 billion people in the world (Bulao, 2021; Eira, n.d.).

"The history of technology is an important factor in the creation of the one-to-one laptop initiative in K-12 education. The increase in computer technology during the past fifty years is incredible, especially with the Internet's development" (Maschmann, 2015, p. 11). Alfageh & Alkarzon (2020) say this regarding the advancement of technology in recent years:

> The technological evolution and the advances during the past decades have changed and altered the way modern daily lives are lived. These advances have crept and seeped through every sector of society wherein people try to learn how to adopt them and at the same time improve their lives. (p. 14)

The emergence of personal computers in the educational setting can be dated back to the 1980s (Cuban, 1992; Grimes & Warschauer, 2008). The launch of the World Wide Web in the early 1990s is often cited as a factor that led to the popularity of schools purchasing computers for instructional purposes (Bayyan, 2016). The first one-to-one laptop program took place in 1990 at the Methodist Ladies' College, an independent girls' school in Melbourne, Australia (Gallamore, 2017; Watters, 2015; Zucker & Light, 2009). The program consisted of three teachers, 82 fifth grade students, and a basic monochrome laptop with no hard drive, nor mouse. Subsequently, educational decision makers visited Australia in the early 1990s to learn from the Australian-based program and figure out how to bring one-to-one programs stateside. Early initiatives in the United States included Microsoft's Anytime, Anywhere Learning program in the mid-1990s, which envisioned a world where all students and teachers had access to a personal computer and the internet twenty-four hours a day, seven days a week (Penuel, 2006).

The ratio of student to computer keeps dropping from year to year as the rate of technology growth continues to increase (Chang, 2016; Coley et al., 1997; Higgins, 2015; Lowther et al., 2003; McClung, 2019). "In 1983, schools averaged one computer for every 125 students" (Higgins, 2015, p. 1). In 1997, a report released by the Educational Testing Service stated that computers were becoming ubiquitous in elementary and secondary schools, with 98% of schools owning a computer (Coley et al., 1997). The 1997 report stated that the ratio of students to computers had declined to an all-time low of 10:1. At the time, the ratio ranged from about 6:1 in Alaska, Florida, North Dakota, and Wyoming to 16:1 in Louisiana (Coley et al., 1997).

The growth of technology as well as the decline in the cost of devices has placed an emphasis on educational leaders purchasing new technology for districts in an effort to increase student achievement (Copeland, 2018; Elizondo, 2018; Gulek & Demirtas, 2005; Islam, 2016; McClung, 2019; Olson, 2016; Penuel, 2006; Zucker & Light, 2009). Rapid technological advances in the past two decades have sparked the interest of many educational leaders to utilize one-to-one devices as an instructional tool to improve student learning (Gulek & Demirtas, 2005). The argument is had that when technology replaces textbooks in the classroom, schools save money (Gallamore, 2017; Horn & Staker, 2015).

The United States Government has taken a role in passing legislation to promote the use of technology in schools due to the potential impact technology can have on education (Elizondo, 2018; Falck et al., 2018; Harris et al., 2016; McClung, 2019). Introduced in the era of No Child Left Behind (NCLB) and continued with the Every Student Succeeds Act (ESSA), states are required to assess students in multiple subject areas (Dudley, 2018). Instruction in schools must continually push the students to perform better each year to meet the demands of the accountability model. “Two past presidents saw the need for fundamental change in education to keep American students in competition with technology with other students from around the world” (Harris et al., 2016, p. 370). In former president Barack Obama’s State of the Union Address in 2014, he announced a multi-billion-dollar program to support the roll-out of technology to emphasize technology in schools as a priority of his education policy (Falck et al., 2018).

The growth of technology may help to reduce the digital divide between students of minority backgrounds or low socioeconomic status (Bayyan, 2016; Conant, 2016;

Copeland, 2018; Deloatch et al., 2014; Hanover Research Council, 2010; Harris et al., 2016). The term digital divide "refers to the disparity between students who have easy access to computers and use them often and those students who lack such access" (Hanover Research Council, 2010, p. 25). "One of the main items that No Child Left Behind set out to accomplish was to diminish the digital divide between socioeconomic class and race of students" (Harris et al, 2016, p. 369). According to Conant (2016):

> Implementing a one-to-one technology program ensures each student has a laptop available for use. Students are free to use these laptops while in school and at home. By providing each student with a laptop, socioeconomic status may be removed, or at least reduced, from the digital divide. (p. 13).

One-to-One Technology in Education

"One-to-one computing initiatives that seek to provide laptop computers and Internet access to students for use at home and school are expanding rapidly across the globe" (Penuel, 2006, p. 329). One-to-one technology refers to every child in the classroom having direct access to a personal computing device to use as a learning tool (Clemensen, 2018; Conant, 2016; Copeland, 2018, Elizondo, 2018; Hanover Research Council, 2010; Harris et al., 2016; Hull & Duch, 2018; Islam, 2016; Stone, 2016; Williams, 2014; Zheng et al., 2016). The popularity of one-to-one programs continues to increase as more school districts implement one-to-one computer programs every year (Alfageh & Alkarzon, 2020; Clemensen, 2018; Copeland; 2018; Islam, 2016; Pane et al.; Zheng et al., 2016).

The growth of technology as well as the decline in the cost of devices has placed an emphasis on educational leaders purchasing new technology for districts in an effort to

increase student achievement (Copeland, 2018; Elizondo, 2018; Gulek & Demirtas, 2005; Islam, 2016; McClung, 2019; Olson, 2016; Penuel, 2006). The declining cost of purchasing one-to-one technology has made it possible for an increased number of school districts adopting a one-to-one program (Ally et al., 2014; Gallamore, 2017; Schaffhauser, 2015).

According to Warschauer (2006), there are five primary reasons states and individual school districts undertake one-to-one programs: to help students develop 21st Century Skills, to promote greater student engagement through multimedia, to allow students to build writing skills, to encourage deeper student learning through the availability of multiple viewpoints and greater information, and to facilitate easier integration of technology into day-to-day instruction (Stone, 2016). Other expected benefits include improving academic achievement, breaking the digital divide, and transforming pedagogical methods (Muir et al., 2005; Penuel, 2006; Stone, 2016; Warschauer, 2014).

One-to-one computer initiatives may be an answer to help students achieve 21st century learning skills (Copeland, 2018; Hanover Research Council, 2010; Harris et al., 2016; Islam, 2016; Olson, 2016, Stone, 2016; Warschauer, 2008; Williams, 2014). The 21st century learning skills are often referred to as the four C's: critical thinking, communication, collaboration, and creativity (Chang, 2016; Copeland; 2018; Horn & Staker, 2015); Lowther et al., 2003). The National Educational Technology Plan Technical Working Group (2010) describes the framework for 21st century learning as the need for students to learn essential skills for success in our world today. The purpose of the plan is to promote critical thinking, problem solving, communication,

collaboration, and multimedia communication, which all include technology in the classroom (Kulow, 2014).

One-to-one computer programs can be a catalyst to personalize learning for all types of learners (Falck, 2018; Gallamore, 2017; Harris et al., 2016; Horn & Staker, 2015; Maschmann, 2015; McClung, 2019, Pane et al., 2017). Pane et al. (2017) refer to personalized learning as practices that tailor instruction to the adequate pace and focus for each individualized student. One-to-one computer programs may help close the achievement gap by ensuring equitable access to resources for all student demographics (Bayyan, 2016; Copeland, 2018; Hull, 2018). However, educators must not be naïve and assume that the device alone will reduce the achievement gap (Elizondo, 2018). "Encountering new technology at school can be especially important for poor and minority students, who often lag behind in computer and internet access at home" (Hull, 2018, p. 79). Bayaan (2016) states the following:

> The socio-economic gap which can be related to the digital divide is also a potential hindrance to student achievement and student standardized test scores. If school districts are to allocate resources to make one-to-one mobile technology a reality for all students, the academic potential and impact can be very powerful while potentially closing the gap of the digital divide. (p. 94)

Norris et al. (2012) examined one-to-one initiatives from different perspectives and concluded that when these computing devices are used as supplemental tools to the curriculum, no increase in student achievement is observed; however, when these computing devices are seen and used as essential tools, student achievement is increased. Additionally, (Williams 2014) believes that for computers to have a positive impact on

learning, they need to be seen as tools that are an integral part of the educational process and utilized on a consistent basis.

A benefit of utilizing technology in the classroom is the enhancement of teaching and learning that could not be accomplished without technology (Clemensen, 2018; Elizondo, 2018; Hull, 2018; Lei & Zhao, 2008; McClung, 2019; Puentedura, 2014). Internet connected devices allow for students to manage their learning materials, acquire resources at their own pace, share their work online, and teachers can review students' work and provide feedback and/or assistance much quicker than through pen and paper methods (Zhai et al., 2018). Introducing one-to-one technology in the classroom also has the potential to increase the frequency of communication (Higgins, 2015; Lei & Zhao, 2008; Stone, 2016; Stortz & Hoffman, 2013).

The teacher's role in a one-to-one computer program is still a vital component to the teaching and learning processes (Chang et al., 2009; Edwards, 2012; Maschmann, 2015; McClung, 2019). "Like a traditional classroom, the teacher in a 1:1 classroom plays indispensable roles – the coordinator, the monitor, the leader, the facilitator, the judge, and the personal guide" (Chang et al., 2009, p. 345). The role of a teacher in a one-to-one classroom changes from content expert to a facilitator of learning in the classroom (Gallamore, 2017; Li, 2007). Students navigate content on their own an learn on their device at their own pace, forcing teachers to change the structure of learning in the classroom (Li, 2007). "Edwards calls this kind of teacher a roaming conductor. This kind of teacher will move about the classroom engaging the students by posing questions and

engaging students as needed" (Harris et al., 372). Alfageh & Alkarzon (2020) stated the following:

> In the current world, people are moving from the traditional way of teaching where the teacher was the students' main event in a classroom setup to other designs in which learners are engaged. Technology has ushered in significant structural changes in the way teachers deliver knowledge to students, especially in terms of their math and reading achievements. (p. 9)

Rather than being a cure-all or silver bullet, one-to-one programs may simply amplify what is already occurring in classrooms whether it be for the better or the worst (Goodwin, 2011; McClung, 2019). Technology alone will not accomplish student learning, unless factors such as how a teacher uses technology, its alignment to the curriculum and professional development supporting teachers are taken into consideration" (Kulow, 2014, p. 48-48). There are a multitude of variables to consider when determining the effectiveness of technology on achievement (Maschmann, 2015; McClung, 2019). These variables include administrative support, professional development, attitude towards integration, etc. (McClung, 2019, p. 24).

Many school districts implementing one-to-one computing programs cite one or more of the following goals as a result of the program: improving academic achievement, increasing equity of access, transforming the quality of instruction, and increasing economic competitiveness of the region by preparing students for work in the 21st century (Penuel, 2006). Evaluating the impact of one-to-one technology programs in education is commonly done in two ways; either by perception or evaluating student achievement scores (McClung, 2019). One-to-one computing is a promising venture to

bring about positive changes in student outcomes. However, the desired effects may not appear until a few years after a program's initiation (Hull & Duch, 2018; Owen et al., 2006; Pane et al., 2017; Stone, 2016).

Implementation

"Technology can transform education into current, highly engaging, and relevant experiences for students if implemented through careful planning and sustained support" (Owen et al., 2006, p. 16). For a one-to-one program to have a truly positive effect on student academic achievement, schools must do more than purchase devices and provide students and teachers with 24/7 access to them (Zucker & Light, 2009). "Implementation fidelity plays a greater role than the type of device or the longevity of implementation when analyzing the impact of one-to-one computing programs on student test scores" (Williams, 2014, p. 91). Ultimately, the determining factor in whether or not a one-to-one program is successful is how it is implemented and how success is defined (Clemensen, 2018). Technology implementation is a complex process that requires a comprehensive approach that transforms school culture, changes the nature of teaching and learning, and expands the boundaries of the school and classroom (Shapley et al., 2010). The culture of the school will impact the implementation of a one-to-one technology program (Chang, 2016; Elizondo, 2018).

In his study, Warschauer (2008) concluded that one-to-one device implementation was affected by factors such as "curricular goals, leadership ability, district administration, professional development provided to teachers, the accessibility and quality of technical support, and the existence of related hardware such as digital whiteboards" (p. 64). "The transformative potential of one-to-one, along with the varied

contextual variables, makes program implementation difficult" (Stone, 2016, p. 2281). Teachers' attitudes and beliefs about technology can affect implementation (Penuel, 2006). According to Stone (2016):

> The growth of one-to-one over the past twenty years has led to a commonly accepted set of best practices, but little agreement on the proper measures of a successful implementation…one-to-one implementation is highly context-dependent and is heavily impacted by individual behaviors, attitudes, and perceptions. (p. 2282).

With the rise of one-to-one technology in the educational world, this phenomenon needs to be introduced carefully and purposefully. Technology should be seen as a tool and not a replacement of best practices for teaching in the classroom (Harris et al., 2016). Technology does not replace the teacher in the classroom (Deloatch et al., 2014; Harris et al., 2016). Teaching does not become easier because of technology. "Teachers must continue to be learners themselves to produce the best teaching methods and introduce technology that works for their classroom and the specific needs of their students" (Harris et al., 2016, p. 380). According to Olson (2016):

> The technology is only as good as the teachers who are utilizing it in the classroom. How and to what extent the technology is incorporated into the classroom is key to the success of the program. The curriculum must be solid and drive the technology. The technology cannot drive the curriculum. (p. 28)

Zheng et al. (2016) wrote in their meta-analysis that 70 studies reported "positive changes in teaching and learning" (p. 17), while many of these studies cautioned that the change in pedagogy could not be brought about solely by technology. Additionally, Islam (2016)

states that “using technology in the classroom can go either way; student results can improve or deteriorate. Only good pedagogy guarantees improvements” (p. 216). Higgins (2018) further explains that “putting a weak teacher in any situation, one-to-one or not, will fail to have a positive effect on the students” (p. 73).

According to McClung (2019), “the implementation of new technology is no different than the implementation of other programs in education, success is often predicted on the resources and follow through” (p. 65). Elizondo (2018) and Higgins (2015) both further emphasize the importance of continuing to provide students and teachers with relevant and meaningful training after device implementation. “Teachers need continuing professional development to be able to fully utilize the technology available to them” (Olson, 2016, p. 23).

The implementation of a one-to-one program requires not only the introduction of technology, but a change in educational process itself – including changes in curricula, assessment, and teaching strategies (Zucker & Light, 2009). According to Dunleavy et al. (2007), “In order to create effective learning environments, teachers need opportunities to learn what instruction and assessment practices, curricular resources and classroom management skills work best in a one-to-one student to networked laptop classroom setting” (p. 440). Pedagogy is important to consider when implementing a one-to-one technology program (Chang, 2009; Harris, 2016; McClung, 2019; Olson, 2016). “By utilizing a one-to-one technology adoption, teachers can change the pedagogical approach in the classroom to meet the changing environment of how students learn in the 21st century classrooms” (Olson, 2016, p. 24). “One-to-one implementations require a different kind of teaching and a change in classroom practice. Teachers need to find ways

to incorporate these new tools into their daily teaching if the program is to be successful" (Owen et al., 2006, p. 15).

Penuel's (2006) synthesis of research findings from several one-to-one device initiatives identified extensive professional development as a commonality in relation to an initiative's successful implementation. Given teachers' important role in implementation, high-quality sustained professional development is a critically important factor (Cunningham, 2003; Shapley et al., 2010). Studies cite the need for teacher professional development that builds teachers' basic technology skills as well as their understanding of curricular integration (Lowther et al., 2003; Owen et al., 2006; Ringstaff & Kelley, 2002). Teachers also need follow-up support as they acquire and implement new skills in the instructional setting (Bradburn & Osborne, 2007; Neugent & Fox, 2007; Owen et al., 2006).

Professional development is an imperative piece of the puzzle to ensure the technology being purchased will positively impact student achievement (Edwards, 2012; Elizondo, 2018; Harris et al., 2016; McClung, 2019; Mora et al., 2018; Olson, 2016; Shapley et al., 2010). Penuel (2006) found "Formal professional development had been a critical component of many large scale and smaller one-to-one programs" (p. 338). Edwards (2012) states, "professional development is vital to successful teaching" (p. 8). He continues to explain that student success is directly connected to professional growth in teachers (Harris et al., 2016).

> For the one-to-one technology to be effective and affective, the teachers must be trained on how to use the device, be given time to access the device, be given the freedom to gather the necessary tools to adequately utilize the device, and be

allowed time to collaborate with colleagues utilizing the device. (Olson, 2016, p. 12)

A recent study in an urban southern California school district involving approximately 120 seventh and eighth grade English Language Arts students sought to determine the effectiveness of one-to-one devices on student achievement and engagement in a middle school setting (Elizondo, 2018). Data collected and analyzed in this case study indicate that integrating technology into the teaching and learning processes may be an effective way to increase student engagement and achievement. Additionally, Elizondo's (2018) study sought to determine if there was a connection between student achievement and engagement with devices and the professional development teachers received. The researcher found insufficient evidence to correlate the two variables; however, the researcher found that minimal professional development provided to participants had a huge impact on device use during class. "The level of teacher technology proficiency impacted the level of instruction that students received with the Chromebook" (p. 50). While most schools offer teachers different levels of support, the ones that stand apart are schools that belong to districts that have long-term commitments to professional development as a major component of effective technology implementation (Cunningham, 2003).

A study of the effectiveness of one-to-one devices on student achievement and engagement by Elizondo (2018) revealed that administration placed an immense responsibility on teachers to implement one-to-one devices without adequate professional development, ultimately impacting implementation. "Depending on the level of teacher technology proficiency, students received an inconsistent level of instruction with

Chromebooks. The level of teacher technology proficiency impacted the level of instruction that students received with the Chromebook" (p. 52).

When teachers lack technology skills, or they have high levels of discomfort with technology, they become hesitant to attempt technology related activities in the classroom, which reduces the frequency of technology use, thus leading to difficulties with student engagement and technology implementation (Elizondo, 2018). For this reason, professional development must provide teachers with a framework "to develop problem-based lessons that utilize real-world resources, student collaboration, and the use of computer tools to reach solutions" (Lowther et al., 2003, p. 25). "A higher level of comfort with the one-to-one device points to a stronger probability that the teacher will effectively use the device with the students" (Olson, 2016, p. 12). According to Kulow (2014):

> Integrating technology can be a positive tool if it is used wisely, used in authentic situations, and promotes critical thinking and problem-solving skills. However, a teacher who is not wise to using technology or feels forced into using it will most likely not succeed at using this tool with students. (p. 43).

A study of one-to-one programs in five middle schools in western Massachusetts found that one school struggled so egregiously with incorporating laptops into learning that even three years after implementation, its students were not using technology any more than students in schools without one-to-one devices (Bebell & Kay, 2010). These researchers attributed the poor implementation to lack of teacher knowledge and buy-in, concluding, "It is impossible to overstate the power of individual teachers in the success or failure of 1:1 computing" (p. 47).

A variety of issues are inherent as school districts attempt to shift to one-to-one programs in the classroom (Alfageh & Alkarzon, 2020; Chang et al., 2009, Dunleavy et al. 2009; Edwards, 2012; Elizondo, 2018; Lei & Zhao, 2008; Owen et al., 2006; Storz & Hoffman, 2013; Williams, 2014). Classroom management issues, constant monitoring of student device screens, and lack of seriousness on the part of students are issues that research has shed light upon as a result of one-to-one program implementation (Alfageh & Alkarzon, 2020; Elizondo, 2018; Lei & Zhao, 2008, Storz & Hoffman, 2013).

If anything, implementing one-to-one technology has made teaching more difficult and complex. Teaching with one-to-one technology requires significant changes for individuals and teams with an exception for everyone to be committed to growth and improvement. Success in the classroom depends more than ever on the talent, initiative, and skills of the teacher. (Edwards, 2012). A study conducted by Dunleavy et al. (2009) cites two general challenges unique to implementing a one-to-one environment. The two challenges are classroom management and hardware issues. According to the study by Dunleavy et al. (2009), "The teachers reported that online research offered instructional challenges for them because of concerns that students might access inappropriate materials (i.e. games, pornography, etc.), or waste time with inefficient or ineffective searches" (p. 445). Additionally, the Dunleavy et al. (2009) revealed:

> While the computers are powerful tools, they can also serve as a competitive or disruptive distraction. Hardware problems present another challenge with a one-to-one student to networked laptop ratio. These challenges consist of students forgetting to bring their machines to class, students not having machines because

> of repair issues and students arriving to class without a fully charged battery. (p. 449)

The Substitution, Augmentation, Modification, and Redefinition model (SAMR) of implementation is an instructional instrument that educators use to drive curriculum design and the role technology plays in the process, while simultaneously examining the impact of technology when integrated into instruction (Higgins, 2018; McClung, 2019; Zhai et al., 2018; Williams, 2014). The SAMR model represents the levels of implementation technology contributes to a lesson with substitution at the lowest end of implementation and redefinition at the highest end of implementation (McClung, 2019). The substitution and augmentation levels are considered an enhancement of existing instructional practices and the task a student is completing could be replicated using pencil and paper, while modification and redefinition are considered a transformation of instructional practices that completely redefine the students' task with technology serving as an enhancement to the process (McClung, 2019; Zhai et al., 2018).

"Successful one-to-one programs should pay special attention to implementation, training, hardware, and software. The infrastructure of a system will make the difference in the continued success of the program" (Maschmann, 2015, p. 80). Clemensen (2018) stated the following regarding the infrastructure necessary to sustain a one-to-one program:

> Immediate failure in a one-to-one program is the lack of appropriate infrastructure to handle the usage. Technology infrastructure can enhance or ruin the usage of one-to-one within your school from both teachers and students. Infrastructure

must meet the needs of the district to ensure functionality across the one-to-one network. (p. 10)

When technical support and professional development are not sufficiently offered, teachers' negative perceptions of laptop programs will persist (Zheng et al., 2016).

Evaluation of a one-to-one laptop program at Bricksville High School in Pennsylvania revealed significant negativity surrounding the program "focused upon technical issues – the laptops' tendency to freeze, slow processing, wireless connectivity issues, bandwidth limitations, software glitches, content filtering restrictions, and perceived batter and heat issues" (Stone, 2016, p. 2306). Both students and teachers perceived the IT department to be inadequate to correct the issues. According to Stone (2016), the lack of confidence in the IT department "may lead to the underreporting of problems to the IT department, as well as a tendency for students to adapt to problems rather than remediate them" (p. 2306). Stone (2016) found that the IT infrastructure was perceived by many to be inadequate to support the needs of the one-to-one program, ultimately limiting buy-in of the program.

Zucker (2005) states that effective implementation requires a comprehensive or systemic approach that includes attention to aspects such as leadership and planning, supportive school culture, training and professional development, robust infrastructures and technical support, and access to digital content and instructional resources. Specifically, committed leadership (at the state, district, school, and classroom levels) has

been associated with stronger implementation (Shapley et al., 2010). According to Zucker & Light (2009):

> Leaders must provide teachers and administrators with a clear vision of how computers are to be used; appropriate digital resources must be made available; effective, ongoing professional development needs to be provided to teachers; technical support must be available for computers, networks, printers, software, and other components; local leaders, including school principals and teacher leaders, need to be trained and supported; and so on. (p. 84).

A one-to-one initiative implemented over a five-year period aimed at developing 21st century skills provided middle school students at a midwestern urban school district with a laptop computer and upon high school graduation, were able to keep the computer (Storz & Hoffman, 2013). One of the key themes that emerged from this study was the suggestion to address professional development needs. Teachers were given their devices the semester prior to student distribution so that they could have time to familiarize themselves with the device. The district provided three mandatory trainings on early release days and two voluntary summer trainings. At the end of the third mandatory professional development session, 64.3% of participants indicated they would benefit from further staff development (p. 2). There also seemed to be a mismatch in perceptions between teachers and the district regarding the amount and quality of professional development provided (p. 13). Teachers interviewed in the study agreed that the professional development efforts provided by the district were both brief and focused on the software installed on the students' computers and they wanted more emphasis on how to use the computer in their teaching.

"In a pilot study of the Technology Immersion model, high-need middle schools were immersed in technology by providing a laptop for each student and teacher, wireless Internet access, curricular and assessment resources, professional development, and technical and pedagogical support" (Shapley et al., 2010, p. 4). The ultimate goal of immersing middle schools in technology was to increase students' academic achievement as measured by state assessments. The study found that teacher-level implementation components were inconsistent and not statistically significant predictors of student achievement on the state administered assessments, whereas students' use of laptops outside of school for homework and learning games was the strongest implementation predictor of achievement. According to Shapley et al. (2010):

> The Technology Immersion model assumes that school-wide provisions of technology resources and supports will produce teachers who are more technologically adept, use laptops and digital resources to transform their teaching, and have students use technology more often in their classrooms. (p. 43)

Zucker & Light (2009) summarize important concepts of successful one-to-one program implementation:

> If the goal of laptop programs is to change educational goals; to improve patterns of teaching, learning, and assessment; and to help transform schools into more effective institutions; more needs to be done than acquire laptops and a corresponding technical infrastructure. Curricula need to be revised, better assessments developed, teachers must learn new approaches, and schools have to support teachers as they learn to teach in new ways. (p. 84-85).

Ultimately, successful one-to-one implementation will require adequate professional development and teacher preparation time, a robust technical support infrastructure, and strong administrative support (Keengwe, 2012).

Previous Research

The research surrounding student achievement when one-to-one programs are implemented suggests mixed results (Conant, 2016; Copeland, 2018; Olson, 2016; Zheng et al., 2016). Efforts to link one-to-one device use with academic gains are both complex and inconsistent (Storz & Hoffman, 2013). Inconsistent and inconclusive results limit the data available to decisions makers who want to implement a one-to-one program in their schools (Copeland, 2018). Many researchers believe there is a lack of large-scale studies focused on the teaching and learning processes in varying environments (Goodwin, 2011; Hanover Research Council, 2010; Zheng et al., 2016; Zucker & Light, 2009). Zheng et al. (2016) believe there is a disproportionate amount of research to date on this topic, with most of the research consisting of small case studies in one or a handful of schools. Additionally, Sauers & McLeod (2012) believe much more research is needed related to the benefits and/or drawbacks of handing every student a robust computing device all day, every day for academic purposes.

Zheng et al. (2016) conducted a meta-analysis of journal articles and doctoral dissertations published from January 2001 to May 2015 to examine the effect of one-to-one programs on teaching and learning in K-12 schools. The results show mixed results. Nineteen effect sizes within six studies that examined the effect of laptop programs on students' English language arts achievement were included. The results suggested that one-to-one laptop programs helped improve students' general English Language Arts

(ELA) achievement by .15 of a standard deviation on average. Thirteen effect sizes within four students were included in the meta-analysis of laptop program effect on students' reading achievement. The estimated average effect size was not statistically different from zero, which indicates that students in the laptop program scored no differently than their comparison group in reading achievement.

In 2001, one of the most extensive one-to-one programs for its time was implemented in Henrico County, Virginia where approximately 23,000 middle and high school students were issued one-to-one devices (Williams, 2014). The program resulted in mixed outcomes regarding student test scores. "Student achievement was positively impacted in reading, science, and history, but was negatively impacted in Algebra I and II, Geometry, and writing after the first year" (p. 29).

A study in Canada aimed at examining the effect of one-to-one iPad integration on the achievement of seventh grade students showed mixed results in regard to whether or not one-to-one technology affects student achievement (Kirkpatrick et al., 2018). "The effects were mixed in that the impact was sometimes positive, sometimes negative, sometimes negative and then positive, and sometimes neutral. There were no significant effects on students' learning skills, as reported on report cards" (p. 171).

Technology Enhances Student Achievement

Previous studies have shown a positive relationship between technology and student achievement (Alfageh & Alkarzon, 2020; Bayyan, 2016; Gulek & Demirtas,

2005); Hanover Research Council, 2010). Gulek & Demirtas (2005) concluded the following:

> There is substantial evidence that using technology as an instructional tool enhances student learning and educational outcomes. Past research suggests that compared to their non-laptop counterparts, students in classrooms that provide all students with their own laptops spend more time involved in collaborative work, participate in more project-based instruction, produce writing of higher quality and greater length, gain increased access to information, improve research analysis skills, and spend more time doing homework on computers. Research has also shown that these students direct their own learning, report a greater reliance on active learning strategies, readily engage in problem solving and critical thinking, and consistently show deeper and more flexible uses of technology that students without individual laptops. (p. 4)

A quantitative study at Forney Independent School District (ISD) in Texas examined whether the implementation of one-to-one mobile technology at the high school level affected the number of 10th grade students who passed their standardized tests at the end of the 2010 school year (Bayyan, 2016). The results showed that when 10th grade students enrolled at Forney ISD in Texas received the opportunity to use one-to-one mobile technology, their standardized test scores improved across the board.

The Berkshire Wireless Learning Initiative, a program implemented specifically to increase student achievement in western Massachusetts, yielded results that student achievement was positively enhanced through a one-to-one computer program (Hanover Research Council, 2010). Ten years of state standardized testing data was disaggregated

to provide strong, historical background information to determine if changes from year to year were significant. After participating in the one-to-one device program, students took a mock standardized test in which written responses of students participating in the program scored higher than their peers taking a pen and paper exam.

Lowther et al. (2003) compared the impact of a five computer per classroom model to a one-to-one model in twenty-one classrooms in fifth, sixth, and seventh grade. The researchers discovered that student achievement on locally administered assessments in writing and problem solving were significantly higher for students in the one-to-one model. Similarly, in a qualitative study focused upon the use of Chromebook technology and the math and reading achievements of elementary students, researchers found that Chromebook technology had a positive effect on math and reading achievement of elementary school students (Alfageh & Alkarzon, 2020).

Harvest Park Middle School in California released a one-to-one laptop immersion program in 2001 (Gulek & Demiartas, 2005). A study was conducted in which grade point averages, end-of-course grades, writing assessments, and state standardized test results were disaggregated to determine the effect of students immersed in the one-to-one program versus their counterparts who were not part of the program. Baseline data showed no statistically significant difference in student achievement between one-to-one and non-one-to-one students prior to enrollment in the immersion program. After one year in the program, one-to-one students showed significantly higher achievement in nearly all categories and longitudinal analysis also proved to verify the substantial impact of one-to-one device use and student learning outcomes.

Some studies have found a positive impact of technology on achievement, particularly in writing (McLeod & Saurer, 2014). Silvernail and Gritter (2007) examined a program in which seventh and eighth grade students and teachers in Maine all received their own individual laptops. Student writing achievement was shown to improve from the time prior to the introduction of the laptops to four years after the laptop introduction. The ways in which students used the laptops also played a role in their writing achievement. The students who used their laptops less demonstrated less improvement in their writing scores, whereas the students who used their laptops across the writing process demonstrated more improvement in writing achievement (Kirkpatrick et al., 2018). Lowther et al. (2003) investigated students in fifth through seventh grade in Walled Lake, Michigan. Students were provided with one-to-one laptop devices and their writing performance was compared to students in other classes who did not receive the devices. Students who were provided with one-to-one laptop devices generally demonstrated greater improvements in their writing than students who were part of the control group (Kirkpatrick et al., 2018).

A technology immersion pilot program conducted in participating public schools in Texas provides information on the impact of technology use and economically disadvantaged students (Hanover Research Council, 2010). Approximately 75% of students in the program were classified as economically disadvantaged. The study's main focus was on how different levels of one-to-one technology program implementation affect student achievement on the Texas Assessment of Knowledge and Skills tests. The most consistent predictor of reading achievement was the level of student access and usage. This means that students who reported higher levels of use in school and home

scored better than their peers with both low access and usage. This study's results conclude that ubiquitous computing environments that allow students to take computing devices home help equalize out-of-school learning opportunities for students in disadvantaged situations and, in turn, increase academic achievement. This four-year Texas study of 5,000 middle school students concluded that the technology skills of students in the laptop programs improved significantly, so much so that after three years, low-income students in the laptop schools displayed the same levels of technology proficiency as wealthier students in the control schools (Shapley et al., 2009).

Another study in Estrella School District in southern California provides insight into the use of technology and economically disadvantaged students (Hanover Research Council, 2010). Approximately forty percent of students in the Estrella School District are classified as economically disadvantaged. This small scale, two-year study yielded the conclusion that participation in the laptop program consistently had positive effects on students' reading and writing scores on the state standardized tests.

In a study of nine hundred and ninety-seven schools across the United States (Greaves et al., 2010) identified nine factors that, if present, appear to contribute to higher levels of achievement in schools that have adopted one-to-one programs. The top three factors were 1. Ensuring uniform integration of technology in every class, 2. Providing time for teacher learning and collaboration (at least monthly), 3. Using technology daily for student online collaboration and cooperative learning. It is perhaps no coincidence that these factors mirror key predictors of effective schools and districts in general (Goodwin, 2011).

There is a substantial body of research that suggests that technology can have a positive effect on student achievement under certain circumstances and when used for certain purposes (Horn & Staker, 2015; Ringstaff & Kelley, 2002). However, there is no magic formula that educators and policymakers can use to determine if this return is actually worth the investment (Ringstaff & Kelley, 2002).

Technology Does Not Impact Student Achievement

Previous studies have not provided sufficient evidence between one-to-one technology usage and student achievement (Hanover Research Council, 2010; Harris, 2016; Kulow, 2014; McClung, 2019; Mora et al., 2018). Some believe there is a lack of research to definitively say that technology impacts student achievement (Chang, 2016; Conant, 2016; Copeland, 2018; Elizondo, 2018; McClung, 2019; Penuel, 2006).

Cuban (2001) is frequently cited by researchers who conclude that computers have no impact on student achievement (Maschmann, 2015; Williams, 2014). After studying two high schools from the Silicon Valley in 1999 that had high access to computers in the school, but not inside each classroom, he found that computers were not frequently used by students, and teachers largely maintained pre-existing, traditional instructional practices (Cuban, 2001). However, it is important to note that student to computer ratios for the two high schools in the study were 4:1 and 5:1 (Williams, 2014). Cuban (2001) claims that what most districts find from adopting one-to-one environments is increased student motivation, more engagement in lessons, and increased interest in learning. Cuban states that one-to-one computing, as well as all other technology introduced in the past 80 years, has failed to show a direct link to improved test scores. According to Cuban, one-to-one supports mistake the devices for instruction

and how teachers teach, and that it is actually instruction that is responsible for achievement gains, not the devices themselves (Maschmann, 2015).

Hur and Oh (2012) investigated the effects of one-to-one laptops on seventh through ninth grade middle-school students' English and science achievement in an all-male school in South Korea using a quantitative quasi-experimental design. Students in the experimental group received a laptop to use for class projects, online collaboration, and lesson reviews for a three-year period. Students in the control group did not receive laptops. Results indicated no significant difference in English and science achievement between those who received a laptop and those who did not. Carr (2012), using a quantitative quasi-experimental design, found similar results in rural Virginia, in regard to fifth grade students' mathematics achievement. Students in the experimental group used iPads during their daily mathematics classes for nine weeks, whereas the control group did not. Results indicated no significant difference in mathematics achievement between the groups at post-test. Similarly, Shapley et al. (2010), used a quantitative quasi-experimental design to compare the effects of a one-to-one program immersion on sixth through eighth grade middle school students' reading and mathematics achievement. Students at twenty-one Texas middle schools received laptops, while students at twenty-one other Texas schools served as controls and did not receive laptops. Results indicated that students in the one-to-one laptop immersion did not differ significantly from controls in terms of reading and mathematics achievement at posttest. The posttest was an annual assessment based on Texas' content standards.

Kulow (2014) conducted a mixed method study of kindergarten and grade one students to determine if students who used Chromebooks in the classroom achieved at

greater rates for reading and math than their counterparts who did not use Chromebooks in the classroom. The results of this study showed no statistical differences in achievement.

In a recent quantitative study aimed at determining the effect of one-to-one technology in the classroom, Zhai et al. (2018) found that one-to-one technology mainly augmented instructional practice in the classroom rather than transforming it, despite its frequent use and the positive outcome.

Quasi-treatment studies in Missouri from 2001-2005 compared students in eMINTS classrooms that used computers and classrooms that did not use computers in the same grade level and at the same school (Kulow, 2014). The data from the quasi-treatment studies conducted from 2001-2005 show that there was no evidence to conclude that using Chromebooks in the classroom made a significant difference with achievement scores in grade one between the control and treatment groups, as both groups made similar achievement progress. In addition, the results support findings that indicate technology alone will not accomplish student learning, unless factors such as how a teacher uses technology, its alignment to the curriculum, and professional development support teachers are taken into consideration.

A recent quantitative study examined the impact of one-to-one technology integration had on student achievement scores on the New England Common Assessment Program (Conant, 2016). The study analyzed data to determine if a statistically significant difference existed between students who participated in a one-to-one program and those who participated in a traditional school. The results indicated that no

statistically significant difference existed between the achievement scores of the one-to-one students and those of the traditional student.

The Maine Educational Research Institute conducted one of the first large-scale one-to-one programs in the United States in 2002 (Deloatch et al., 2014; Goodwin, 2011; Hanover Research Council, 2010; Herold & Kazi, 2017; Higgins, 2018; McClung, 2019; Olson, 2016; Silvernail & Gritter, 2007; Zucker and Light, 2009). Students in seventh and eighth grade were issued laptops and their writing achievement was measured to determine if there was a relationship between technology and achievement. Over the course of the five-year study, it was determined that there was a strong relationship between writing achievement scores of students in the one-to-one laptop program compared to non-one-to-one device schools, but there were no significant changes in students' standardized test scores since the beginning of the program.

Similar to the study conducted in Maine in 2002, a study was conducted in Farrington School district in California (Grimes & Warschauer, 2008; McClung, 2019). This study examined one-to-one schools and relative non-one-to-one device schools. The results concluded that in the first year of implementation, there was an initial dip in reading and writing achievement, but in the second year of implementation, one-to-one schools' achievement scores increased.

Utilizing data from the Rankin County School District in Mississippi, Dudley (2018) analyzed test scores of 1,355 students to study the link between students issued a one-to-one computer and students who were not issued a one-to-one computer as measured by the Mississippi Achievement Assessment Program's English Language Arts assessment. The study was designed to compare one year of literacy instruction without

laptops and compare those results to one year of instruction using laptops. Results of the study illustrated that there was no statistically significant difference in the test scores of students who had a one-to-one laptop versus students who did not.

In 2008, Mark Edwards, the superintendent in Mooresville, North Carolina launched the Digital Conversion Initiative (Harris et al., 2016; Hull & Duch, 2018). The Mooresville School District distributed laptop computers to every student fourth grade and up (Hull & Duch, 2018). Simultaneously, the district trained its teachers on how to take advantage of this new technology in their lesson plans. "Several thousand students were exposed to the program over the course of five years" (p. 80). In regard to improved reading scores, there is no evidence that the one-to-one initiative improved reading scores in the short term and mixed evidence on whether they improved in the medium term.

A study overseas in Catalonia examined secondary school students' performance in Catalan, Spanish, English, and mathematics (Mora et al., 2018). The Catalan government initiated a One Laptop Per Child (OLPC) program in 2009-2010 where an educational authority provided laptops to children (for free or at a subsidized cost) instead of traditional textbooks. The results of this study provide evidence that a one-to-one initiative has a small, but statistically significant negative effect on student performance. Test scores fell by 0.20 – 0.22 standardized points, which equates 3.8-6.2% of the average test score.

In studying one-to-one programs in Maine and California, Warschauer (2008) determined the programs would not cause an increase in test scores, reform troubled schools, or erase the achievement gap; but, the one thing the program will do is foster

greater collaboration between the teacher and student (Higgins, 2015). Although the study could not provide evidence to support that a one-to-one program would increase test scores, the study concluded three main, positive changes in the teaching and learning processes of reading in the one-to-one classroom: scaffolding, epistemic engagement, and page to screen (Warschauer, 2008).

A recent quantitative study was conducted to determine the effect a one-to-one computing environment had on student academic achievement means at a rural middle school campus in Nevada (Price, 2019). Student GPAs and summative math and ELA assessment data from the year before implementation and the two years after implementation were looked at to determine any effect. The results of the study showed that a one-to-one computing environment had no significant difference on students' end-of-year grade point average means comprised of semester grades in math, English, social studies, and science, and the results were divided between Year 1 and Year 2 of implementation on the summative math and ELA assessments.

Harris et al. (2016) conducted a quantitative study using fourth grade students from a Title I elementary school is Central Illinois. The purpose of the study was to determine whether one-to-one technology truly impacts and effects the academic achievement of students. The results of the study show that overall, the data does not support the hypothesis that technology would increase student academic achievement.

Olson (2016) conducted a quantitative quasi-experimental study in which the purpose was to investigate the impact of one-to-one technology on the reading growth of students. The one-to-one technology was Apple iPads and reading growth was measured by analyzing the Northwest Evaluation Association's (NWEA) standardized test known

as MAP (Measures of Academic Progress). The study took place in a southwest suburban Chicago elementary school district serving approximately 4000 students. Data were collected from approximately one hundred and fifty sixth grade students who received iPads and approximately one hundred and fifty sixth grade students who did not receive iPads. Students' reading MAP scores collected from Fall and Spring 2012-2015 were collected for the students' sixth and seventh grade years to establish a growth trend. This study did not show any statistically significant impact on student growth, positive or negative from the use of one-to-one computing.

Copeland (2018) sought to determine if, between the year prior to a one-to-one program and the three years following its implementation, the achievement of low socioeconomic students of color had improved. The research does not indicate there was a positive effect for low socioeconomic students of color across the school district between the year prior to a one-to-one program's implementation and the three subsequent years of implementation.

The Need for Improved Reading Skills

Creating literate students is a goal of educators worldwide. Recent national and state reports show deficiencies in literacy skills being taught classrooms (ACT, 2019; Howell, 2019; Institute of Education Sciences, 2020; National Assessment of Educational Progress, n.d.). According to a report from the National Council of Teachers of English (2007), the state of literacy instruction and education in the United States has far reaching consequences. Ensuring students are literate comes with challenges. The challenges associated with adolescent literacy extend beyond elementary school to both secondary school and college (National Council of Teachers of English (2007). Elementary schools

place an emphasis on processes of how to read, which in turn crowd out attention to reading for ideas, information, and concepts, all of which are important skills secondary students need to succeed. The report also states that college instructors claim that students arrive to their classes unprepared to take up literacy tasks of higher education, and employers lament the inadequate literacy skills of young workers (National Council of Teachers of English, 2007).

Nationwide, 34 percent of children entering kindergarten lack the basic skills needed to learn how to read, putting them at risk of becoming parents with poor reading skills (Plotkin, 2020). This creates a cycle of illiteracy that cannot be unbroken. Additionally, 21 percent of adults in the United States have low English literacy skills, and 43 percent of adults with the lowest literacy levels live in poverty (Plotkin, 2020). "The National Council for Adult Learning reports that low skill levels cost the United States at least $225 billion annually in (1) non-productivity in the workforce, (2) crime, and (3) loss of tax revenue due to unemployment (Plotkin, 2020).

In 1969, the United States Congress created the National Assessment of Educational Progress (NAEP), which is still used today (Conant, 2016). The primary purpose of the NAEP assessment is to monitor students' academic performance in grades 4, 8, and 12. The two goals of NAEP are to compare student achievement in states and other jurisdictions and to track changes in achievement of 4th, 8th, and 12th grade students over time in mathematics, reading, writing, and other selected content areas (Conant, 2016). According to data from the most recent NAEP reading assessment:

> In 2019, average reading scores were lower for both fourth and eighth grade students compared to 2017. Scores were lower by 1 point at fourth grade and

> lower by 3 points at eighth grade. At grade 12, the average score was 2 points lower in comparison to 2015. Average scores at grades 4 and 8 were higher compared to the first reading assessment in 1992; however, the average score at grade 12 was lower in comparison to 1992. (National Assessment of Educational Progress, n.d.)

Specific to the state of Arkansas, in 2019, the average score of fourth grade students on the NAEP reading assessment was 215 (Institute of Education Sciences, 2020). This score was 4 points lower than the average score of 219 for students across the nation. The average score of 215 for fourth graders was lower than those in 32 states/jurisdictions, higher than those in 3 states/jurisdictions, and not significantly different from those in 16 states/jurisdictions. When looking at score gaps for specific student groups, African American students had an average score that was 26 points lower than that for Caucasian students. Female students in Arkansas had an average score that was higher than male students by 5 points. Students identified as low-socioeconomic status had an average score that was 25 points lower than their counterparts.

In 2019, the average score of eighth grade students in Arkansas on the NAEP reading assessment was 259 (Institute of Education Sciences, 2020). This score was 3 points lower than the average score of 262 for students across the nation. The average score of 259 for eighth graders was lower than those in 34 states/jurisdictions, higher than those in 4 states/jurisdictions, and not significantly different from those in 13 states/jurisdictions. When looking at score gaps for specific student groups, African American students had an average score that was 29 points lower than that for Caucasian students. Female students in Arkansas had an average score that was higher than male

students by 13 points. Students identified as low-socioeconomic status had an average score that was 24 points lower than their counterparts.

A report released by ACT in 2019 looked at the condition of college and career readiness as indicated by the high school graduating class who took the ACT at some time between grade 10 to 12 (ACT, 2019). According to the report, the national average ACT composite score for the 2019 graduating class was down slightly to 20.7 from 20.8 in 2018. The report also indicated that readiness levels in English, reading, math, and science have all decreased since 2015, meaning fewer students have a chance of obtaining an A, B, or C in corresponding credit-bearing first-year college courses.

The ACT Aspire assessment is a vertically scaled, standards-based system of assessments that monitors student growth and progress toward college and career readiness (ACT, 2021). The ACT Aspire is for students in grades 3 through 10 and is anchored by the ACT test administered to students in grades 11 and 12. The ACT Aspire tests students in 5 content areas: Reading, Writing, English, Math, and Science. Students receive scores in all content areas as well as a combined English language arts score composed of the Reading, Writing, and English tests. In 2018, 43.92% of students in grades 3 through 10 in Arkansas were at or above grade level achievement on the combined English language arts score (Howell, 2019). In 2019, 44.64% of students in grades 3 through 10 in Arkansas were at or above grade level achievement on the combined English language arts score (Howell, 2019). Due to the COVID-19 pandemic, students in Arkansas did not take the summative ACT Aspire in 2020; therefore, there is no data to compare. In 2021, 36.9% of students in grades 3 through 10 in Arkansas were at or above grade level achievement on the combined English language arts score

(Division of Elementary and Secondary Education, 2021). While the data shows that the average percent of students obtaining grade level achievement increased slightly from 2018 to 2019, the percentage of students achieving grade level literacy skills is still less than half. Additionally, between the 2019 and 2021 assessments, the percentage of students in grades 3 through 10 meeting grade level proficiency on the combined English language arts score dropped 7.74%.

According to data provided by AR Kids Read (2021), nearly 60% of third graders in Arkansas are reading below grade level. In 2015, The Arkansas Department of Education reported that out of the 1,057 schools included in the report, only 109 schools reported proficient literacy scores of 50 percent and above, while almost one-third of the schools reported average literacy scores lower than 25 percent (Arkansas State University, 2017). These staggering statistics add to the notion that students in Arkansas are falling behind.

Research Question/Hypotheses

The following research questions guided this mixed-methods study:

Research Question One: Is there a significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of cohort, year, gender, and socioeconomic status?

a. H_0: There is no significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of grade, gender, and socioeconomic status.

b. H_1: There is a significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of grade, gender, and socioeconomic status.

Research Question Two: Is there a relationship between teachers' perceptions of technology and student reading achievement?

c. H_0: There is no impact on student reading achievement when teachers have positive perceptions of technology and student reading achievement.
d. H_1: There is a positive impact on student reading achievement when teachers have positive perceptions of technology and student reading achievement.

Research Question Three: Are there specific factors of a one-to-one technology implementation that impact student reading achievement?

c. H_0: There are no specific factors of a one-to-one technology implementation that positively impact student reading achievement.
d. H_1: There are specific factors of a one-to-one technology implementation that positively impact student reading achievement.

Specifically, the study examined Renaissance Star Reading scores of students in grades 6, 7, and 8 before and after implementation of the one-to-one student device program. Detailed analysis of each grade was conducted to determine if implementation of the one-to-one student device program had a significant impact on reading achievement scores of students based on the student's gender or socioeconomic status.

The independent variable is the device, while the dependent variable is reading scores. According to Creswell & Creswell (2018), "Independent variables are those that influence, or affect outcomes in experimental studies. They are described as independent

because they are variables that are manipulated in an experiment and thus independent of all other influences" (p. 50). In this study, the device is the independent variable since it is anticipated that the device will influence or affect student reading achievement as seen on the Renaissance Star Reading assessment. According to Creswell & Creswell (2018), "Dependent variables are those that depend on the independent variables; they are the outcomes or results of the influence of the independent variables" (p. 50). In this study, student achievement on the Renaissance Star Reading assessment is the dependent variable since the score, it is anticipated, will be dependent upon the influence of the device.

Theoretical Framework/Conceptual Framework

Ivan Pavlov, John B. Watson, and B. F. Skinner are frequently referenced researchers associated with the behaviorist approach to learning. Behaviorism is a theory of learning that explains learning in terms of observable behaviors and how they are influenced by stimuli from the environment (Eggen & Kauchak, 2013; McLeod, 2017). These behaviors are acquired through conditioning (Cherry, 2021; Eggen & Kauchak, 2013). The two types of conditioning are classical conditioning and operant conditioning. The differences between the two are represented in Table 1.

According to Eggen & Kauchak (2013), classical conditioning focuses on emotional and psychological responses to stimuli from the environment, while operant conditioning examines changes in behaviors in response to consequences. One of the most commonly cited studies, dating from the late 1800s to early 1900s, related to classical conditioning is Ivan Pavlov's research on salivating dogs in response to being fed (Eggen & Kauchak, 2013; McLeod, 2017). Pavlov found the dogs associated the

presentation of food with the sound of a bell, at first, and then the sight of a lab assistant's white coat (Cherry, 2021). Eventually, the lab coat alone elicited a salivation response from the dogs.

"Whereas classical conditioning depends on developing associations between events, operant conditioning involves learning from the consequences of our behavior (McLeod, 2018). B. F. Skinner is considered the most influential figure in operant conditioning (Eggen & Kauchak, 2013). Skinner argued that behaviors are controlled primarily by consequences. However, Skinner's theory of operant conditioning is built on the ideas of Edward Thorndike (McLeod, 2018). Thorndike's research, based upon placing cats in boxes, lead to the law of effect, which states that any behavior that is followed by pleasant consequences is likely to be repeated, and any behavior that is followed by unpleasant consequences is likely to be stopped. Skinner, like Thorndike, put animals in boxes and observed them.

Table 1

A Comparison of Operant and Classical Conditioning

	Classical Conditioning	**Operant Conditioning**
Behavior	Involuntary (person does not have control of behavior Emotional Physiological	Voluntary (person has control of behavior)
Order	Behavior follows stimulus.	Behavior precedes stimulus (consequence).
How learning occurs	Neutral stimuli become associated with unconditioned stimuli.	Consequences of behaviors influence subsequent behaviors.
Example	Learners associate classrooms	Learners attempt to answer questions and are praised, so their

	(initially neutral) with the warmth of teachers, so classrooms elicit positive emotions.	attempts to answer increase.
Key researcher	Pavlov	Skinner

Note. Adapted from *Educational Psychology: Windows on Classrooms* (9th ed., p. 296) by P. Eggen and D. Kauchak, 2013, Pearson. Copyright 2013 by Paul Eggen and Don Kauchak.

Behaviorism was formally established in 1913 when John B. Watson published his paper, "Psychology as the Behaviorist Views It" (Cherry, 2021; McLeod, 2017). This paper is referenced by some as the behaviorist manifesto that initiated behaviorism as a discipline and academic field of study. Watson believed the theoretical goal of behaviorism is the prediction and control of behavior (Watson, 1913). In one of his most famous and controversial experiments exploring classical conditioning that would elicit ethical considerations by today's standards, Watson demonstrated that a 9-month-old baby boy, Little Albert, could be conditioned to fear something, like a white rat, when no such fear initially existed (Cherry, 2020; McLeod, 2020). Watson combined a loud noise with the appearance of a white rat in order to create fear in the baby. Watson concluded that a child could be conditioned to fear a previously neutral stimulus and that this fear could be generalized to other similar objects.

According to Eggen and Kauchak (2013), "behaviorism, and particularly operant conditioning, has historically had a strong influence on the use of technology in the classroom" (p. 307). At the turn of the 21st century, experts estimated that 85% of existing educational software emphasized skill learning based on behaviorist principles, and the figure was nearly as high 10 years later (Jonassen et al., 2003; Tamim et al., 2011).

Motivation is a powerful factor that influences both student learning and achievement. According to Eggen and Kauchak (2013), motivated peers learn more than their less motivated peers. Motivation can be broken into two categories: intrinsic motivation and extrinsic motivation. Simply put, intrinsic motivation comes from within and you engage in an activity because you get personal satisfaction from doing it, while extrinsic motivation arises from external factors and you do something in order to receive an external reward. "Behaviorism views learning as a change in observable behavior that occurs as a result of experience, and it treats motivation the same way" (Eggen & Kauchak, 2013, p. 332). For example, an increase in the amount of time spent studying is viewed as evidence of motivation, so reinforcers, such as praise, comments on homework, and good grades are motivators (Schunk et al., 2008). Rewards are commonly used as motivators in the classroom and research suggests that judicious use of rewards can be effective (Eggen & Kauchak, 2013). However, critics argue that using rewards sends students the wrong message about learning, and some suggest that rewards used as an extrinsic motivator decrease interest when tasks are already intrinsically motivating.

Although technology continues to become more advanced, drill-and-practice software based on operant conditioning continues to be an effective tool to develop students' basic skills (Eggen & Kauchak (2013). Drill-and-practice software can be used effectively as a supplement to teaching, but isn't designed to replace the teacher. Critics of drill-and-practice software based on behaviorist principles describe it as "little more than electronic flashcards" (Eggen & Kauchak, 2013, p. 308).

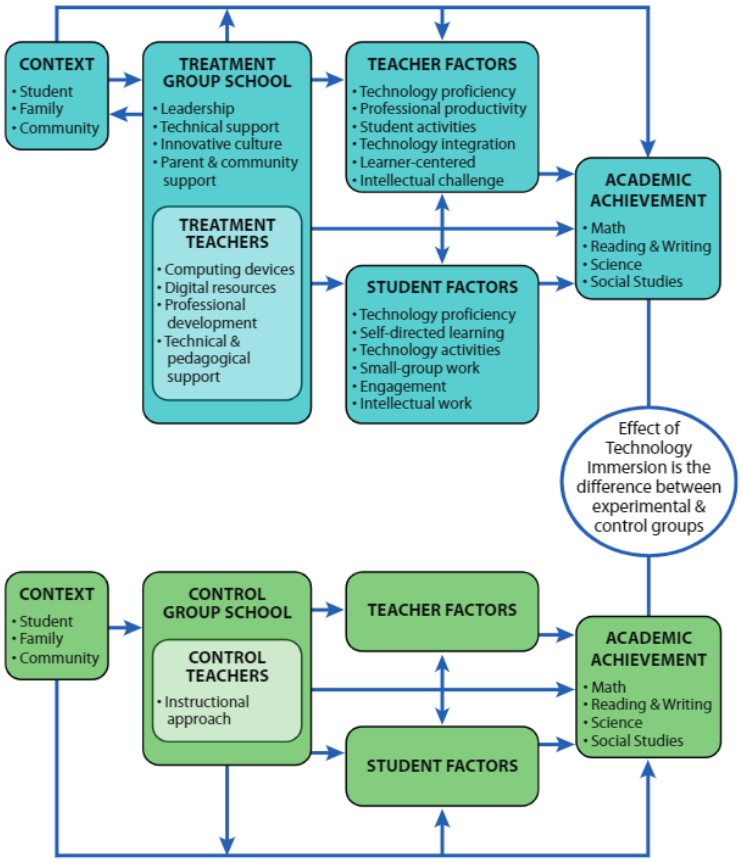
It is a common belief that immersing students and teachers in technology will increase student achievement. Individual factors such as teacher professional

development and training, teacher and student perception, infrastructure, motivation, access outside of school, etc., can begin to describe the relationship between technology and achievement, but the level of implementation and how technology is ultimately implemented within classroom is the strongest indicator of whether technology immersion positively affects student achievement.

In 2003, the Texas Legislature created the Technology Immersion Pilot (TIP), which assumed that the use of technology in Texas public schools could be achieved more effectively by immersing schools in technology rather that by introducing technology resources in a cyclical fashion over time (Shapley et al., 2010). The pilot involved twenty-one middle schools with approximately 7,000 students in grades 7 through 9 (Williams, 2014). The Theoretical Framework for Technology Immersion guided the evaluation, as shown in Figure 1. The Texas Educational Agency chose 3 vendors to provide the immersive experience: Dell Computer Inc., Apple Computer Inc., and Region 1 Education Service Center (Shapley et al., 2010). The four components of technology immersion were wireless laptops and productivity software, online instructional and assessment resources, professional development, and technical and pedagogical support.

Figure 1

Theoretical Framework for Technology Immersion



Note. Reprinted from "Evaluating the Implementation Fidelity of Technology Immersion and its Relationship with Student Achievement," by K. S. Shapley, D. Sheehan, C. Maloney, & F. Caranikas-Walker, 2010, *The Journal of Technology, Learning, and Assessment, 9*(4), p. 8. Copyright 2010 by Kelly S. Shapley, Daniel Sheehan, Catherine Maloney, and Fanny Caranikas-Walker.

Shapley et al. (2010) summarize the expected outcomes of schools immersed in technology:

> An improved school environment for technology is expected to produce teachers who are more technically proficient, use technology for professional productivity, have students use technology in their classes, and use laptops and digital resources to increase the intellectual rigor of lessons. In turn, changed school and

> classroom conditions are expected to improve students' technology proficiency, learning experiences collaborative interactions with peers, personal self-direction, and engagement in school and learning. Changes in students and their learning experiences presumably contribute to increased academic performance as measured by standardized test scores. (p. 7)

Seven immersion components were identified in order to measure implementation. In order to measure progress toward each indicator of technology immersion, teacher and student survey data was used and analyzed. A scoring rubric adapted from the RAND corporation was then incorporated to compute each indicator relative to the maximum value of 4.0, which was the value assigned to full implementation (Shapley et al., 2010). The pilot concluded that while there had been no statistically significant improvement in scores on the Texas Assessment of Knowledge and Skills (TAKS) test in reading writing or math, when data were analyzed based on the level of implementation, there were significant differences in student test scores between high implementation and low implementation schools (Shapley et al., 2010).

Figure 2

Description of Implementation Indicators for Technology Immersion

Support for Technology Immersion	
Leadership	To what extent do teachers indicate that administrators establish a clear vision and expectations, encourage integration, provide supports, and involve staff in making decisions about instructional technology.
Teacher Support	To what extent do teachers share an understanding about technology use, do teachers continually learn and seek new ideas, are teachers unafraid to learn about and use technologies, and are teachers supportive of integration efforts.
Parent and Community Support	To what extent do teachers believe that parents and the surrounding community support the school's efforts with technology.
Technical Support	To what extent do teachers indicate that technical problems with computers, Internet access, repairs, and material availability pose barriers to Technology Immersion.
Professional Development	*Contact Hours* To what extent does the duration (hours) of technology-related professional development (PD) support the integration of technology into teaching, learning, and the curriculum.
	Classroom Support To what extent do core-subject teachers receive coaching or mentoring from an internal source, such as another teacher or technology coordinator, or an external (non-school) source.
	Content Focus To what extent do core-subject teachers indicate that PD emphasizes curriculum, instructional methods, and lesson development in core subjects.
	Coherence To what extent do core-subject teachers indicate that PD is consistent with personal and school goals, builds on prior learning, and supports state standards and assessments.
Classroom Immersion	
Technology Integration To what extent do core teachers alter instructional practices, allocate time, integrate research on teaching and learning, improve basic skills, and support higher order thinking through technology.	
Learner-Centered Instruction To what extent do teachers have students establish learning goals, use information and inquiry skills, complete alternative assessments, and have active and relevant learning experiences.	
Student Classroom Activities To what extent do teachers have students use particular technology resources for learning in core-subject classes, such as a word processor for writing, a spreadsheet for calculation or graphing, or the Internet for research.	
Communication To what extent do teachers use technology to communicate with students, parents, and colleagues or to post information on a class website.	
Professional Productivity To what extent do teachers use technology to enhance their professional productivity (e.g., keep records, analyze data, develop lessons, deliver information).	
Student Access and Use	
Laptop Access To what extent do students have access to wireless laptops throughout the school year.	
Core-Subject Learning How frequently do students use technology resources for learning in core-subject classes.	
Home Learning To what extent do students have access to and use laptops outside of the school for homework and learning.	

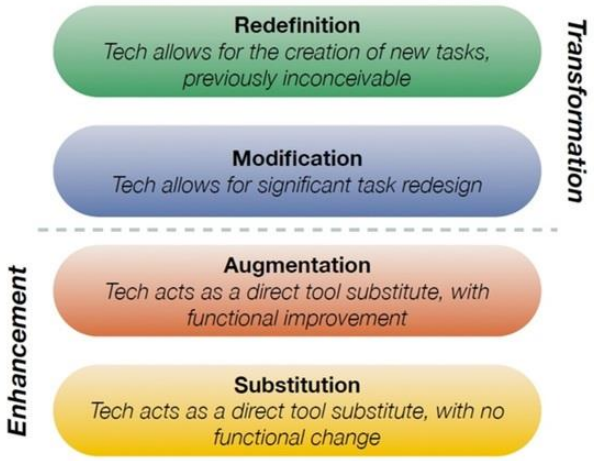
Note. Reprinted from "Evaluating the Implementation Fidelity of Technology Immersion and its Relationship with Student Achievement," by K. S. Shapley, D. Sheehan, C. Maloney, & F. Caranikas-Walker, 2010, *The Journal of Technology, Learning, and Assessment, 9*(4), p. 19. Copyright 2010 by Kelly S. Shapley, Daniel Sheehan, Catherine Maloney, and Fanny Caranikas-Walker.

Dr. Ruben Puentedura's (2006) Substitution, Augmentation, Modification, and Redefinition (SAMR) model was developed as part of his work with the Maine Learning Technologies Initiative. The SAMR model is a tool to help educators immerse

technology into the teaching and learning processes. Figure 2 represents the SAMR model's four classifications of technology use for learning activities. Puentedura (2016) believes it is important for educators to feel comfortable with what they are already doing with technology at the substitution and augmentation levels and once they have mastered these elements, then move on to the modification and redefinition levels. He further states that one of the things he sees happening in classrooms that are very successful at incorporating tools at the modification and redefinition levels is seeing students taking charge and ownership of their education.

Figure 3

SAMR Model



Note. Reprinted from "As We May Teach," by Ruben Puentedura, 2009. Copyright 2009 by Ruben Puentedura.

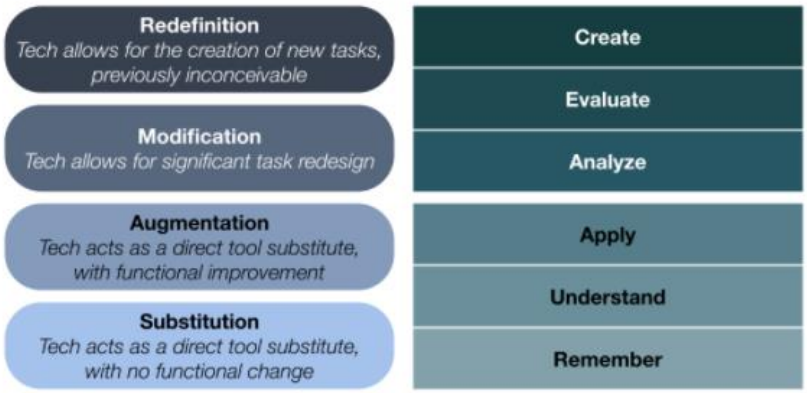
The model represents four implementation levels of technology which contribute to a lesson starting with substitution as the lowest level of implementation and redefinition as the highest level of implementation. Substitution, the lowest level, means the task being completed by the student could be replicated using pencil and paper (McClung, 2019). A lesson is at the redefinition level when technology is used to completely redefine the task

at hand. According to the model, when technology is at the substitution and augmentation levels, technology is used to enhance learning. At the modification and redefinition levels, technology is used to transform learning in ways that could not be accomplished without technology.

Puentedura (2014) states that the goal for the teacher is to construct a simple SAMR ladder that is coupled with Bloom's Taxonomy; that is, as the task moves from lower to upper levels of Blooms Taxonomy, it also moves from lower to upper levels of SAMR. Figure 3 represents the association between the SAMR model and Bloom's Taxonomy. According to Puentedura (2014), the two enhancement levels of SAMR (substitution and augmentation) are associated with the three lower levels of Bloom's Taxonomy (remember, understand, and apply), while the two transformation levels of SAMR (modification and redefinition) are associated with the upper levels of Bloom's Taxonomy (analyze, evaluate, and create). Bloom's Taxonomy is influenced by the cognitive learning theory on education, which means it describes objectives in terms of students' cognitive processes instead of behaviors (Eggen & Kauchak, 2013). Bloom's Taxonomy classifies educational learning objectives into levels of complexity and specificity.

Figure 4

The SAMR Model and Bloom's Taxonomy



Note. Reprinted from "SAMR and Bloom's Taxonomy: Assembling the Puzzle," by Ruben Puentedura, 2014. Copyright 2014 by Ruben Puentedura.

This study utilized the theoretical framework of Behaviorism to examine if there is a relationship between one-to-one technology in the classroom and student achievement as measured through examining data from the Renaissance Star Reading assessment. The one-to-one device is a stimulus, and student response will be evaluated through looking at archived student achievement data on the Renaissance Star Reading assessment. The device has the potential to either positively impact student achievement through enhancing the processes of teaching and learning, or negatively impact student achievement if the device is seen as a distraction or anything other than a tool to learn. If teachers have to spend more time correcting inappropriate student behavior as a result of the device, it is probable that the device will not enhance student achievement. This study will also apply the conceptual framework of technology immersion to understand if the immersive process affected student achievement as measured through examining data from the Renaissance Star Reading assessment.

Summary

This literature review examined the topic of research from five aspects. First, the literature review examined the growth of technology. Computer use in education has been ongoing for the past several decades, spanning from the first use of Teletype connections in 1964 to the more recent use of laptops, netbooks, and Chromebooks over the last decade in one-to-one programs (Bebell & Kay, 2010; Copeland, 2018; Johnstone, 2003; Warschauer, et al., 2014). Second, the literature review examined the role of one-to-one technology in education. One-to-one technology refers to every child in the classroom having direct access to a personal computing device to use as a learning tool (Clemensen, 2018; Conant, 2016; Copeland, 2018, Elizondo, 2018; Hanover Research Council, 2010; Harris et al., 2016; Hull & Duch, 2018; Islam, 2016; Stone, 2016; Williams, 2014; Zheng et al., 2016). One-to-one technology initiatives in school districts are a popular trend amongst decision makers trying to deliver education to 21st century learners. Third, the literature review examined the implementation of technology in schools. Several studies cite the necessity for adequate implementation and support through professional development in order for a one-to-one program to be successful in positively impacting student achievement (McClung, 2019). Next, the literature review examined previous research surrounding technology and student achievement. Generally, the research regarding student achievement when one-to-one programs are implemented provide mixed results (Copeland, 2018; Olson, 2016; Zheng et al., 2016). Decision makers who want to implement a one-to-one program in their schools are hampered by inconsistent and inconclusive results from previous studies (Copeland, 2018). Finally, the literature review examined the need for improved reading skills. One-to-one technology

programs are taking the place of textbook adoption programs within a growing number of school districts across the United States (Olson, 2016). With 34 percent of children entering kindergarten lacking the basic skills needed to learn how to read and 21 percent of adults in the United States having low English literacy skills, it becomes paramount to identify how one-to-one programs are impacting reading achievement.

Chapter III: Methodology

The purpose of this mixed-methods study was to determine if a one-to-one computer program impacted student achievement, specifically in reading. A mixed-methods study with quantitative, causal-comparative research, quantitative survey data, and qualitative interviews was conducted to determine if there was a significant difference in the reading achievement scores of students prior to and after the implementation of a one-to-one computer program.

This chapter addresses all aspects of the research by thoroughly describing the research methodology and design, population and sample selection, instrumentation, data collection, and data analysis so that replication of the study is possible. The findings of the study provide valuable knowledge to school leaders and policymakers as they make future instructional decisions in schools. This work serves as a notable contribution to the field of existing knowledge concerning one-to-one technology programs and student reading achievement.

Research Questions/Hypotheses

The following research questions guided this mixed-methods study:

Research Question One: Is there a significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of cohort, year, gender, and socioeconomic status?

a. H_0: There is no significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of cohort, year, gender, and socioeconomic status.

b. H_1: There is a significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of cohort, year, gender, and socioeconomic status.

Research Question Two: Is there a relationship between teachers' perceptions of technology and student reading achievement?

e. H_0: There is no impact on student reading achievement when teachers have positive perceptions of technology and student reading achievement.
f. H_1: There is a positive impact on student reading achievement when teachers have positive perceptions of technology and student reading achievement.

Research Question Three: Are there specific factors of a one-to-one technology implementation that impact student reading achievement?

e. H_0: There are no specific factors of a one-to-one technology implementation that positively impact student reading achievement.
f. H_1: There are specific factors of a one-to-one technology implementation that positively impact student reading achievement.

Specifically, the study examined Renaissance Star Reading scores of students in grades six, seven, and eight before and after implementation of the one-to-one student device program. Detailed analysis of each grade was conducted to determine if implementation of the one-to-one student device program had a significant impact on reading achievement scores of students based on the student's gender or socioeconomic status.

The independent variable is the device, while the dependent variable is reading scores. According to Creswell & Creswell (2018), "Independent variables are those that influence, or affect outcomes in experimental studies. They are described as independent

because they are variables that are manipulated in an experiment and thus independent of all other influences" (p. 50). In this study, the device is the independent variable since it is anticipated that the device will influence or affect student reading achievement as seen on the Renaissance Star Reading assessment. According to Creswell & Creswell (2018), "Dependent variables are those that depend on the independent variables; they are the outcomes or results of the influence of the independent variables" (p. 50). In this study, student achievement on the Renaissance Star Reading assessment is the dependent variable since the score, it is anticipated, will be dependent upon the influence of the device.

Research Methodology and Design

The purpose of this mixed-methods study was to examine one-to-one technology and student reading achievement. Mixed-methods research involves the collection of both qualitative and quantitative data in response to research questions or hypotheses (Edmonds & Kennedy, 2013; Creswell & Creswell, 2018). According to Creswell & Creswell (2018), it can be argued that integrating both qualitative and quantitative data "provides a stronger understanding of the problem or question than either by itself" (p. 213).

Since the researcher was looking at archived student achievement data and no random assignment will be used, the researcher conducted quantitative, casual-comparative research. Creswell & Creswell (2018) state that "quantitative research is an

approach for testing objective theories by examining the relationship among variables (p. 4). Edmonds & Kennedy (2013) state the following of quantitative research:

> Research in quantitative methods essentially refers to the application of the systematic steps of the scientific method, while utilizing quantitative properties (i.e., numerical systems) to research the relationships or effects of specific variables. Measurement is the critical component of the quantitative method. Measurement reveals and illustrates the relationship between quantitatively derived variables. (p. 20)

The two variables found within this study are one-to-one student device use and student reading achievement as measured by the Renaissance Star Reading assessment. The independent variable is the device, while the dependent variable is reading scores. According to Creswell & Creswell (2018), "Independent variables are those that influence, or affect outcomes in experimental studies. They are described as independent because they are variables that are manipulated in an experiment and thus independent of all other influences. Dependent variables are those that depend on the independent variables; they are the outcomes or results of the influence of the independent variables" (p. 50).

True experimental research involves participants being randomly assigned to either the treatment or control group, whereas they are not randomly assigned in a causal-comparative research design. The first quantitative piece to this study is causal-comparative in design due to the fact the variables are not randomized, but instead treatment conditions are assigned (Creswell & Creswell, 2018; Edmonds & Kennedy,

2013; Price et al., 2013; Joyner et al., 2018). Creswell & Creswell (2018) state the following of casual-comparative research:

> Causal-comparative designs are utilized when the researcher cannot control the treatment variable (i.e., the treatment and control groups are selected after the treatment has occurred), and there are not pretest measures, whole only a posttest is collected. (p. 98)

Creswell & Creswell (2018) further explain that in causal-comparative research, the investigator compares two or more groups in terms of a cause (independent variable) that has already happened (p. 11).

The quantitative, causal-comparative component to this study utilized the interrupted time-series design (Price et al., 2013). A time series is a set of measurements taken at intervals over a designated period of time. The Renaissance Star Reading assessment is given three times a year: at the beginning of the year, the middle of the year, and at the end of the year. This data was analyzed both prior to and following the implementation of the one-to-one device program in the school.

The second quantitative component to this mixed-methods study was a survey. Survey research provides a quantitative description of trends, attitudes, or opinions of a population by studying a sample of that population (Creswell & Creswell, 2018; Edmonds & Kennedy, 2013). The survey for this still was cross-sectional in design. A cross-sectional survey allows the researcher to collect data at one point in time (Creswell & Creswell, 2018; Edmonds & Kennedy, 2018). The survey was created using Google Forms and divided into two distinct sections: pre-one-to-one device implantation and post-one-to-one device implementation.

A qualitative interview founded upon phenomenological research was utilized in this mixed-method study. According to Creswell & Creswell (2018), "phenomenological research is a design of inquiry coming from philosophy and psychology in which the researcher describes the lived experiences of individuals about a phenomenon as described by participants" (p. 13). This rich description comes from several individuals' immediate experiences with the same phenomenon (Edmonds & Kennedy, 2013). Atticus Finch said it best, "You never really understand a person until you consider things from his point of view – until you climb into his skin and walk around in it" (Lee, 1960, p. 36). The phenomenon of interest in this study was teachers' perceptions, training, self-efficacy, and beliefs regarding one-to-one technology implementation prior to and following the 2020-2021 school year when Sample School implemented a one-to-one program as a response to the Covid-19 pandemic.

Population and Sample Selection

Since this study is not true experimental, but causal-comparative in design, randomized sampling cannot be utilized. This study utilized convenience sampling for a piece of the quantitative portion. Convenience sampling is described as choosing individuals to participate in the study because they are easily accessible to the researcher (Creswell & Creswell, 2018; Edmonds & Kennedy, 2013; Etikan et al., 2016). However, convenience sampling is not generalizable to other populations because it does not represent the entire population (Etikan et al., 2016). Convenience sampling "impedes the researcher's ability to draw inferences about a population" (Etikan et al., 2016, p. 4). The researcher looked at archived student cohort data from a small, rural public middle school in Northwest Arkansas. The archived data came from Renaissance's Star Reading

assessment and was composed of approximately three hundred students in grades 6 through 8. The school district identified for this study was not be referred to by its actual name. Instead, the middle school identified was referred to as Sample School.

This study utilized purposeful, homogenous sampling for both the survey and interview. Purposive sampling relies on the judgment of the researcher when it comes to selecting the participants for the study (Bogdan & Biklen, 2007; Creswell & Creswell, 2018; Knops, 2017; Leedy & Ormrod, 2016). The purpose of homogenous sampling is to describe a particular subgroup in depth (Patton, 2002). The researcher will identify all certified educators at Sample School who taught sixth, seventh, and/or eighth grade both prior to and following the one-to-one device implementation. A Google Form was sent to all identified individuals in order to gather anonymous survey results. From the survey results, anonymous participants willingly chose to have their identities revealed; henceforth, interview participants were identified for the qualitative component to this study.

Instrumentation

Data was compiled using Sample School's archived data from the Renaissance Star Reading assessment. The Renaissance Star Reading Assessment is a norm-referenced computer-adaptive test that measures students' reading skills (Renaissance, n.d.). The grade 6, grade 7, and grade 8 cohorts from the 2020-2021 school year were used as data sources. Since the archived data showed student scores from all assessment sessions to date, it was easy to identify student scores both before and after the implementation of one-to-one devices in the district.

The cross-sectional survey was conducted through a Google Form. The researcher chose a Google Form to conduct the survey since the software makes it easier to organize and analyze participants' responses. The researcher chose to combine and adapt two surveys from previous studies, which required permission from the original surveyors (Knops, 2017; Park & Ertmer, 2007). The survey was utilized to collect data on the following themes regarding technology use both prior to and after the implementation of the one-to-one initiative during the 2020-2021 school year: technology use by teachers and students at Sample School, training and comfortability of teachers using the devices in the classroom, the purpose of technology in the classroom, teacher perception of how technology has impacted instruction, and teacher perception of how technology has impacted student learning.

For the qualitative interviews, the researcher was the instrument. According to Creswell & Creswell (2018), "qualitative researchers collect data themselves through examining documents, observing behavior, or interviewing participants. They may use a protocol – an instrument for recording data – but the researchers are the ones who actually gather the information and interpret it" (p. 181). According to Patton (2015):

> In qualitative inquiry, the person conducting the interviews and engaging in field observations is the instrument of the inquiry. The inquirer's skills, experience, and background matter…Qualitative inquiry provides a point of intersection between the personal and the professional. (p. 33)

Data Collection

The researcher accessed the Renaissance program's archived data after the Spring 2021 administration of the Star Reading assessment. The researcher used their

administrative credentials to login to the program and access student data. All students in the grade 6, grade 7, and grade 8 cohorts were selected when the reports were created. From the Growth and Progress report option, the Star Student Progress Monitoring Report was selected. Once this report was selected, the following demographic reports were created using the All-Time date range:

1. All Demographics for grade 6
2. All Demographics for grade 7
3. All Demographics for grade 8
4. Female students in grade 6
5. Female students in grade 7
6. Female students in grade 8
7. Male students in grade 6
8. Male students in grade 7
9. Male students in grade 8
10. Economically disadvantaged students in grade 6
11. Economically disadvantaged students in grade 7
12. Economically disadvantaged students in grade 8

Once all of the reports were created, data was kept in a secure location within the researcher's classroom until the researcher shredded the data after it was put into the appropriate statistical software program. The timeline for this was approximately two weeks.

After receiving informed consent from certified educators at Sample School who taught 6th, 7th, and/or 8th grade both prior to and following the one-to-one device

implementation, the researcher sent an email with an anonymous link to a Google Form survey to all certified staff members at Sample School that taught both before and after implementation of the one-to-one device program. The email containing the link to the survey was sent to participants' school emails. Since the researcher is a practitioner at Sample School, access to participants' professional email addresses was readily available. Survey results were anonymous and remained in a secure folder within the researcher's Google Drive until completion of the study. Once the study was complete, all survey results were deleted from the researcher's Google Drive and server.

Interview questions were prepared in advance; however, additional questions may have been asked based upon individual participant's responses. Once the researcher interviewed participants identified from the survey, interview participants received informed consent to participate in the interview. Interview dates and times were then set through a mutual agreement between the researcher and interview participant. Each interview participant was recorded and then the researcher used Rev Speech-to-Text Services to transcribe each interview.

Data Analysis

Once all reports were created in Renaissance, IBM SPSS Statistics software was used to analyze the data and to create reports to identify variables within the program before any tests were ran. Once all variables were defined, the researcher then ran a series of T-Tests in IBM SPSS Statistics software to determine if there was a significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of cohort, gender, ethnicity, and socioeconomic status. The researcher looked at all cohorts combined first and then each

individual cohort. To protect student identity, numbers were assigned to a student in IBM SPSS Statistics software instead of the student's name.

Survey results from the online survey was analyzed by each of the following themes from the Google Form: technology access, technology professional development, barriers to technology integration, teacher self-efficacy, teacher beliefs about technology, and technology in education. Each theme was analyzed both prior to and after the implementation of the one-to-one device implementation during the 2020-2021 school year.

Once each interview was transcribed by Rev Speech-to-Text Services, the researcher used a combination of Patton's (2002) general guidelines, Lincoln & Guba's (1985) constant comparative technique, and Saldaña's (2013) coding method to identify emergent main ideas and themes. The researcher used content analysis to read through the transcripts, making comments in the margins (Patton, 2002). The content analysis revealed patterns or themes that were then color coded using the constant comparative technique (Saldaña, 2013). The researcher utilized Lincoln & Guba's (1985) constant comparative technique to code the smallest piece of information possible. The researcher cut sentences from the interview transcripts and then pasted them onto an index card, being sure to label the code/theme, source, respondent, location, and data collection episode (Lincoln & Guba, 1985). Next, the researcher brought together categories/codes that appear to relate to the same content (Lincoln & Guba, 1985; Saldana, 2013). Subsequently, the researcher took each pile of cards and gave it a name or title that captured the essence of the data in that category (Lincoln & Guba, 1985). After this step, the researcher checked the miscellaneous pile to see if any of these cards now fit into any

of the defined coded categories (Lincoln & Guba, 1985). The researcher then checked for categories that overlapped to ensure there were no ambiguities about how any particular card was categorized (Lincoln & Guba, 1985). Finally, the researcher checked for relationships among categories (Lincoln & Guba, 1985). There were some categories that need to be divided up into two or more categories instead of one unwieldy one, or some categories were missing, incomplete, or otherwise unsatisfactory; henceforth they were omitted or further data collection was not necessary. The constant comparative technique was stopped when there was an exhaustion of resources, saturation of categories, emergence of regularities and overextension (Lincoln & Guba, 1985). Saldaña (2013) emphasizes that themes are an outcome of coding. Once the researcher had themes identified, the next step in data analysis, triangulation, occurred.

The researcher triangulated the quantitative and qualitative data in order to compare and validate results. Triangulation uses quantitative data, qualitative, or both types of data to look at the same phenomenon (Edmonds & Kennedy, 2013; Heale & Forbes, 2013; Patton, 2002; Scott & Morrison, 2005). "Cross-checking the evidence by collecting different kinds of data about the same phenomenon makes validation possible and is known as triangulation" (Scott & Morrison, 2005, p. 251). Patton (2002) believes "triangulation strengthens a study by combining methods" (p. 247). Additionally, Noble & Heale (2019) believe "triangulation is a method used to increase the credibility and validity of research findings" (p. 67).

The triangulation of qualitative and quantitative data constitutes a form of comparative analysis (Patton, 2002). "Areas of convergence increase confidence in findings. Areas of divergence open windows to better understanding the multifaceted,

complex nature of a phenomenon" (Patton, 2002, p. 559). Through triangulating the data, the researcher anticipates there to be a relationship between one-to-one technology and student reading achievement, but it is imperative to understand that a relationship between the two variables does not fundamentally equate causation. According to McClung (2019):

> Due to the complexity of student achievement, it was expected that it would be difficult to measure the impact of all potential variables related to student achievement. Additional factors can contribute to achievement data that have no relationship to technology. (p. 24)

In order to accurately address the research question, it was vital to include both quantitative and qualitative data. As McClung (2019) indicated in his study, "the more difficult component to measure in this study is the role that many variables can play in the impact on student achievement" (p. 52). To better assess the impact of one-to-one technology on student reading achievement, multiple data sets were utilized to provide a more comprehensive understanding of the correlation between the two variables.

Chapter IV: Data Analysis

The purpose of this nonexperimental, mixed-methods study was to explore the relationship between one-to-one student device use and reading achievement on the norm-referenced STAR reading assessment for middle school students at a rural, public school in Northwest Arkansas. Additionally, this study utilized survey and interview data to determine whether additional factors contributed to student reading achievement. Archived student achievement data on the Renaissance Star Reading assessment was collected for students two years prior to the one-to-one device implementation and during the year the one-to-one device implementation occurred. In addition to the archived student reading achievement data collected for this study, a survey was sent to educators at Sample School. From the survey, the interview participants were identified for the study. This study was guided by the following questions:

Research Question One: Is there a significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of cohort, year, gender, and socioeconomic status?

a. H_0: There is no significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of cohort, year, gender, and socioeconomic status.

b. H_1: There is a significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of cohort, year, gender, and socioeconomic status.

Research Question Two: Is there a relationship between teachers' perceptions of technology and student reading achievement?

g. H_0: There is no impact on student reading achievement when teachers have positive perceptions of technology and student reading achievement.

h. H_1: There is a positive impact on student reading achievement when teachers have positive perceptions of technology and student reading achievement.

Research Question Three: Are there specific factors of a one-to-one technology implementation that impact student reading achievement?

g. H_0: There are no specific factors of a one-to-one technology implementation that positively impact student reading achievement.

h. H_1: There are specific factors of a one-to-one technology implementation that positively impact student reading achievement.

Data Preparation and Screening

The researcher accessed all students' archived Renaissance Star Reading achievement data using their school-issued login credentials. The researcher printed reports for all students in the sixth grade, seventh grade, and eighth grade cohorts for the 2020-2021 school year at Sample School. In order to determine which data should be considered for research, the researcher carefully examined all student reports and omitted any reports that did not contain consecutive student achievement data for the 2018-2019, 2019-2020, and 2020-2021 school years.

The survey was sent to seventeen certified teachers who taught at Sample School prior to and during the one-to-one device implementation. The researcher received eleven responses, which equated to a 65% response rate. The survey had two distinct parts. The first part of the survey asked questions about technology at Sample School prior to the one-to-one device implementation, while the second part asked the same questions, but

respondents were asked to answer based upon their experience during the year of the one-to-one device implementation. Additionally, the survey was set up using seven themes to make it easier to disaggregate data. The seven themes from the survey were: technology access, technology professional development, barriers to technology integration, teacher self-efficacy, teacher beliefs about technology, Chromebook engagement, and technology in education. Survey respondents could agree to participate in an interview at a later date upon completion of the survey. Ten of the eleven survey respondents agreed to participate in an interview with the researcher. Interviews were set up at an agreed upon place and time between the researcher and interviewee. Upon receiving informed consent of the process from the interviewee, the researcher recorded each interview to make transcription easier at a later time.

Main Findings

The researcher will discuss main findings in relation to the archived student reading achievement data, teacher survey results, teacher interview data, and the three research questions that guided this study.

Archived Renaissance Star Reading Student Achievement Data

The researcher entered all data into IBM SPSS Statistics. In order to protect students' identities, the researcher used numbers to identify students instead of names. Nominal variables were student, year, cohort, gender, and socioeconomic status, while growth was the only scale variable.

In order to test for normality, *n* quota, and homogeneity of variance, the researcher ran a descriptive statistics test for each of the variables to determine if the histograms had a normal curve and an ANOVA test in IBM SPSS Statistics. While both

normality and *n* quota were normal, the homogeneity of variance test produced a result of $p < .05$, which indicated a significance difference in the data. Since one of the three pretests to check for normalcy of data was not satisfied, the researcher chose to run the Kruskal-Wallis test in IBM SPSS Statistics. According to Knapp (2018), "In cases where the three pretest criteria are not satisfied for the ANOVA, the Kruskal-Wallis tests, which is conceptually similar to the ANOVA, is the better option…" (p. 109). The Kruskal-Wallis test is the nonparametric version of the ANOVA test (Knapp, 2018).

According to Table 2, there is a statistically significant difference in data between school year and growth due to $p < .05$. It is important to note that growth on the Renaissance Star Reading assessment is measured according to months in a school year. For example, a growth score of 1.4 would indicate a student grew an entire year as well as 4 months into the next. A growth score of -.3 would indicate a student regressed three months of a school year. According to Table 3, there is a statistically significant difference in data between cohort and growth due to $p < .05$.

Table 2

Kruskal-Wallis Test for Growth Based Upon School Year

Ranks			
	Year	N	Mean Rank
growth	2018-2019	227	386.56
	2019-2020	227	322.07
	2020-2021	227	314.37
	Total	681	

continued

Test Statistics[a,b]	
	Growth
Kruskal-Wallis H	18.456
df	2
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: year

Table 3

Kruskal-Wallis Test for Growth Based Upon Cohort

Ranks			
	cohort	N	Mean Rank
growth	6	204	354.18
	7	249	357.55
	8	228	311.13
	Total	681	

Test Statistics[a,b]	
	Growth
Kruskal-Wallis H	7.947
df	2
Asymp. Sig.	.019

a. Kruskal Wallis Test

b. Grouping Variable: cohort

Table 4 shows the mean growth by year by cohort. The cohort was determined by the 2020-2021 school year, the same year the one-to-one device implementation occurred. The sixth grade cohort went from a mean growth of .724 in 2018-2019 to .391 in 2019-2020 and .419 in 2020-2021. The seventh grade cohort went from a mean growth of .774 in 2018-2019 to .541 in 2019-2020 and .331 in 2020-2021. The eighth grade cohort went from a mean growth of .529 in 2018-2019 to .160 in 2019-2020 to .251 in 2020-2021. It is not clear exactly what caused the decline in mean growth from the first

year to the third year for each cohort, but two variables should be considered to help determine what happened. During the 2019-2020 school year, schools in Arkansas closed on-campus learning in March 2020 due to the COVID-19 pandemic. This was a major, unprecedented interruption to regular learning, which could attribute to the decline. Additionally, Sample School implemented a one-to-one device program during the 2020-2021 school year while still battling restrictions due to the COVID-19 pandemic.

Table 4

Means Table Growth by Year by Cohort

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
growth * year * cohort	681	100.0%	0	0.0%	681	100.0%

Growth

Year	cohort	Mean	N	Std. Deviation
2018-2019	6	.724	68	.7411
	7	.774	83	.8265
	8	.529	76	.9249
	Total	.677	227	.8403
2019-2020	6	.391	68	.7576
	7	.541	83	.9189
	8	.160	76	1.0923
	Total	.368	227	.9477
2020-2021	6	.419	68	1.1566
	7	.331	83	1.2657
	8	.251	76	1.2748
	Total	.331	227	1.2335
Total	6	.511	204	.9138
	7	.549	249	1.0333
	8	.313	228	1.1129
	Total	.459	681	1.0310

Table 5 shows the results from a Spearman rho correlation test to determine if there were any correlations among variables. The results indicated there was a relationship between cohort and growth as well as year and growth due to $p < .05$ for both relationships. Table 5 further proved the data from Table 2 and Table 3. Table 2 showed $p < .05$, which indicated a statistically significant difference between school year and growth. Table 3 showed $p < .05$, which indicated a statistically significant difference between cohort and growth.

Table 5

Spearman rho Variable Correlation Test

Correlations							
			growth	gender	cohort	socioeconomic	year
Spearman's rho	Growth	Correlation Coefficient	1.000	-.058	-.090*	.038	-.150**
		Sig. (2-tailed)	.	.132	.019	.316	.000
		N	681	681	681	681	681
	Gender	Correlation Coefficient	-.058	1.000	-.034	-.026	.000
		Sig. (2-tailed)	.132	.	.379	.501	1.000
		N	681	681	681	681	681
	Cohort	Correlation Coefficient	-.090*	-.034	1.000	-.004	.000
		Sig. (2-tailed)	.019	.379	.	.919	1.000
		N	681	681	681	681	681
	socioeconomic	Correlation Coefficient	.038	-.026	-.004	1.000	.000
		Sig. (2-tailed)	.316	.501	.919	.	1.000
		N	681	681	681	681	681

continued

year	Correlation Coefficient	-.150**	.000	.000	.000	1.000
	Sig. (2-tailed)	.000	1.000	1.000	1.000	.
	N	681	681	681	681	681

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

The researcher ran two independent samples T-Tests to determine if there was a relationship between gender and growth as well as socioeconomic status and growth, which can be seen in Table 6 and Table 7. According to the results of each test, there was no relationship between gender and growth or socioeconomic status and growth due to $p > .05$ for each test.

Table 6

T-Test Results for Gender Compared to Growth

Group Statistics

	gender	N	Mean	Std. Deviation	Std. Error Mean
growth	male	342	.517	.9614	.0520
	female	339	.399	1.0950	.0595

continued

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
growth	Equal variances assumed	.223	.637	1.496	679	.135	.1181	.0789	-.0369	.2731
	Equal variances not assumed			1.495	666.276	.135	.1181	.0790	-.0370	.2732

Table 7

T-Test Results for Socioeconomic Status Compared to Growth

Group Statistics					
	socioeconomic	N	Mean	Std. Deviation	Std. Error Mean
growth	f&r	474	.447	1.0266	.0472
	non	207	.485	1.0430	.0725

continued

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
growth	Equal variances assumed	.198	.656	-.444	679	.657	-.0381	.0859	-.2069	.1306
	Equal variances not assumed			-.441	387.000	.659	-.0381	.0865	-.2082	.1319

One-to-One Technology Survey

The researcher entered the data from the Likert survey into IBM SPSS Statistics. In order to transform the variables, the researcher took the mean of each variable to check for normality. Since the cases were less than 100, the researcher utilized the Shapiro Wilk test of normality. Since the variables were statistically significant at 0.05 and below, the researcher determined that the variables were not normally distributed. An ordinal regression analysis was conducted by the researcher. The researcher chose the Spearman rho correlation analysis because the variables were not found to be normally distributed. Table 8 summarizes the results from the Spearman rho correlation analysis.

Table 8

Results of the Spearman rho Correlation Analysis for the Survey

Correlations													
			BTA	BTPD	BTSE	BTBT	BCE	BTE	ATA	ATPD	ATSE	ATBT	ACE	ATE
Spearman's rho	BTA	Correlation Coefficient	1.000	.633*	.482	-.086	.302	-.170	-.164	.554	.441	.816**	-.526	.252
		Sig. (2-tailed)	.	.036	.133	.801	.367	.617	.630	.077	.174	.002	.097	.455
		N	11	11	11	11	11	11	11	11	11	11	11	11
	BTPD	Correlation Coefficient	.633*	1.000	.774**	-.337	.788**	.397	-.409	.735**	.099	.440	-.110	.699*
		Sig. (2-tailed)	.036	.	.005	.310	.004	.227	.211	.010	.772	.176	.747	.017
		N	11	11	11	11	11	11	11	11	11	11	11	11
	BTSE	Correlation Coefficient	.482	.774**	1.000	-.201	.782**	.643*	-.405	.774**	.442	.432	.171	.731*
		Sig. (2-tailed)	.133	.005	.	.553	.004	.033	.217	.005	.174	.184	.615	.011
		N	11	11	11	11	11	11	11	11	11	11	11	11
	BTBT	Correlation Coefficient	-.086	-.337	-.201	1.000	-.435	-.335	-.173	-.486	.638*	.386	-.473	-.624*
		Sig. (2-tailed)	.801	.310	.553	.	.181	.314	.610	.130	.035	.240	.141	.040
		N	11	11	11	11	11	11	11	11	11	11	11	11
	BCE	Correlation Coefficient	.302	.788**	.782**	-.435	1.000	.698*	-.365	.770**	-.020	.116	.293	.925**
		Sig. (2-tailed)	.367	.004	.004	.181	.	.017	.270	.006	.953	.734	.381	.000
		N	11	11	11	11	11	11	11	11	11	11	11	11
	BTE	Correlation Coefficient	-.170	.397	.643*	-.335	.698*	1.000	-.367	.475	-.062	-.232	.660*	.704*
		Sig. (2-tailed)	.617	.227	.033	.314	.017	.	.267	.140	.856	.493	.027	.016

continued

	N	11	11	11	11	11	11	11	11	11	11	11	11
ATA	Correlation Coefficient	-.164	-.409	-.405	-.173	-.365	-.367	1.000	-.122	-.118	-.103	-.304	-.389
	Sig. (2-tailed)	.630	.211	.217	.610	.270	.267	.	.722	.729	.764	.364	.237
	N	11	11	11	11	11	11	11	11	11	11	11	11
ATPD	Correlation Coefficient	.554	.735**	.774**	-.486	.770**	.475	-.122	1.000	.061	.227	.046	.798**
	Sig. (2-tailed)	.077	.010	.005	.130	.006	.140	.722	.	.859	.503	.893	.003
	N	11	11	11	11	11	11	11	11	11	11	11	11
ATSE	Correlation Coefficient	.441	.099	.442	.638*	-.020	-.062	-.118	.061	1.000	.817**	-.418	-.198
	Sig. (2-tailed)	.174	.772	.174	.035	.953	.856	.729	.859	.	.002	.201	.559
	N	11	11	11	11	11	11	11	11	11	11	11	11
ATBT	Correlation Coefficient	.816**	.440	.432	.386	.116	-.232	-.103	.227	.817**	1.000	-.680*	-.089
	Sig. (2-tailed)	.002	.176	.184	.240	.734	.493	.764	.503	.002	.	.021	.794
	N	11	11	11	11	11	11	11	11	11	11	11	11
ACE	Correlation Coefficient	-.526	-.110	.171	-.473	.293	.660*	-.304	.046	-.418	-.680*	1.000	.479
	Sig. (2-tailed)	.097	.747	.615	.141	.381	.027	.364	.893	.201	.021	.	.136
	N	11	11	11	11	11	11	11	11	11	11	11	11
ATE	Correlation Coefficient	.252	.699*	.731*	-.624*	.925**	.704*	-.389	.798**	-.198	-.089	.479	1.000
	Sig. (2-tailed)	.455	.017	.011	.040	.000	.016	.237	.003	.559	.794	.136	.
	N	11	11	11	11	11	11	11	11	11	11	11	11

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

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

After analyzing the data in Table 8, the researcher concluded several relationships exist amongst the variables, which can be seen in Table 9. In order for a relationship to exist, the correlation coefficient had to be closer to +1 instead of 0 and the statistical significance, or *p* value, had to be less than .05.

Table 9

Relationship Between Survey Variables

Variables		Correlation Coefficient	*p* Value
Technology Access Before Implementation	Technology Professional Development Before Implementation	.633	.036
Technology Access Before Implementation	Teacher Self-efficacy During Implementation	.816	.022
Technology Professional Development Before Implementation	Teacher Self-efficacy Before Implementation	.774	.005
Technology Professional Development Before Implementation	Chromebook Engagement Before Implementation	.788	.004
Technology Professional Development Before Implementation	Technology Professional Development During Implementation	.735	.010
Technology Professional Development Before Implementation	Technology in Education During Implementation	.699	.017
Technology Professional Development During Implementation	Technology in Education During Implementation	.798	.003
Teacher Self-efficacy Before Implementation	Chromebook Engagement Before Implementation	.782	.004
Teacher Self-efficacy Before Implementation	Technology in Education Before Implementation	.643	.033
Teacher Self-efficacy Before Implementation	Technology Professional Development During Implementation	.744	.005
Teacher Self-efficacy Before Implementation	Technology in Education During Implementation	.731	.011
Teacher Self-efficacy Before Implementation	Teacher Beliefs About Technology During Implementation	.817	.002

continued

Teacher Beliefs About Technology Before Implementation	Teacher Self-efficacy during Implementation	.638	.035
Teacher Beliefs About Technology Before Implementation	Technology in Education During Implementation	-.634	.040
Teacher Beliefs About Technology During Implementation	Technology Access Before Implementation	.816	.002
Teacher Beliefs About Technology During Implementation	Chromebook Engagement During Implementation	-.680	.021
Chromebook Engagement Before Implementation	Technology in Education Before Implementation	.698	.017
Chromebook Engagement Before Implementation	Technology Professional Development During Implementation	.770	.006
Chromebook Engagement Before Implementation	Technology in Education After Implementation	.925	.000
Technology in Education Before Implementation	Chromebook Engagement During Implementation	.660	.027
Technology in Education Before Implementation	Technology in Education During Implementation	.704	.016

The researcher ran a descriptive statistics analysis for continuous variables in IBM SPSS Statistics to find the mean for each category of survey questions. The frequency tables for each category of the survey are represented in Table 10.1 through Table 10.12. The researcher was interested in knowing if the mean for each survey category changed or stayed the same prior to or during one-to-one device implementation.

Table 10.1

Frequency Table for Technology Access Before Implementation

Statistics						
		BTA1	BTA2	BTA3	BTA4	BTA5
N	Valid	11	11	11	11	11
	Missing	0	0	0	0	0
Mean		3.45	3.27	2.36	1.91	2.82
Median		3.00	4.00	3.00	2.00	3.00
Mode		3	4	3	1	2
Std. Deviation		.522	.905	.809	.944	.874
Variance		.273	.818	.655	.891	.764
Range		1	2	2	2	2
Minimum		3	2	1	1	2
Maximum		4	4	3	3	4

Table 10.2

Frequency Table for Technology Access During Implementation

Statistics						
		ATA1	ATA2	ATA3	ATA4	ATA5
N	Valid	11	11	11	11	11
	Missing	0	0	0	0	0
Mean		3.91	3.00	3.09	2.91	3.18
Median		4.00	3.00	3.00	3.00	3.00
Mode		4	4	2	2	2[a]
Std. Deviation		.944	1.095	1.044	1.221	1.079
Variance		.891	1.200	1.091	1.491	1.164
Range		3	3	3	4	3
Minimum		2	1	2	1	2
Maximum		5	4	5	5	5

a. Multiple modes exist. The smallest value is shown

Table 10.3

Frequency Table for Technology Professional Development Before Implementation

Statistics				
		BTPD1	BTPD2	BTPD3
N	Valid	11	11	11
	Missing	0	0	0
Mean		3.73	1.91	2.64
Median		4.00	2.00	3.00
Mode		4	1	2[a]
Std. Deviation		.786	1.044	.924
Variance		.618	1.091	.855
Range		3	3	3
Minimum		2	1	1
Maximum		5	4	4

a. Multiple modes exist. The smallest value is shown

Table 10.4

Frequency Table for Technology Professional Development During Implementation

Statistics				
		ATPD1	ATPD2	ATPD3
N	Valid	11	11	11
	Missing	0	0	0
Mean		3.64	2.00	2.36
Median		4.00	1.00	2.00
Mode		3[a]	1	2
Std. Deviation		.674	1.342	1.120
Variance		.455	1.800	1.255
Range		2	4	4
Minimum		3	1	1
Maximum		5	5	5

a. Multiple modes exist. The smallest value is shown

Table 10.5

Frequency Table for Teacher Self-efficacy Before Implementation

Statistics								
		BTSE1	BTSE2	BTSE3	BTSE4	BTSE5	BTSE6	BTSE7
N	Valid	11	11	11	11	11	11	11
	Missing	0	0	0	0	0	0	0
Mean		4.36	4.18	4.45	4.00	4.09	4.18	4.00
Median		4.00	4.00	4.00	4.00	4.00	4.00	4.00
Mode		4	4	4	4	4	4	4
Std. Deviation		.505	.405	.522	.894	.701	.405	.447
Variance		.255	.164	.273	.800	.491	.164	.200
Range		1	1	1	3	2	1	2
Minimum		4	4	4	2	3	4	3
Maximum		5	5	5	5	5	5	5

a. Multiple modes exist. The smallest value is shown

Table 10.6

Frequency Table for Teacher Self-efficacy During Implementation

Statistics								
		ATSE1	ATSE2	ATSE3	ATSE4	ATSE5	ATSE6	ATSE7
N	Valid	11	11	11	11	11	11	11
	Missing	0	0	0	0	0	0	0
Mean		4.36	4.36	4.27	4.09	3.91	4.00	3.73
Median		4.00	4.00	4.00	4.00	4.00	4.00	4.00
Mode		4	4	4[a]	4	4	4	4
Std. Deviation		.505	.505	.905	.701	.831	.894	.786
Variance		.255	.255	.818	.491	.691	.800	.618
Range		1	1	3	2	3	3	3
Minimum		4	4	2	3	2	2	2
Maximum		5	5	5	5	5	5	5

a. Multiple modes exist. The smallest value is shown

Table 10.7

Frequency Table for Teacher Beliefs About Technology Before Implementation

Statistics							
		BTBT1	BTBT2	BTBT3	BTBT4	BTBT5	BTBT6
N	Valid	11	11	11	11	11	11
	Missing	0	0	0	0	0	0
Mean		3.91	3.55	3.91	3.73	4.00	4.18
Median		4.00	4.00	4.00	3.00	4.00	4.00
Mode		4	4	4	5	4	4
Std. Deviation		.831	.820	.831	1.272	.775	.874
Variance		.691	.673	.691	1.618	.600	.764
Range		3	2	3	3	3	3
Minimum		2	2	2	2	2	2
Maximum		5	4	5	5	5	5

a. Multiple modes exist. The smallest value is shown

Table 10.8

Frequency Table for Teacher Beliefs About Technology During Implementation

Statistics							
		ATBT1	ATBT2	ATBT3	ATBT4	ATBT5	ATBT6
N	Valid	11	11	11	11	11	11
	Missing	0	0	0	0	0	0
Mean		3.91	3.64	3.91	3.82	4.45	4.27
Median		4.00	4.00	4.00	4.00	4.00	4.00
Mode		4	3[a]	4	4	4	4
Std. Deviation		1.044	.924	.944	.982	.522	.647
Variance		1.091	.855	.891	.964	.273	.418
Range		3	3	3	3	1	2
Minimum		2	2	2	2	4	3
Maximum		5	5	5	5	5	5

a. Multiple modes exist. The smallest value is shown

Table 10.9

Chromebook Engagement Before Implementation

Statistics																
		BCE1	BCE2	BCE3	BCE4	BCE5	BCE6	BCE7	BCE8	BCE9	BCE10	BCE11	BCE12	BCE13	BCE14	BCE15	BCE16
N	Valid	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
	Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean		3.09	2.36	.55	1.09	1.09	1.27	1.64	.73	.27	.91	1.73	.55	.55	1.91	.09	.55
Median		3.00	2.00	.00	.00	1.00	1.00	1.00	.00	.00	1.00	1.00	.00	.00	1.00	.00	.00
Mode		3[a]	1[a]	0	0	1	1	0[a]	0	0	0	1	0	0	1	0	0
Std. Deviation		.831	1.120	.934	1.814	.539	1.272	1.629	1.191	.647	1.044	1.348	1.214	1.036	1.446	.302	.820
Variance		.691	1.255	.873	3.291	.291	1.618	2.655	1.418	.418	1.091	1.818	1.473	1.073	2.091	.091	.673
Range		2	3	3	5	2	4	5	3	2	3	5	4	3	5	1	2
Minimum		2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum		4	4	3	5	2	4	5	3	2	3	5	4	3	5	1	2

a. Multiple modes exist. The smallest value is shown

Table 10.10

Chromebook Engagement During Implementation

Statistics																
		ACE1	ACE2	ACE3	ACE4	ACE5	ACE6	ACE7	ACE8	ACE9	ACE 10	ACE 11	ACE12	ACE13	ACE14	ACE15	ACE16
N	Valid	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
	Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean		3.91	3.73	1.45	2.18	1.91	2.45	2.09	1.64	.55	1.73	3.27	2.09	1.18	3.45	1.00	1.36
Median		4.00	4.00	1.00	2.00	2.00	2.00	1.00	1.00	.00	2.00	4.00	2.00	1.00	4.00	.00	.00
Std. Deviation		.831	1.421	1.214	2.136	1.300	1.695	2.119	1.963	.820	1.618	2.005	1.700	1.401	1.508	1.673	1.963
Variance		.691	2.018	1.473	4.564	1.691	2.873	4.491	3.855	.673	2.618	4.018	2.891	1.964	2.273	2.800	3.855
Range		2	3	3	5	4	5	5	5	2	4	5	5	4	5	5	5
Minimum		3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum		5	5	3	5	4	5	5	5	2	4	5	5	4	5	5	5

Table 10.11

Technology in Education Before Implementation

Statistics						
		BTE1	BTE2	BTE3	BTE4	BTE5
N	Valid	11	11	11	11	11
	Missing	0	0	0	0	0
Mean		2.45	2.36	2.27	2.55	2.18
Median		2.00	2.00	2.00	2.00	2.00
Mode		2	2	2	2	2
Std. Deviation		1.036	1.027	.786	.934	1.079
Variance		1.073	1.055	.618	.873	1.164
Range		3	3	3	3	4
Minimum		1	1	1	1	1
Maximum		4	4	4	4	5

Table 10.12

Technology in Education During Implementation

Statistics						
		ATE1	ATE2	ATE3	ATE4	ATE5
N	Valid	11	11	11	11	11
	Missing	0	0	0	0	0
Mean		2.09	2.27	2.45	2.45	1.82
Median		2.00	2.00	2.00	2.00	2.00
Mode		1	2	2	2	2
Std. Deviation		1.300	1.104	1.293	.934	.603
Variance		1.691	1.218	1.673	.873	.364
Range		3	3	4	3	2
Minimum		1	1	1	1	1
Maximum		4	4	5	4	3

After analyzing Table 10.1 through Table 10.12, the researcher identified eighteen relationships among the categories in the survey where the mean was either less than the rest of the questions from the same category, or the mean was notably different from before and during the one-to-one device implementation. Thirteen of the eighteen relationships where the mean was notably different from before and during the one-to-one device implementation were within the Chromebook Engagement category. Table 11 identifies the relationships along with differences in means in order to show how notably different survey respondents answered prior to and during one-to-one device implementation. It is important to note that the survey results are reported based upon a Likert Scale with 1 being the most negative response and 5 being the most positive. Additionally, the Likert Scale questions regarding how many days per week on average Chromebooks were used are based upon the same scale, with 1 being 1 day and 5 being 5 days.

Table 11

Significant Difference in Survey Means Prior and During One-to-one Device Implementation

Survey Category Question with Mean	Survey Category Question with Mean	Question from Survey	Difference in Means Before and During
Before Technology Access **M**= 2.36	During Technology Access **M** = 3.09	The speed of available internet connection at your school.	+0.73
Before Technology Access **M** = 1.91	During Technology Access **M** = 2.91	The reliability of the internet connection at your school.	+1.00
Before Technology Access **M** = 2.82	During Technology Access **M** = 3.18	The technology support available to you at your school.	+0.36
Before Technology Professional Development **M** = 2.64	During Technology Professional Development **M** = 2.36	How would you describe the number of technology-related professional development opportunities provided to you by your educational cooperative?	-0.28
Before Technology in Education **M** = 2.18	During Technology in Education **M** = 1.82	Please rate the degree to which you believe access to technology helped prepare students for assessments such as ACT Aspire, Renaissance STAR Assessments, etc.	-0.36
Before Chromebook Engagement **M** = 2.36	During Chromebook Engagement **M** = 3.73	On average, how many days per week (during school) did you involve students' use of Chromebooks in your classroom?	+1.37
Before Chromebook Engagement **M** = 0.55	During Chromebook Engagement **M** = 1.45	On average, how many hours per week might students have spent using technology at home to complete assignments from your class?	+0.90
Before Chromebook Engagement **M** = 1.09	During Chromebook Engagement **M** = 2.18	On average, how many days per week did students spend using Chromebooks on the following activities? Email.	+1.09
Before Chromebook Engagement **M** = 1.27	During Chromebook Engagement **M** = 2.45	On average, how many days per week did students spend using Chromebooks on the	+1.18

continued

		following activities? Projects.	
Before Chromebook Engagement **M** = 1.64	During Chromebook Engagement **M** = 2.09	On average, how many days per week did students spend using Chromebooks on the following activities? Typing.	+0.45
Before Chromebook Engagement **M** = 0.73	During Chromebook Engagement **M** = 1.64	On average, how many days per week did students spend using Chromebooks on the following activities? Listening to Music.	+0.91
Before Chromebook Engagement **M** = 0.91	During Chromebook Engagement **M** = 1.73	On average, how many days per week did students spend using Chromebooks on the following activities? Online Research.	+0.82
Before Chromebook Engagement **M** = 1.73	During Chromebook Engagement **M** = 3.27	On average, how many days per week did students spend using Chromebooks on the following activities? Completing Classwork.	+1.54
Before Chromebook Engagement **M** = 0.55	During Chromebook Engagement **M** = 2.09	On average, how many days per week did students spend using Chromebooks on the following activities? Watching Video Lectures.	+1.54
Before Chromebook Engagement **M** = 0.55	During Chromebook Engagement **M** = 1.18	On average, how many days per week did students spend using Chromebooks on the following activities? Discussion.	+0.63
Before Chromebook Engagement **M** = 1.91	During Chromebook Engagement **M** = 3.45	On average, how many days per week did students spend using Chromebooks on the following activities? In-class Assignments.	+1.54
Before Chromebook Engagement **M** = 0.09	During Chromebook Engagement **M** = 1.00	On average, how many days per week did students spend using Chromebooks on the following activities? Note-taking.	+0.91
Before Chromebook Engagement **M** = 0.55	During Chromebook Engagement **M** = 1.36	On average, how many days per week did students spend using Chromebooks on the following activities? Free Time.	+0.81

As shown in Table 11, survey respondents' answers were quite different in some categories when looking at responses prior to the one-to-one implementation and during the one-to-one implementation. Of the eighteen relationships among categories, sixteen had a positive mean growth when looking at before and during implementation, while only two had a mean regression when looking at before and during the implementation.

Much of the growth in mean among the categories is not as significant as the researcher expected. For example, the mean for the question regarding the speed of available internet connect at school only increased by 0.73, and went from **M**=2.36 before implementation and **M**=3.09 during implementation. The corresponding categories went from fair to adequate. The researcher expected the mean for during implementation to be at least good (**M** > 4), not adequate since a one-to-one device implementation requires more than adequate internet speed to be truly successful.

The mean for the question concerning the reliability of the internet connection at school surprised the researcher as well. While the mean did increase by 1.00, the mean only went from **M**=1.91 before implementation to **M**=2.91 during implementation. The corresponding categories went from poor to fair. The researcher expected the mean for during implementation to be at least good (**M** > 4) since a one-to-one device implementation requires a higher reliability of internet connection than a non-one-to-one program.

Interviews

Once each interview was transcribed by Rev Speech-to-Text Services, the researcher used a combination of Patton's (2002) general guidelines, Lincoln and Guba's (1985) constant comparative technique, and Saldaña's (2013) coding method to identify

emergent main ideas and themes. The researcher used content analysis to read through the transcripts, and make comments in the margins (Patton, 2002). The content analysis revealed patterns or themes that were color coded using the constant comparative technique (Saldaña, 2013). The researcher utilized Lincoln and Guba's (1985) constant comparative technique to code the smallest piece of information possible. Five recurring themes emerged from the interview data: professional development, implementation, teacher beliefs about technology, one-to-one program at Sample School, and teaching and learning.

Professional Development. Question seven from the interview questions asked each responded to consider the professional development activities and programs created to support teachers prior to and during the implementation of the one-to-one devices being in the classroom for the 2020-2021 school year. All respondents said that Sample School provided professional development; however, three respondents went into further detail and described the professional development they received for the implementation. Respondent one said a one-day session was provided during the summer prior to implementation in which administration showed teachers how to set up a Google Classroom and record videos. Respondent two said Sample School provided professional development on Google Classroom that was very basic, and beyond that, programs were found by teachers throughout the school year. Respondent three said there were not enough professional development opportunities provided by the school.

Implementation. Respondents stated that students received a Chromebook, charger, carrying case, and flash drive and were expected to take the device to every class and charge it at night so it was ready for the next day. Per administration, all assignments

were to be posted in Google Classroom, the learning management system (LMS) chosen by Sample School.

Respondents varied when asked about the purpose of the one-to-one program; however, their responses were connected to the COVID-19 pandemic. The following summarizes all respondents' answers to the purpose of implementing the one-to-one device program: equity between virtual and on-site students, reduction of potential transmission of COVID by not having physical copies of assignments, new opportunities with new programs, and to limit interruptions in learning due to COVID-19 quarantines.

When asked if any criteria were given by administration at Sample School to determine the success of the one-to-one program, all respondents responded with no. Respondent four further explained that the one-to-one implementation was a necessity due to the COVID-19 pandemic, not an attempt at success.

Respondents did not elaborate much when asked about any expectations and/or policies for student device usage during implementation. Respondents stated that students were expected to bring their Chromebooks and chargers to class everyday with their devices charged and ready to go, which rarely happened. Respondents stated they had to provide extra charging stations in their classrooms and allow students to borrow Chromebooks from the office when they left theirs at home. Additionally, respondents said students were expected to maintain their devices and not access inappropriate material while using them. One respondent said students accessed inappropriate content regularly and, in their classroom, many students' Chromebook screens would shatter due to students not treating them properly. The respondent further stated that there were no

actual consequences for misuse of the device. One respondent said that common sense was an expectation for student device usage during implementation.

Question sixteen from the interview questions asked respondents if Sample School continued or discontinued the one-to-one program after the 2020-2021 school year. All respondents said that Sample School discontinued the program with no reasoning why this occurred. Respondent three further explained that although the program was discontinued, students still had access to a one-to-one device if they were quarantined as long as they requested the device to be checked out.

Teacher Beliefs About Technology. All respondents have experience teaching prior to and during the one-to-one device implementation at Sample School. Two respondents felt as though one-to-one devices are the best configuration in the classroom. Respondent three felt as though having a classroom set of devices is sufficient to use as needed, not a device for students to have access to that goes home with them daily. Respondent four felt as though students need a very narrow ability to access lessons and lesson appropriate material in order to focus on learning.

All four respondents were neutral in believing that more access to technology impacts student achievement. They all stated there are pros and cons to technology. Respondent one believed that if students and teachers were trained properly and teachers could monitor students on the devices, then yes, more access can benefit student achievement; however, if students see technology as a toy rather than a learning tool, more access can hinder student achievement. Respondent three stated that technology can improve student achievement when used correctly, with support and supervision, and with the right age group. It is Respondent three's belief that grades kindergarten through

sixth are too immature to have one-to-one access, but instead, instruction should be delivered primarily in person through direct instruction and hands on learning.

All four respondents had varying answers to the benefits for students in a one-to-one device environment. They believed benefits to students in this environment include: access to information quickly and easily, differentiation, collaboration, equity, engagement, access to instructional materials, parental involvement on the device through the LMS, digital record of student work and/or progress, and access to online tools for students who struggle with reading and writing. Holistically, all four respondents believed that technology in the classroom should be seen as supplemental, not essential to student achievement.

One-to-One Program at Sample School. Prior to one-to-one device implementation, respondents reported that the typical use of Chromebooks in their classrooms were primarily for research. Respondents reported challenges with the one-to-one program at Sample School. Respondent one felt that not being able to mirror students' Chromebook screens to monitor what they were doing, inconsistent Wi-Fi, limited programs, limited professional development, and no true guidance or monitoring from administration presented themselves as challenges. Respondent two and three reported similar challenges to the one-to-one program. They felt that students regularly forgetting to charge their device and using the devices inappropriately were challenges to the one-to-one program. Respondent four felt that keeping students on task and making sure they read the material for the assignment before simply clicking to be done were challenges to the program at Sample School.

Although respondents reported challenges with the one-to-one program at Sample School, they also reported successes with the program. Respondent one believed that Google Classroom was very easy to use, which made the LMS easy to handle, and the program created less paperwork. Respondent two believed that students were quick to learn and having 24/7 access to educational materials made it easier to teach and for students to learn. Respondent three personally gained a number of valuable instructional tools moving forward and believed students became more computer savvy as a result of the program. Respondent four was able to find many valuable teaching material, especially video clips that are still used during instruction even though Sample School discontinued the one-to-one device program.

When reflecting on whether it was worth implementing the one-to-one program during the 2020-2021 school year, all respondents believed that it was worth the implementation; however, their reasoning varied. Respondent one believed the program taught them what does and does not work within their classroom. Respondent two believed it made quarantines a much smoother process and students were more likely to do work that could not be lost unlike paper copies of assignments. Respondent three stated that because of the situation we were thrown into with COVID, it was worth implementing the one-to-one program; however, it should be considered an unintentional experiment with data being collected and analyzed with schools moving on from that point. Respondent four believed that it was necessary due to the COVID-19 pandemic.

Teaching and Learning. All respondents reported changes, both positive and negative, that occurred as a result of the one-to-one program being implemented within their classrooms. Respondent one said that instead of students bringing their textbook,

binder, and a pencil to class, they now came to class prepared if they had their Chromebook, case, and charger. Therefore, the supplies needed for class, both for the teacher and students, was a big change. Respondent one further elaborated that they felt as though they became more of a facilitator instead of a teacher due to how Sample School expected everything to be loaded into the LMS. Videos, notes, and all assignments were expected to be loaded, which took the place of a lot of classroom instruction. Students worked at their own pace on their Chromebooks. Respondent two believed a positive change was the instant feedback and collaboration on assignments that the LMS provided as well as less grading time for the teacher; however, they also reported they felt as though they were doing twice the planning due to teaching a combination of virtual and on-site students, and student misuse of devices took up a lot of their instructional time. Respondent three believed students had to become responsible for a specific device instead of a textbook, notebook, and pencil. Respondent three also felt there was too much time spent during prep planning for both in-person instruction and modifying instruction for virtual students. They reported students would often delete assignments or turn them in blank and felt as though grades went down overall as a result of the one-to-one program within their classroom. Respondent four lost the ability to monitor students' reading and working behaviors that helped monitor and adjust to better fit each students' learning style.

Respondents believed the one-to-one environment changed how students learned and/or the way they taught, both positively and negatively. Respondent one believed students became lazier and more excuse prone due to the one-to-one environment. Students could blame the computer for losing and/or deleting their assignments, which

they did quite frequently. Students also learned how to delete the history on their device, so there was no way to track whether the assignments were ever completed and deleted, or the student just did not do the assignment. Respondent one also reported feeling like a facilitator instead of a teacher due to the set-up of the LMS and expectations set by administration. Respondent two believed the environment made student rely more heavily on devices and it changed the supplements used in class. Paper supplements were replaced with digital supplements. Respondent three stated the blended environment changed how they taught. They felt as though they had more options, but early on in the school year, they switched to paper assignments as often as possible. Respondent three felt that if devices were used less, students would stay more engaged when devices were used for specific reasons in the classroom. Respondent three believed students did not effectively learn though virtual instruction on devices as a whole and overall, learning was more difficult and students' achievement levels decreased. Respondent four believed their teaching partially changed by stating they just exchanged a book for a Chromebook; however, they now have an intro video for every lesson even after Sample School discontinued the one-to-one device program.

Respondents believed student engagement in the learning process was affected in the one-to-one learning environment. Respondents one and four believed that overall, student engagement in the learning process was negatively affected in the one-to-one learning environment. They felt the students did not take learning seriously in this environment. Respondent one said that Sample School did not purchase any programs to prevent students from doing other things they were not supposed to be doing. For example, if students had a PowerPoint to look at while the teacher was going over it,

nothing stopped them from opening a new tab and playing a game. Students were preoccupied in this learning environment. Respondent two believed that student engagement seemed to increase due to access outside of school and more interactive materials; however, there were some students who used the devices as a crutch or for personal entertainment. Respondent four believed that students often got tired of staring at a computer screen all day for each class, but of course there were exceptions. Some students did effectively learn and remain engaged, but not all students did.

Research Question One

Is there a significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of cohort, year, gender, and socioeconomic status?

a. H_0: There is no significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of grade, gender, and socioeconomic status.

b. H_1: There is a significant difference in reading achievement scores among students before and after implementing a one-to-one student device program, considering factors of grade, gender, and socioeconomic status.

According to the data, there was a statistically significant difference among student achievement on the Renaissance Star Reading assessment before and after implementing a one-to-one student device program based on of year and cohort; however, there was no statistically significant difference when gender and socioeconomic status were considered in the research study. When looking at the data, it is important to view the findings holistically. The one-to-one device program can be seen as a variable

that affected student achievement; however, it is not the single variable affecting student reading achievement in this study.

Since $p < .05$ for both cohort compared to growth on the Renaissance Star Reading assessment and year compared to growth on the Renaissance Star reading assessment, the null hypothesis was partially rejected. The alternative hypothesis was also partially rejected due to $p > .05$ for both gender compared to growth on the Renaissance Star Reading assessment and socioeconomic status compared to growth on the Renaissance Star Reading assessment. The data showed the only two factors related to student reading achievement on the Renaissance Star Reading assessment were growth and year, while gender and socioeconomic status were both considered unrelated to achievement in this study.

The mean growth for student achievement decreased from the 2018-2019 school year to the 2020-2021 school year. During the 2018-2019 school year, Sample School did not have a one-to-one device program. The program was implemented during the 2020-2021 school year. The data showed that from two years prior to implementation to the year of the one-to-one device implementation, student achievement decreased. Again, it is important to view the findings holistically. The one-to-one device program was seen as a variable that affected student achievement; however, it was not the single variable affecting student reading achievement in this study.

Research Question Two

Is there a relationship between teachers' perceptions of technology and student reading achievement?

a. H_0: There is no impact on student reading achievement when teachers have positive perceptions of technology and student reading achievement.

b. H_1: There is a positive impact on student reading achievement when teachers have positive perceptions of technology and student reading achievement.

Figure 5 shows survey respondents' answers before and during the one-to-one implementation on a question related to the degree of technology access preparing students for assessments. According to the decrease in mean by -0.36, it is possible to conclude that respondents felt as though more access to technology does not help prepare students for assessments; therefore, simply making access to technology easier does not equate to student achievement.

Figure 5

Excerpt from Table 11

Before Technology in Education **M** = 2.18	During Technology in Education **M** = 1.82	Please rate the degree to which you believe access to technology helped prepare students for assessments such as ACT Aspire, Renaissance STAR Assessments, etc.	-0.36

Interview data supported the information found in Figure 5. From their interview, respondent two said that technology is a valuable tool for teachers and students. When used correctly and age appropriately, technology can improve engagement, understanding, and student achievement. Unfortunately, we cannot control all factors, supervise students on computers at all times, and because of the pandemic, computers were the only option for students. Ultimately, it was detrimental to their learning.

Figure 6 and Figure 7 show survey respondents' perceptions of technology as a tool to impact student achievement before and during one-to-one device implementation. According to Figure 6 and Figure 7, the results stayed mostly the same regardless of

whether the response was prior to or during implementation. Six respondents somewhat agreed that technology was a tool that impacted student achievement both prior to and during implementation. Four respondents strongly agreed that technology is a tool that impacts student achievement both prior to and during implementation. Prior to implementation, one respondent somewhat disagreed that technology was a tool that impacted student achievement, while one respondent was undecided during implementation whether technology was a tool that impacted student achievement.

Figure 6

Technology as a Tool Survey Results Prior to Implementation

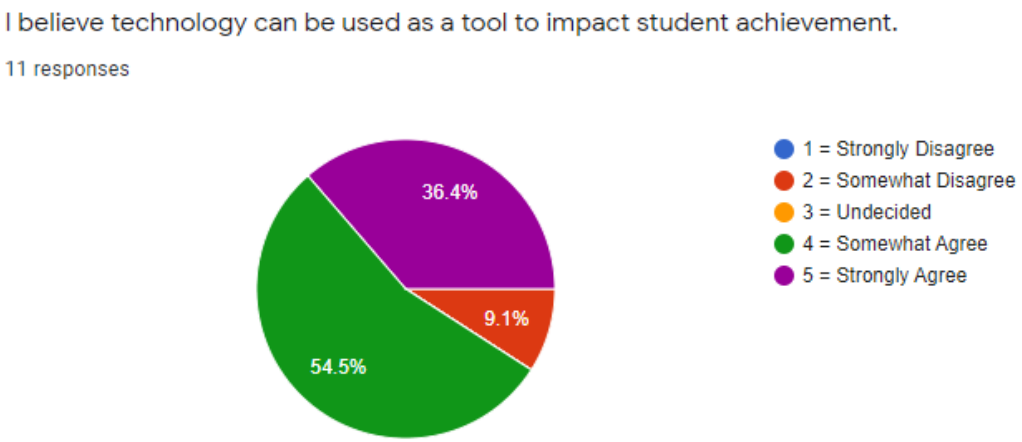
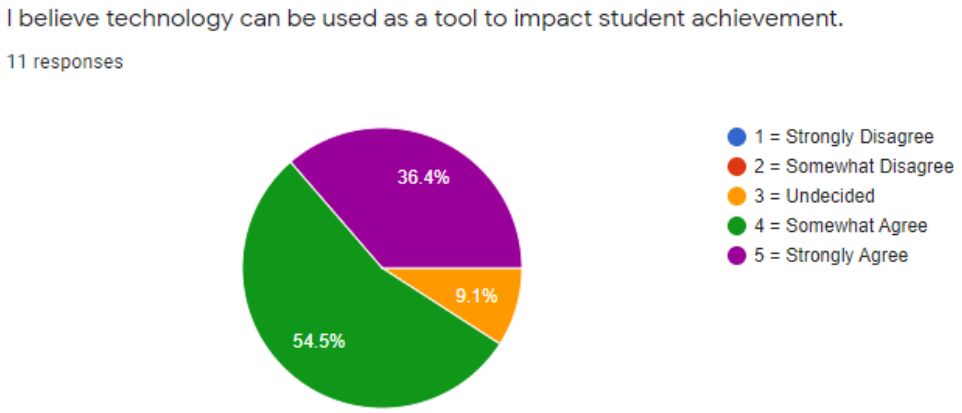


Figure 7

Technology as a Tool Survey Results During Implementation



While survey respondents seemingly had positive perceptions regarding technology used as a tool to impact student achievement, the archived student reading achievement data showed that the device alone did not positively impact student achievement. In fact, student achievement decreased on the Renaissance Star Reading assessment when one-to-one devices were implemented as opposed to two years prior to device implementation.

Figure 8 and Figure 9 show survey respondents' perceptions of technology's role in education before and during one-to-one device implementation. According to Figure 8 and Figure 9, results were identical prior to and during implementation. Six respondents believed technology in education was a supplemental tool, while five respondents believed technology in education was an essential tool.

Figure 8

Role of Technology Perception Prior to Implementation

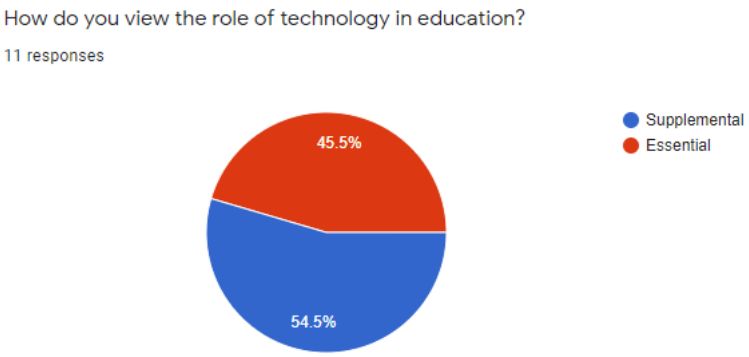
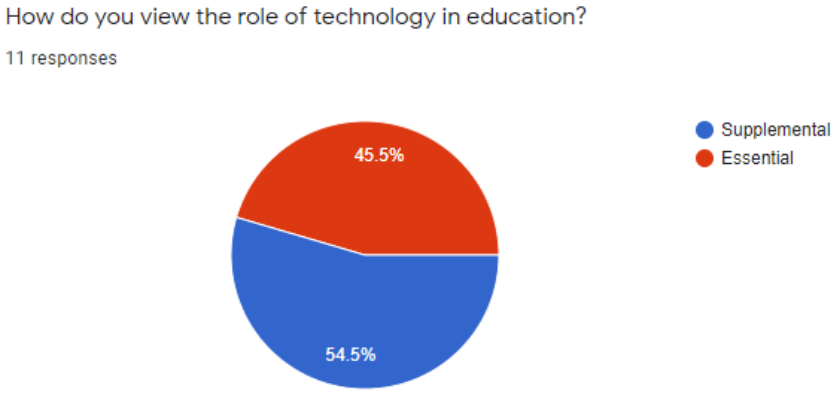


Figure 9

Role of Technology Perception During Implementation



The data from Figure 8 and Figure 9 was significant because it shows how strikingly different respondents view technology as a tool in education. Those who view it as a supplemental tool are less likely to rely upon the device to teach, while those who view it as an essential tool are more likely to rely upon the device to teach. Therefore, this creates facilitators instead of teachers within the classroom. Holistically, all four interview respondents believed that technology in the classroom should be seen as supplemental, not essential to student achievement.

Both the null and alternative hypotheses were rejected for research question two since student achievement on the Renaissance Star Reading assessment regressed; however, the data suggested that perception and technology are variables that can potentially influence student achievement.

Research Question Three

Are there specific factors of a one-to-one technology implementation that impact student reading achievement?

a. H_0: There are no specific factors of a one-to-one technology implementation that positively impact student reading achievement.
b. H_1: There are specific factors of a one-to-one technology implementation that positively impact student reading achievement.

Both the survey and interview results indicate a strong relationship between professional development related to one-to-one technology and student achievement. Figure 10 and Figure 11 show a stark difference between survey respondents' answers concerning technology professional development prior to and during the one-to-one device implementation. Prior to implementation, six respondents felt they were not provided enough technology-related professional development, while five felt as though they were provided enough technology-related professional development. During implementation, nine respondents felt they were not provided enough technology-related professional development, while only two felt as though they were provided enough technology-related professional development. Lack of technology-related professional development for educators at Sample School is one factor that helped to explain why

student achievement on the Renaissance Star Reading assessment dropped during the 2020-2021 school year.

Figure 10

Technology Professional Development Prior to Implementation

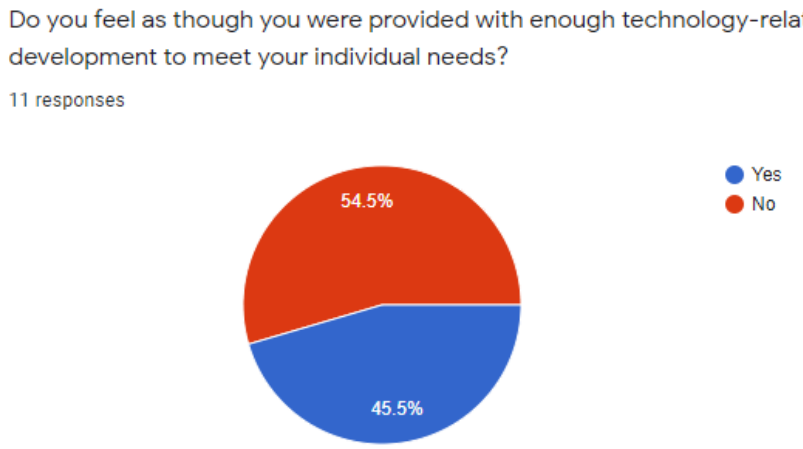
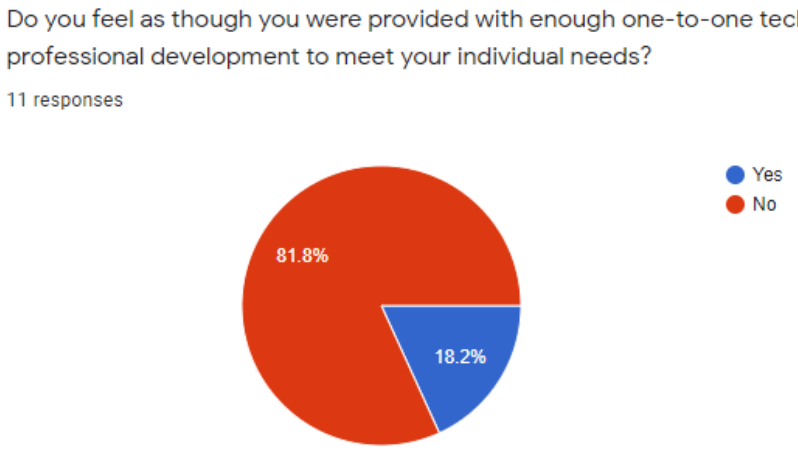


Figure 11

Technology Professional Development During Implementation



Lack of technology-related support at Sample School was a second factor that helped explain why student achievement on the Renaissance Star Reading assessment dropped during the 2020-2021 school year. Figure 12 shows teacher perceptions of

technology access prior to and during the one-to-one implementation as measured by the survey.

Figure 12

Technology Access Survey Results

Before Technology Access **M=** 2.36	During Technology Access **M** = 3.09	The speed of available internet connection at your school.	+0.73
Before Technology Access **M** = 1.91	During Technology Access **M** = 2.91	The reliability of the internet connection at your school.	+1.00
Before Technology Access **M** = 2.82	During Technology Access **M** = 3.18	The technology support available to you at your school.	+0.36

While the mean scores increased from prior to and during implementation regarding the speed and reliability of internet as well as the technology support available, they did not increase as much as the researcher anticipated. Perceptions went from poor and fair prior to implementation to fair and adequate during implementation. Fair and adequate internet and support during one-to-one device implementation is not sufficient to implement and sustain this type of change.

Implementation fidelity is a third factor of a one-to-one technology implementation that impacted student reading achievement. “Implementation fidelity is the degree to which programs are implemented as intended by the program developers” (Carroll et al., 2007, p. 1). Interview data suggested Sample School did not implement the one-to-one device program with fidelity. At the end of each interview, the researcher asked each respondent if there was any other information they would like to share. Respondent one said they needed more support and training from the school. One professional development session was insufficient to prepare for such a large change. There was no follow up, which made implementation disastrous and not uniform. Respondent two said that technology was a valuable tool for teachers and students.

Respondent four said that it was a grueling experience, but wished Sample School had been able to work out the bugs and continue with the program, especially since we still cannot share classroom sets of books due to COVID-19 restrictions.

Both the null and alternative hypotheses were rejected for research question three since student achievement on the Renaissance Star Reading assessment regressed; however, the data suggested certain variables including– professional development, technology support, and implementation fidelity can potentially influence student reading achievement.

Chapter V: Conclusions

This final chapter, Chapter Five, will further examine the results in Chapter Four and discuss the potential implications the findings could have on technology in education. The results will be discussed using the following themes, which are derivatives from the three research questions: one-to-one technology and student achievement, teacher perception of technology and student achievement, and one-to-one technology implementation factors that impact student achievement. Utilizing these themes, the three research questions will be addressed, and the findings further examined. Chapter Five will conclude with a discussion regarding limitations of the study and recommendations for how further research could contribute to the body of literature.

A mixed-methods study was conducted in order to investigate a relationship between one-to-one device programs and student reading achievement. Additionally, this study utilized survey and interview data to determine whether additional factors can contribute to student reading achievement. This study was designed to investigate if there was a connection between a one-to-one computer initiative and improved reading achievement as measured by the Renaissance Star Reading assessment by analyzing student performance data two years prior to the initiative and the year following the initiative. It was designed to compare two years of archived Star Reading assessment data when one-to-one devices were not implemented with Star Reading assessment data at the end of the first year of one-to-one device implementation. Essentially, does access to technology through a one-to-one initiative show a measurable change in students' performance on the Renaissance Star Reading assessment, a norm-referenced reading assessment, in grades six, seven, and eight?

The researcher anticipated there to be a relationship between one-to-one technology and student reading achievement, but it is imperative to understand that a relationship between the two variables does not fundamentally equate causation. According to McClung (2019):

> Due to the complexity of student achievement, it was expected that it would be difficult to measure the impact of all potential variables related to student achievement. Additional factors can contribute to achievement data that have no relationship to technology. (p. 24)

One-to-One Technology and Student Achievement

When analyzed using IBM SPSS Statistics software, archived Renaissance Star Reading student achievement data provided evidence that student reading achievement regressed during implementation of the one-to-one device program from two years prior to implementation to the year during implementation. Data showed a statistically significant difference between school year and student reading growth as well as cohort and student reading growth, but there was not a statistically significant difference when socioeconomic status and gender were taken into consideration.

Due to the timing of this study, it is nearly impossible to say that the technology alone caused the regression. The impact COVID-19 had upon the second and third year of archived Renaissance Star Reading student achievement data is unknown. COVID-19 is a factor that must be considered when looking at the results of this study. During the 2020-2021 school year, the year of the one-to-one device implementation at Sample School, many students chose the option to remain home and learn virtually, students and faculty were quarantined for various amounts of time with many being quarantined more

than once, some students and faculty did not have internet access at home, and some students faced a lack of learning support at home. All of these factors must be taken into account when looking at the decline in student reading achievement during the time period this study is centered upon.

Teacher Perception of Technology and Student Achievement

Studies solely relying upon student achievement data to determine whether a variable such as technology impacts student achievement leave out the human element, so the researcher included teacher perceptions through a survey and interviews. Data collected from the survey and interviews showed most teachers at Sample School holistically viewed technology as supplemental, not essential to learning and teachers' perception changed to a more negative view during implementation when asked if teachers believed access to technology helped prepare students for assessments such as the Renaissance Star Reading assessment and ACT Aspire. Before implementation, **M** = 2.18, which equated to technology fairly preparing students for these types of assessments; however, during implementation, **M** = 1.84, which equated technology poorly preparing students for these types of assessments.

Before the one-to-one device implementation, **M** = 4.18 when teachers were asked if technology can be used as a tool to impact student achievement. This mean score indicated the majority somewhat agree with this statement, with **M** = 5.0 being the highest score indicating all teachers strongly agreed with the statement. During the one-to-one device implementation, the mean went up to **M** = 4.27, which indicated more teachers believed technology to be a tool to impact student achievement during the implementation than prior to implementation.

Before the one-to-one device implementation, **M** =2.55 when teachers were asked if they believed access to more technology is beneficial to student success. This mean score indicated the majority believe access to more technology is somewhat harmful to student success with **M** = 1 being the lowest score indicating teachers believed more access to be harmful and **M** = 5 being the highest score indicating teachers believed more access to be beneficial to student success. During the one-to-one device implementation, the mean went slightly down to **M** = 2.45, which indicated fewer teachers believed technology to be somewhat harmful to student success.

All interview respondents were neutral in believing that more access to technology impacts student achievement. All teachers stated there are pros and cons to technology. One teacher believed that if students and teachers are trained properly and teachers can monitor students on the devices, then yes, more access can benefit student achievement; however, if students see technology as a toy rather than a learning tool, more access can hinder student achievement. Another teacher stated that technology can improve student achievement when used correctly, with support and supervision, and with the right age group. This teacher further explained that when used correctly and age appropriately, technology can improve engagement, understanding, and student achievement. Unfortunately, we cannot control all factors, supervise students at all times on computers, and because of the pandemic, computers were the only option for students. Ultimately, it was detrimental to their learning. A third teacher believed that grades kindergarten through sixth are too immature to have one-to-one access, but instead, instruction should be delivered primarily in person through direct instruction and hands on learning.

While the majority teachers in this study agreed both before and after implementation that technology is a tool that can impact student achievement, data suggested that these teachers do not believe technology to be the only tool that can impact student achievement. This was an important finding to this study because it emphasized the importance of viewing student achievement as multi-faceted and not solely affected by one single variable; however, technology can be a variable that is a part of the larger puzzle that altogether makes up student achievement.

One-to-One Technology Implementation Factors that Impact Student Achievement

As previously discussed in Chapter Two, the literature review emphasized the importance of one-to-one device implementation being conducted correctly. Professional development, technical support, and implementation fidelity are three of the factors discussed in the literature review that can affect teachers' perceptions and classroom implementation of a one-to-one device program. The researcher found all three factors – professional development, technical support, and implementation fidelity – to be substantial limitations to the implementation of the one-to-one device program at Sample School.

Unfortunately, the data from this study suggested that professional development was inadequate; therefore, teachers were inadequately prepared for implementation of the one-to-one device program. Before one-to-one device implementation, only six of eleven survey respondents did not believe they were provided with enough technology-related professional development to meet their needs; however, during one-to-one device implementation, nine of eleven respondents did not believe they were provided with enough technology-related professional development to meet their needs. The rise in the

number of teachers who believed they were not provided adequate technology-related professional development during implementation can be contributed to the lack of technology-related professional development provided by Sample School before implementation of the one-to-one device program. Interview data suggested the lack of technology-related professional development provided by Sample School as well. Inadequate teacher training can be a factor that caused student achievement to regress. When teachers are not prepared, students receive inconsistent levels of instruction based upon teachers' individual levels of technological proficiency.

Interview data suggested teachers believed there to be technology-related obstacles when trying to associate technology with student achievement. For example, interview respondents felt that not being able to mirror students' Chromebook screens to monitor what they were doing, inconsistent Wi-Fi, students regularly forgetting to charge their device, and keeping students on task with the online assignment were all reported challenges to the one-to-one program at Sample School. Additionally, the survey reported that teachers did not believe there to be adequate internet speed, internet availability, and technology support at Sample School to support the one-to-one device implementation.

When asked if any criteria were given by administration at Sample School to determine the success of the one-to-one program, all respondents responded with no. Respondent four further explained that the one-to-one implementation was a necessity due to the COVID-19 pandemic, not an attempt at success. At the end of each interview, the researcher asked each respondent if there was any other information they would like to share. One teacher stated that one professional development session was insufficient to prepare for such a large change. There was no follow up, making implementation

disastrous and not uniform. Another teacher said that it was a grueling experience, but wished Sample School had been able to work out the bugs and continue the program. Lack of implementation fidelity at Sample School led to teacher frustration and non-uniform implementation of the devices in classrooms. Students did not receive the same degree of instruction with devices, which possibly can be attributed to the decline in student achievement on the Renaissance Star Reading assessment.

Limitations

Several limitations presented themselves throughout this study, many of which can be tied to the COVID-19 pandemic shutting down on-campus learning in Arkansas in March 2020. The extent to which COVID-19 has impacted education is still widely unknown, proving it difficult to make generalizations about how the pandemic affected this study.

Another limitation to this study is the sample size. The researcher was limited on the amount of archived Renaissance Star Reading student achievement available due to a large number of students being virtual learners during the 2020-2021 school year. These virtual learners did not come to campus to take the Renaissance Star Reading test, so data is unavailable for these students. The researcher was able to use 227 students' archived reading achievement data from Sample School. The researcher received 11 responses to the survey from certified staff members at Sample School who taught both prior to and during the one-to-one device implementation. Four interviews were conducted with certified staff members at Sample School who taught both prior to and during the one-to-one device implementation. The researcher had other interviews scheduled, but the resurgence of the COVID-19 pandemic during the 2021-2022 school year caused the

researcher to have to cancel due to time limitations. Several interview candidates were under quarantine during their scheduled interview day and time. The sample size is too small to make any generalizations based upon the data.

Limitations related to technology are prevalent in this study. The level of training individual classroom teachers provided to students regarding how to use the one-to-one device for educational purposes could have greatly affected how different classes utilized and viewed the devices. The level of training and readiness of teachers to implement instruction that would prepare students for the Renaissance Star Reading assessment is a limitation that can factor into whether students were prepared to take the norm-referenced assessment. The assessment is adaptive and increases with difficulty from the beginning, middle, to end of the school year, so if teachers were not implementing instruction that increased with difficulty as well, students may have performed better on the assessment at the beginning of the year versus the end of the year. The varying levels one one-to-one device implementation by teachers within Sample School is a limitation that had the potential to help or hinder student achievement. Not all teachers at Sample School implemented the one-to-one devices with fidelity. Some teachers were more comfortable with technology, while others were not and did not feel as though they received proper training to make such a shift in such a short amount of time. Finally, Sample School dissolved the one-to-one technology initiative the year following implementation, so it is not possible to compare more than one year of data after the implementation of the initiative.

Recommendations for Future Research

While the three research questions guiding this study did provide valuable insight which can contribute to the body of research surrounding technology and student achievement, there are three recommendations for future studies that could further the body of research on the topic. The first recommendation would be to include another measure of student reading achievement, such as the norm-referenced ACT Aspire assessment. The researcher could not utilize this data since Arkansas did not test using the ACT Aspire during the 2019-2020 school year. Additional measures of student reading achievement would allow for richer insight to better understand achievement comprehensively instead of basing conclusions on one source. Within an educational setting, collecting and combining data from more than one source can help provide implications for teaching and learning. Using a variety of sources can also help to diminish the effects of researcher bias. The more sources of data a researcher can collect and analyze, the more credible the findings will be.

The second recommendation would be to further analyze how devices were utilized within each classroom during implementation of a one-to-one device program. With the majority of survey and interview respondents believing Sample School did not provide enough technology-related professional development during implementation of the one-to-one device program, this analysis could potentially provide evidence for specific technology-related professional development. Additionally, observing teachers implementing a one-to-one device program could provide observational data to support professional development needs both individually and collectively.

A final recommendation would be to carry out this study in a school setting where the school did not discontinue the one-to-one device program after only one year of implementation. Since Sample School discontinued the program, it is impossible to examine student achievement results after the 2020-2021 school year to determine the long-term impact of the one-to-one device implementation.

Conclusion

Technology alone cannot predict student achievement or success; however, it is a variable that can contribute to both if implemented correctly and with fidelity. Rather than being a cure-all or silver bullet, one-to-one programs may simply amplify what is already occurring in classrooms whether it be for the better or the worst (Goodwin, 2011; McClung, 2019). Technology alone will not accomplish student learning, unless factors such as how a teacher uses technology, its alignment to the curriculum and professional development supporting teachers are taken into consideration" (Kulow, 2014, p. 48-48). There are a multitude of variables to consider when determining the effectiveness of technology on achievement (Maschmann, 2015; McClung, 2019). These variables include administrative support, professional development, attitude towards integration, etc. (McClung, 2019, p. 24).

Technology should be seen as a tool and not a replacement of best practices for teaching in the classroom (Harris et al., 2016). Technology does not replace the teacher in the classroom (Deloatch et al., 2014; Harris et al., 2016). Teaching does not become easier because of technology. "Teachers must continue to be learners themselves to produce the best teaching methods and introduce technology that works for their

classroom and the specific needs of their students" (Harris et al., 2016, p. 380). According to Olson (2016):

> The technology is only as good as the teachers who are utilizing it in the classroom. How and to what extent the technology is incorporated into the classroom is key to the success of the program. The curriculum must be solid and drive the technology. The technology cannot drive the curriculum. (p. 28)

Specific to this study, the COVID-19 pandemic is a factor that may play an integral role in the relationship between one-to-one technology and student reading achievement. Educators, political leaders, and other stakeholders are using the phrase learning loss to describe the effect COVID-19 has had upon students in schools (Donnelly & Patrinos, 2021; Dorn et al., 2020; Engzell et al., 2021). The results of this study add to the literature that students, in fact, experienced learning loss due to effects of the COVID-19 pandemic.

Educators at Sample School were tasked an immense responsibility to implement a one-to-one device program without adequate implementation tools such as professional development, technology support, and implementation guidelines and goals. Depending upon individual teacher's proficiency and view of technology in education, students received inconsistent levels of instruction during the one-to-one device implementation. These inconsistent levels could be an additional factor that led to the decline in student reading achievement during implementation of the one-to-one device program.

When teachers lack technology skills, or they have high levels of discomfort with technology, they become hesitant to attempt technology related activities in the classroom, which reduces the frequency of technology use, thus leading to difficulties

with student engagement and technology implementation (Elizondo, 2018). For this reason, professional development must provide teachers with a framework "to develop problem-based lessons that utilize real-world resources, student collaboration, and the use of computer tools to reach solutions" (Lowther et al., 2003, p. 25). "A higher level of comfort with the one-to-one device points to a stronger probability that the teacher will effectively use the device with the students" (Olson, 2016, p. 12). According to Kulow (2014):

> Integrating technology can be a positive tool if it is used wisely, used in authentic situations, and promotes critical thinking and problem-solving skills. However, a teacher who is not wise to using technology or feels forced into using it will most likely not succeed at using this tool with students. (p. 43).

Reflection

When I first had the idea to pursue my Doctoral degree, I could never have fathomed an unprecedented pandemic would completely change my pathway to get to the finish line. Prior to schools closing in March 2020, I had already chosen a topic for my dissertation, which now seems ironic. I knew that I wanted to focus upon technology and student achievement, but little did I know how much technology would not only change the way I teach within the walls of my own classroom, but how I learned as a Doctoral student as well.

Now that I am at the end of this study, I truly realize that technology is just a piece of the larger picture that stakeholders refer to as student achievement. Technology alone is not a catalyst that can perpetuate 21st century learning. We are living in a period where technology is a catalyst of change in school districts across the country, yet the

true educational advantage of having more access to technology remains unclear. I personally believe that technology can play a role in perpetuating student success, but only if the technology is seen as supplementary to the teaching and learning processes. Teachers must remain strong in their pedagogy and not let technology replace best practice within the classroom.

Educational leaders who want to implement a one-to-one device program must look at previous research before embarking upon this type of change with no plan. Implementation factors such as professional development, technology-related support, and implementation goals must all be considered and planned before deciding to implement such a program within their schools. Technology is a large monetary investment for a school, but we are also investing in the futures of all of our students who walk into our classrooms on a daily basis. If we are only thinking about the monetary investment and not a human investment as well, we are not seeing the larger picture.

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Appendices

Appendix A: IRB Approval

ARKANSAS TECH UNIVERSITY

OFFICE OF RESEARCH AND SPONSORED PROGRAMS

1509 North Boulder Avenue
Administration, Room 207
Russellville, AR 72801

479-880-4327
www.atu.edu

November 24, 2021

To Whom It May Concern:

The Arkansas Tech University Institutional Review Board has approved the IRB application for Jennifer Hignite's proposed research, entitled "Student Engagement with One-to-One Devices in the Classroom and Reaching Achievement." The Institutional Review Board used an expedited review procedure under 45 CFR 46.110 (7).

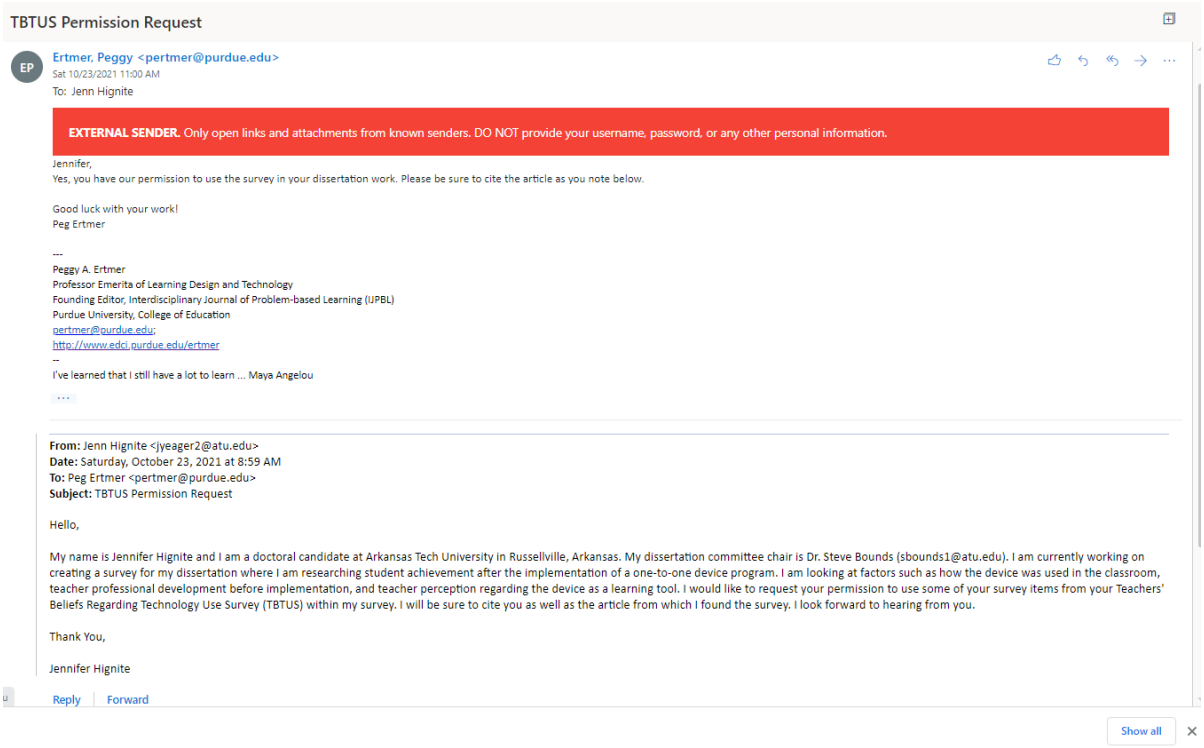
Please note that in the event that any of the parameters of the study change, the researcher may be required to submit an amended application.

Please proceed with your research. We wish you success with this endeavor.

Sincerely,

Melissa Darnell, Ph.D.
Institutional Review Board
Arkansas Tech University

Appendix B: Ertmer Survey Permission Request



TBTUS Permission Request

EP

Ertmer, Peggy <pertmer@purdue.edu>
Sat 10/23/2021 11:00 AM
To: Jenn Hignite

EXTERNAL SENDER. Only open links and attachments from known senders. DO NOT provide your username, password, or any other personal information.

Jennifer,
Yes, you have our permission to use the survey in your dissertation work. Please be sure to cite the article as you note below.

Good luck with your work!
Peg Ertmer

Peggy A. Ertmer
Professor Emerita of Learning Design and Technology
Founding Editor, Interdisciplinary Journal of Problem-based Learning (IJPBL)
Purdue University, College of Education
pertmer@purdue.edu;
http://www.edci.purdue.edu/ertmer
--
I've learned that I still have a lot to learn ... Maya Angelou

From: Jenn Hignite <jyeager2@atu.edu>
Date: Saturday, October 23, 2021 at 8:59 AM
To: Peg Ertmer <pertmer@purdue.edu>
Subject: TBTUS Permission Request

Hello,

My name is Jennifer Hignite and I am a doctoral candidate at Arkansas Tech University in Russellville, Arkansas. My dissertation committee chair is Dr. Steve Bounds (sbounds1@atu.edu). I am currently working on creating a survey for my dissertation where I am researching student achievement after the implementation of a one-to-one device program. I am looking at factors such as how the device was used in the classroom, teacher professional development before implementation, and teacher perception regarding the device as a learning tool. I would like to request your permission to use some of your survey items from your Teachers' Beliefs Regarding Technology Use Survey (TBTUS) within my survey. I will be sure to cite you as well as the article from which I found the survey. I look forward to hearing from you.

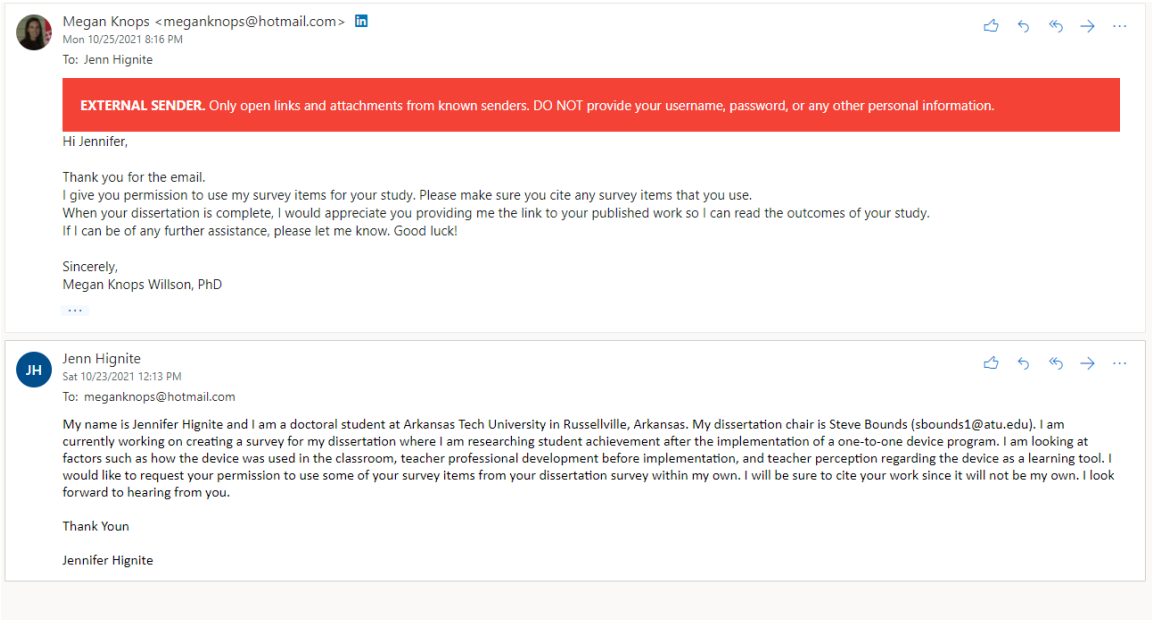
Thank You,

Jennifer Hignite

Reply | Forward

Show all

Appendix C: Knops Survey Permission Request



Megan Knops <meganknops@hotmail.com>
Mon 10/25/2021 8:16 PM
To: Jenn Hignite

EXTERNAL SENDER. Only open links and attachments from known senders. DO NOT provide your username, password, or any other personal information.

Hi Jennifer,

Thank you for the email.
I give you permission to use my survey items for your study. Please make sure you cite any survey items that you use.
When your dissertation is complete, I would appreciate you providing me the link to your published work so I can read the outcomes of your study.
If I can be of any further assistance, please let me know. Good luck!

Sincerely,
Megan Knops Willson, PhD

Jenn Hignite
Sat 10/23/2021 12:13 PM
To: meganknops@hotmail.com

My name is Jennifer Hignite and I am a doctoral student at Arkansas Tech University in Russellville, Arkansas. My dissertation chair is Steve Bounds (sbounds1@atu.edu). I am currently working on creating a survey for my dissertation where I am researching student achievement after the implementation of a one-to-one device program. I am looking at factors such as how the device was used in the classroom, teacher professional development before implementation, and teacher perception regarding the device as a learning tool. I would like to request your permission to use some of your survey items from your dissertation survey within my own. I will be sure to cite your work since it will not be my own. I look forward to hearing from you.

Thank Youn

Jennifer Hignite

Appendix D: Google Form Survey Informed Consent Email

You are being invited to participate in a research study. You will be provided with information on the research project, your role, and the associated risks and benefits of the research. Your participation is completely voluntary and you may withrdrawl as a participant at any point during the study. It is important that you fully understand what is being asked of you, the research study, and ask questions if necessary in order to make an informed decision.

You have been selected to participate in a Google Form survey as part of research being collected for a dissertation entitled, "STUDENT ENGAGEMENT WITH ONE-TO-ONE DEVICES IN THE CLASSROOM AND READING ACHIEVEMENT." You have been selected since you taught in the district prior to and during the 2020-2021 academic school year. This dissertation is being conducted by Jennifer Hignite, a graduate student at Arkansas Tech University in Russellville, Arkansas. The purpose of the study is to examine the relationship between one-to-one technology in the classroom and student reading achievement. The study will also examine teachers' perceptions of technology as to whether one-to-one technology is supplemental or essential within the classroom.

I understand that if I agree to participate in this study, I will be asked to complete an anonymous online Google Form survey that contains questions related to my experience with one-to-one technology both prior to the 2020-2021 school year and during the 2020-2021 school year. I am aware that my participation is voluntary and may be withdrawn at any time. As an incentive to complete the survey and participate in a future interview, I will receive a $10 Walmart gift certificate upon completion of the survey. I understand that participation in the survey does not equate participation in the interview. Participation in the interview is optional and solely my own decision.

I understand that the intended benefits of this study include an increased knowledge of one-to-one devices and an impact on student achievement as well as critical insight into how the Covid-19 pandemic affected educators and students during the 2020-2021 school year. If I have any additional questions concerning this study, I may contact Jennifer Hignite at jyeager2@atu.edu or Dr. Steve Bounds at sbounds1@atu.edu.

I understand that all information collected for this study will be kept confidential and the researcher will ensure anonymity of my information at all times. I understand that the Google Form survey is not collecting my email address, so my identity will be protected. I understand that if I wish to participate in the interview after the survey, the researcher will use pseudonyms when reporting the interview data to protect my identity.

I understand that by clicking the link below and participating in the Google Form survey, I am providing my informed consent to participate in this study.

Please go to the following link to complete the survey.
https://forms.gle/ov3J5BKjpLPPHMpb8

Thank You,

Jennifer Hignite (jyeager2@atu.edu)
Cell Number: (479) 477-0783

Appendix E: Google Form Survey

One-to-One Device Survey

Your response to this survey is 100% anonymous. Email addresses are not being collected. This survey has two parts: One-to-one technology use prior to the 2020-2021 school year, and one-to-one technology use during the 2020-2021 school year.

You will be compensated with a $10 Walmart gift card upon completion of this survey.

* Required

Pre-Covid (Prior to 2020-2021 School Year)

This section will ask questions about your technology use prior to the 2020-2021 school year. Please answer the questions to the best of your knowledge based upon technology use in your classroom prior to the 2020-2021 school year.

1. Was your school considered a one-to-one device school? (Students had access to a Chromebook at all times throughout the day.) *

   Mark only one oval.

   - ◯ Yes
   - ◯ No

2. Please briefly describe the Chromebook configuration that was used in your school if your school was not considered to be a one-to-one school. You may skip this question if your school was considered to be a one-to-one school.

   _____

Technology Access

Please choose the answer that best describes the following technology availability/access at your school prior to the 2020-2021 school year.

3. Do you believe your school had adequate access to technology for all students? *

   Mark only one oval.

   - ◯ Yes
   - ◯ No

4. The devices available to you and your students for instruction. *

   Mark only one oval.

   - ◯ 1 = Poor
   - ◯ 2 = Fair
   - ◯ 3 = Adequate
   - ◯ 4 = Good
   - ◯ 5 = Excellent

5. The software/apps available to your and your students at school. *

   Mark only one oval.

   - ◯ 1 = Poor
   - ◯ 2 = Fair
   - ◯ 3 = Adequate
   - ◯ 4 = Good
   - ◯ 5 = Excellent

6. The speed of the available internet connection at your school. *

Mark only one oval.

- ◯ 1 = Poor
- ◯ 2 = Fair
- ◯ 3 = Adequate
- ◯ 4 = Good
- ◯ 5 = Excellent

7. The reliability of the internet connection at your school. *

Mark only one oval.

- ◯ 1 = Poor
- ◯ 2 = Fair
- ◯ 3 = Adequate
- ◯ 4 = Good
- ◯ 5 = Excellent

8. The technology support available to you at your school. *

Mark only one oval.

- ◯ 1 = Poor
- ◯ 2 = Fair
- ◯ 3 = Adequate
- ◯ 4 = Good
- ◯ 5 = Excellent

Technology Professional Development

Please choose the answer that best describes the following technology professional development opportunities at your school prior to the 2020-2021 school year.

9. How would you describe your confidence in your technological abilities? *

Mark only one oval.

- ◯ 1 = Poor
- ◯ 2 = Fair
- ◯ 3 = Adequate
- ◯ 4 = Good
- ◯ 5 = Excellent

10. How would you describe the number of technology-related professional development opportunities provided to you by your school? *

Mark only one oval.

- ◯ 1 = Poor
- ◯ 2 = Fair
- ◯ 3 = Adequate
- ◯ 4 = Good
- ◯ 5 = Excellent

11. How would you describe the number of technology-related professional development opportunities provided to you by your educational cooperative? *

Mark only one oval.

- 1 = Poor
- 2 = Fair
- 3 = Adequate
- 4 = Good
- 5 = Excellent

12. Do you feel as though you were provided with enough technology-related professional development to meet your individual needs? *

Mark only one oval.

- Yes
- No

13. Please describe the type of professional development that you felt would've been most beneficial to your implementation of technology within your classroom.

_____

Barriers to Technology Integration

14. Of the following barriers related to technology integration, rank the barriers from the most challenging barrier (1) to the least challenging barrier (7). *There should only be one column checked for each row.* *

Check all that apply.

	1	2	3	4	5	6	7
Time required to create lesson plans that involve technology.	☐	☐	☐	☐	☐	☐	☐
Time required for the teacher to learn how to use the technology.	☐	☐	☐	☐	☐	☐	☐
Classroom time required to teach students to use the technology.	☐	☐	☐	☐	☐	☐	☐
Lack of availability of devices (Chromebooks, laptops, computers, etc.)	☐	☐	☐	☐	☐	☐	☐
Lack of professional development opportunities related to technology use.	☐	☐	☐	☐	☐	☐	☐
Lack of applicability of the technology-related professional development that is provided.	☐	☐	☐	☐	☐	☐	☐
Lack of Instructional Technology (IT) personnel to help with technology issues.	☐	☐	☐	☐	☐	☐	☐

Teacher Self-Efficacy

To what degree do you agree or disagree with the following statements:

15. I am confident that I can use technology as an effective teaching tool. *

Mark only one oval.

- ◯ 1 = Strongly Disagree
- ◯ 2 = Somewhat Disagree
- ◯ 3 = Undecided
- ◯ 4 = Somewhat Agree
- ◯ 5 = Strongly Agree

16. I am confident that I can use technology effectively during large group instruction. *

Mark only one oval.

- ◯ 1 = Strongly Disagree
- ◯ 2 = Somewhat Disagree
- ◯ 3 = Undecided
- ◯ 4 = Somewhat Agree
- ◯ 5 = Strongly Agree

17. I am confident that I can develop effective lessons that incorporate technology. *

Mark only one oval.

- ◯ 1 = Strongly Disagree
- ◯ 2 = Somewhat Disagree
- ◯ 3 = Undecided
- ◯ 4 = Somewhat Agree
- ◯ 5 = Strongly Agree

18. I am confident that I can use technology effectively to teach content across the curriculum. *

Mark only one oval.

- ◯ 1 = Strongly Disagree
- ◯ 2 = Somewhat Disagree
- ◯ 3 = Undecided
- ◯ 4 = Somewhat Agree
- ◯ 5 = Strongly Agree

19. I am confident that I can overcome difficulties using technology in the classroom (time, scheduling, accountability). *

Mark only one oval.

- ◯ 1 = Strongly Disagree
- ◯ 2 = Somewhat Disagree
- ◯ 3 = Undecided
- ◯ 4 = Somewhat Agree
- ◯ 5 = Strongly Agree

20. I am confident that I can manage the grouping of students while using technology as a teaching tool. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

21. I am confident that I can meet the challenges of technology integration. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

Teacher Beliefs about Technology

To what degree do you agree or disagree with the following statements:

22. Devices can provide instruction suited to individual student's needs. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

23. Device use promotes student-centered learning and self-discovery. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

24. Devices can enhance my students' creativity and imagination. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

25. Devices can engage my students in collaborative work. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

26. I am making more time now than I used to for students to do more of the thinking, analyzing, interpreting, inferring, and synthesizing of information because of devices. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

27. I am getting quite good at recognizing worthy uses of new technologies while avoiding technologies that do not deliver much educational value. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

28. I believe technology can be used as a tool to impact student achievement. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

Chromebook Engagement

29. Please rate the degree to which students were engaged with Chromebooks in your classroom. *

Check all that apply.

- [ ] 1 - not at all engaged
- [ ] 2 - slightly engaged
- [ ] 3 - somewhat engaged
- [ ] 4 - very engaged
- [ ] 5 - extremely engaged

30. On average, how many days per week (during school) did you involve students' use of Chromebooks in your classroom? *

Mark only one oval.

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

31. On average, how many hours per week might students have spent using technology at home to complete assignments from your class? *

Mark only one oval.

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

32. On average, how many days per week did students spend using Chromebooks on the following activities? *

Check all that apply.

	0	1	2	3	4	5
Email	☐	☐	☐	☐	☐	☐
Educational Games (Kahoot, Quizziz, Blooket, etc.)	☐	☐	☐	☐	☐	☐
Projects (Google Slides, etc.)	☐	☐	☐	☐	☐	☐
Typing (Google Docs, etc.)	☐	☐	☐	☐	☐	☐
Listening to Music	☐	☐	☐	☐	☐	☐
Video Conferencing (Zoom, Google Meets, etc.)	☐	☐	☐	☐	☐	☐
Online Research	☐	☐	☐	☐	☐	☐
Completing Classwork	☐	☐	☐	☐	☐	☐
Watching a Video Lecture	☐	☐	☐	☐	☐	☐
Discussion	☐	☐	☐	☐	☐	☐
In-class Assignments	☐	☐	☐	☐	☐	☐
Homework	☐	☐	☐	☐	☐	☐
Note-taking	☐	☐	☐	☐	☐	☐
Free Time	☐	☐	☐	☐	☐	☐

33. How prepared were your students in the following areas: *

Check all that apply.

	Not Prepared	Poorly Prepared	Neutral	Adequately Prepared	Well Prepared
Using Technology for Communication	☐	☐	☐	☐	☐
Using Technology for Expressing Themselves Artistically	☐	☐	☐	☐	☐
Using Technology for Working with Others (Collaboration)	☐	☐	☐	☐	☐
Using Technology for Research	☐	☐	☐	☐	☐
Using Technology for Analyzing and Problem Solving	☐	☐	☐	☐	☐
Using Technology for Evaluating Online Resources	☐	☐	☐	☐	☐
Using Technology Skills in General	☐	☐	☐	☐	☐

Technology in Education

34. How do you view the role of technology in education? *

Mark only one oval.

- ◯ Supplemental
- ◯ Essential

35. How do you feel technology impacted your job as an educator? *

Check all that apply.

- ☐ Technology Made My Job Much Easier.
- ☐ Technology Made My Job Somewhat Easier.
- ☐ Technology Neither Made My Job Easier Nor Harder.
- ☐ Technology Made My Job Somewhat Harder.
- ☐ Technology Made My Job Much Harder.

36. Please rate the degree to which you believe technology impacted the quality of your instruction. *

Check all that apply.

- ☐ Technology Positively Affected the Quality of My Instruction
- ☐ Technology Somewhat Positively Affected the Quality of My Instruction
- ☐ Technology Neither Positively Nor Negatively Affected the Quality of My Instruction
- ☐ Technology Somewhat Negatively Affected the Quality of My Instruction
- ☐ Technology Negatively Affected the Quality of My Instruction

37. Please rate the degree to which you believe technology impacted student learning. *

Check all that apply.

- ☐ Technology Positively Impacted Student Learning
- ☐ Technology Somewhat Positively Impacted Student Learning
- ☐ Technology Neither Positively Nor Negatively Impacted Student Learning
- ☐ Technology Somewhat Negatively Impacted Student Learning
- ☐ Technology Negatively Impacted Student Learning

38. Please rate the degree to which you consider the access to more technology as beneficial for student success. *

Check all that apply.

- [ ] Access to More Technology is Harmful to Student Success
- [ ] Access to More Technology is Somewhat Harmful to Student Success
- [ ] Access to More Technology is Neither Harmful Nor Beneficial to Student Success
- [ ] Access to More Technology is Somewhat Beneficial to Student Success
- [ ] Access to More Technology is Beneficial to Student Success

39. Please rate the degree to which you believe access to technology helped prepare students for assessments such as ACT Aspire, Renaissance STAR Assessments, etc. *

Check all that apply.

- [ ] Access to Technology Does Not Prepare Students for Assessments
- [ ] Access to Technology Somewhat Prepares Students for Assessments
- [ ] Access to Technology Neither Hinders Nor Prepares Students For Assessments
- [ ] Access to Technology Prepares Students for Assessments

40. Please use this opportunity to offer any opinion and/or advice about your experience with Chromebooks prior to the 2020-2021 (one-to-one device) school year. Your comments will be anonymous and much appreciated.

_____

Post-Covid (2020-2021 School Year Only)

This section will ask questions about your technology use during the 2020-2021 school year only. Please answer the questions to the best of your knowledge based upon technology use in your classroom during the 2020-2021 school year.

41. Was your school considered a one-to-one device school? (Students had access to a Chromebook at all times throughout the day.) *

Mark only one oval.

- ◯ Yes
- ◯ No

42. Please briefly describe the Chromebook configuration that was used in your school if your school was not considered to be a one-to-one school. You may skip this question if your school was considered to be a one-to-one school.

_____

Technology Access

Please choose the answer that best describes the following technology availability/access at your school prior to the 2020-2021 school year.

43. Do you believe your school had adequate access to technology for all students? *

Mark only one oval.

- ◯ Yes
- ◯ No

44. The devices available to you and your students for instruction. *

Mark only one oval.

- ◯ 1 = Poor
- ◯ 2 = Fair
- ◯ 3 = Adequate
- ◯ 4 = Good
- ◯ 5 = Excellent

45. The reliability of the internet connection at your school. *

Mark only one oval.

- ◯ 1 = Poor
- ◯ 2 = Fair
- ◯ 3 = Adequate
- ◯ 4 = Good
- ◯ 5 = Excellent

46. The speed of the available internet connection at your school. *

Mark only one oval.

- ◯ 1 = Poor
- ◯ 2 = Fair
- ◯ 3 = Adequate
- ◯ 4 = Good
- ◯ 5 = Excellent

47. The software/apps available to your and your students at school. *

Mark only one oval.

- ◯ 1 = Poor
- ◯ 2 = Fair
- ◯ 3 = Adequate
- ◯ 4 = Good
- ◯ 5 = Excellent

48. The technology support available to you at your school. *

Mark only one oval.

- ◯ 1 = Poor
- ◯ 2 = Fair
- ◯ 3 = Adequate
- ◯ 4 = Good
- ◯ 5 = Excellent

Technology Professional Development

Please choose the answer that best describes the following one-to-one technology professional development at your school during the 2020-2021 school year.

49. How would you describe your confidence in your technological abilities in a one-to-one classroom? *

Mark only one oval.

- 1 = Poor
- 2 = Fair
- 3 = Adequate
- 4 = Good
- 5 = Excellent

50. How would you describe the number of one-to-one technology-related professional development opportunities provided to you by your school? *

Mark only one oval.

- 1 = Poor
- 2 = Fair
- 3 = Adequate
- 4 = Good
- 5 = Excellent

51. How would you describe the number of one-to-one technology-related professional development opportunities provided to you by your educational cooperative? *

Mark only one oval.

- 1 = Poor
- 2 = Fair
- 3 = Adequate
- 4 = Good
- 5 = Excellent

52. Has the professional development you received for one-to-one device implementation increased your integration of technology into your instruction? *

Mark only one oval.

- Yes
- No

53. How would you describe the overall usefulness and applicability of one-to-one technology-related professional development you have experienced? *

Mark only one oval.

- 1 = Poor
- 2 = Fair
- 3 = Adequate
- 4 = Good
- 5 = Excellent

54. Do you feel as though you were provided with enough one-to-one technology-related professional development to meet your individual needs? *

Mark only one oval.

- Yes
- No

55. How would you describe the overall usefulness and applicability of one-to-one technology-related professional development you have experienced? *

Mark only one oval.

- 1 = Poor
- 2 = Fair
- 3 = Adequate
- 4 = Good
- 5 = Excellent

56. Please describe the type of professional development that you felt would've been most beneficial to your implementation of one-to-one technology within your classroom.

Barriers to Technology Integration

57. Of the following barriers related to technology integration, rank the barriers from the most challenging barrier (1) to the least challenging barrier (7). *There should only be one column checked for each row.* *

Check all that apply.

	1	2	3	4	5	6	7
Time required to create lesson plans that involve technology.	☐	☐	☐	☐	☐	☐	☐
Time required for the teacher to learn how to use the technology.	☐	☐	☐	☐	☐	☐	☐
Classroom time required to teach students to use the technology.	☐	☐	☐	☐	☐	☐	☐
Lack of availability of devices (Chromebooks, laptops, computers, etc.)	☐	☐	☐	☐	☐	☐	☐
Lack of professional development opportunities related to technology use.	☐	☐	☐	☐	☐	☐	☐
Lack of applicability of the technology-related professional development that is provided.	☐	☐	☐	☐	☐	☐	☐
Lack of Instructional Technology (IT) personnel to help with technology issues.	☐	☐	☐	☐	☐	☐	☐

Teacher Self-Efficacy

To what degree do you agree or disagree with the following statements:

58. I am confident that I can use one-to-one technology as an effective teaching tool. *

Mark only one oval.

- ◯ 1 = Strongly Disagree
- ◯ 2 = Somewhat Disagree
- ◯ 3 = Undecided
- ◯ 4 = Somewhat Agree
- ◯ 5 = Strongly Agree

59. I am confident that I can use one-to-one technology effectively during large group instruction. *

Mark only one oval.

- ◯ 1 = Strongly Disagree
- ◯ 2 = Somewhat Disagree
- ◯ 3 = Undecided
- ◯ 4 = Somewhat Agree
- ◯ 5 = Strongly Agree

60. I am confident that I can develop effective lessons that incorporate one-to-one technology. *

Mark only one oval.

- ◯ 1 = Strongly Disagree
- ◯ 2 = Somewhat Disagree
- ◯ 3 = Undecided
- ◯ 4 = Somewhat Agree
- ◯ 5 = Strongly Agree

61. I am confident that I can use one-to-one technology effectively to teach content across the curriculum. *

Mark only one oval.

- ◯ 1 = Strongly Disagree
- ◯ 2 = Somewhat Disagree
- ◯ 3 = Undecided
- ◯ 4 = Somewhat Agree
- ◯ 5 = Strongly Agree

62. I am confident that I can overcome difficulties using one-to-one technology in the classroom (time, scheduling, accountability). *

Mark only one oval.

- ◯ 1 = Strongly Disagree
- ◯ 2 = Somewhat Disagree
- ◯ 3 = Undecided
- ◯ 4 = Somewhat Agree
- ◯ 5 = Strongly Agree

63. I am confident that I can manage the grouping of students while using one-to-one technology as a teaching tool. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

64. I am confident that I can meet the challenges of one-to-one technology integration. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

Teacher Beliefs about Technology

To what degree do you agree or disagree with the following statements:

65. Devices can provide instruction suited to individual student's needs. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

66. Device use promotes student-centered learning and self-discovery. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

67. Devices can enhance my students' creativity and imagination. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

68. Devices can engage my students in collaborative work. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

69. I am making more time now than I used to for students to do more of the thinking, analyzing, interpreting, inferring, and synthesizing of information because of devices. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

70. I am getting quite good at recognizing worthy uses of new technologies while avoiding technologies that do not deliver much educational value. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

71. I believe technology can be used as a tool to impact student achievement. *

Mark only one oval.

- 1 = Strongly Disagree
- 2 = Somewhat Disagree
- 3 = Undecided
- 4 = Somewhat Agree
- 5 = Strongly Agree

Chromebook Engagement

72. Please rate the degree to which students were engaged with Chromebooks in your classroom. *

Check all that apply.

- [ ] 1 - not at all engaged
- [ ] 2 - slightly engaged
- [ ] 3 - somewhat engaged
- [ ] 4 - very engaged
- [ ] 5 - extremely engaged

73. On average, how many days per week (during school) did you involve students' use of Chromebooks in your classroom? *

Mark only one oval.

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

74. On average, how many hours per week might students have spent using technology at home to complete assignments from your class? *

Mark only one oval.

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

75. On average, how many days per week did students spend using Chromebooks on the following activities? *

Check all that apply.

	0	1	2	3	4	5
Email	☐	☐	☐	☐	☐	☐
Educational Games (Kahoot, Quizziz, Blooket, etc.)	☐	☐	☐	☐	☐	☐
Projects (Google Slides, etc.)	☐	☐	☐	☐	☐	☐
Typing (Google Docs, etc.)	☐	☐	☐	☐	☐	☐
Listening to Music	☐	☐	☐	☐	☐	☐
Video Conferencing (Zoom, Google Meets, etc.)	☐	☐	☐	☐	☐	☐
Online Research	☐	☐	☐	☐	☐	☐
Completing Classwork	☐	☐	☐	☐	☐	☐
Watching a Video Lecture	☐	☐	☐	☐	☐	☐
Discussion	☐	☐	☐	☐	☐	☐
In-class Assignments	☐	☐	☐	☐	☐	☐
Homework	☐	☐	☐	☐	☐	☐
Note-taking	☐	☐	☐	☐	☐	☐
Free Time	☐	☐	☐	☐	☐	☐

76. How prepared were your students in the following areas: *

Check all that apply.

	Not Prepared	Poorly Prepared	Neutral	Adequately Prepared	Well Prepared
Using Technology for Communication	☐	☐	☐	☐	☐
Using Technology for Expressing Themselves Artistically	☐	☐	☐	☐	☐
Using Technology for Working with Others (Collaboration)	☐	☐	☐	☐	☐
Using Technology for Research	☐	☐	☐	☐	☐
Using Technology for Analyzing and Problem Solving	☐	☐	☐	☐	☐
Using Technology for Evaluating Online Resources	☐	☐	☐	☐	☐
Using Technology Skills in General	☐	☐	☐	☐	☐

Technology in Education

77. How do you view the role of technology in education? *

Mark only one oval.

- ◯ Supplemental
- ◯ Essential

78. How do you feel technology impacted your job as an educator? *

Check all that apply.

- ☐ Technology Made My Job Much Easier.
- ☐ Technology Made My Job Somewhat Easier.
- ☐ Technology Neither Made My Job Easier Nor Harder.
- ☐ Technology Made My Job Somewhat Harder.
- ☐ Technology Made My Job Much Harder.

79. Please rate the degree to which you believe technology impacted the quality of your instruction. *

Check all that apply.

- ☐ Technology Positively Affected the Quality of My Instruction
- ☐ Technology Somewhat Positively Affected the Quality of My Instruction
- ☐ Technology Neither Positively Nor Negatively Affected the Quality of My Instruction
- ☐ Technology Somewhat Negatively Affected the Quality of My Instruction
- ☐ Technology Negatively Affected the Quality of My Instruction

80. Please rate the degree to which you believe technology impacted student learning. *

Check all that apply.

- ☐ Technology Positively Impacted Student Learning
- ☐ Technology Somewhat Positively Impacted Student Learning
- ☐ Technology Neither Positively Nor Negatively Impacted Student Learning
- ☐ Technology Somewhat Negatively Impacted Student Learning
- ☐ Technology Negatively Impacted Student Learning

81. Please rate the degree to which you consider the access to more technology as beneficial for student success. *

Check all that apply.

- [ ] Access to More Technology is Harmful to Student Success
- [ ] Access to More Technology is Somewhat Harmful to Student Success
- [ ] Access to More Technology is Neither Harmful Nor Beneficial to Student Success
- [ ] Access to More Technology is Somewhat Beneficial to Student Success
- [ ] Access to More Technology is Beneficial to Student Success

82. Please rate the degree to which you believe access to technology helped prepare students for assessments such as ACT Aspire, Renaissance STAR Assessments, etc. *

Check all that apply.

- [ ] Access to Technology Does Not Prepare Students for Assessments
- [ ] Access to Technology Somewhat Prepares Students for Assessments
- [ ] Access to Technology Neither Hinders Nor Prepares Students For Assessments
- [ ] Access to Technology Prepares Students for Assessments

83. Please use this opportunity to offer any opinion and/or advice about your experience with Chromebooks during the 2020-2021 (one-to-one device) school year. Your comments will be anonymous and much appreciated.

84. Would you be willing to participate in a personal interview regarding professional development and one-to-one device implementation for the 2020-2021 school year? (The interview should last no longer than 30-45 minutes. The interview will take place at a time and location that are mutually agreed upon.) If "Yes," please provide your name and the easiest way for the researcher to contact you. (You will be automatically entered to win one of two $50 Walmart gift cards). If "No," please type "no" followed by your initials and submit your form now. Thank you for your time.

Survey questions adapted with permission from Megan Knops (2017) and Park & Ertmer (2007).

Appendix F: Interview Informed Consent

You are being invited to particpate in a research study. You will be provided with inforation on the research project, your role, and the associated risks and benefits of the research. Your participation is completely voluntary and you may withrdraw as a participant at any point during the study. It is important that you fully understand what is being asked of you, the research study, and ask questions if necessary in order to make an informed decision.

On behalf of myself and my study, thank you for your willingness to participate in a short interview. Your participation in the interview will guarantee you a spot in the drawing for one of two $50 Walmart gift cards.

I agree to participate in an interview as part of research being collected for a dissertation entitled, "STUDENT ENGAGEMENT WITH ONE-TO-ONE DEVICES IN THE CLASSROOM AND READING ACHIEVEMENT." This dissertation is being conducted by Jennifer Hignite, a graduate student at Arkansas Tech University in Russellville, Arkansas. The purpose of the study is to examine the relationship between one-to-one technology in the classroom and student reading achievement. The study will also examine teachers' perceptions of technology as to whether one-to-one technology is supplemental or essential within the classroom.

I understand that if I agree to participate in this study, I will be asked questions related to my experience with one-to-one technology both prior to the 2020-2021 school year and during the 2020-2021 school year. I am aware that my participation is voluntary and may be withdrawn at any time. I understand that participation in the interview is optional and solely my own decision.

I understand that the intended benefits of this study include an increased knowledge of one-to-one devices and an impact on student achievement as well as critical insight into how the Covid-19 pandemic affected educators and students during the 2020-2021 school year. If I have any additional questions concerning this study, I may contact Jennifer Hignite at jyeager2@atu.edu or Dr. Steve Bounds at sbounds1@atu.edu.

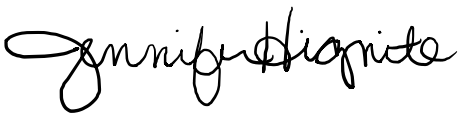
I understand that all information collected for this study will be kept confidential and the researcher will ensure anonymity of my information at all times. I understand that the interview will not contain questions related to my name, so my identity will be protected. I understand that the researcher will use pseudonyms when reporting the interview data to protect my identity.

In addition to agreeing to participate in the interview, I also consent to having the interview audio recorded.

_____ _____

Signature of Participant Date

Thank You,



Jennifer Hignite (jyeager2@atu.edu)
Cell Number: (479) 477-0783

Appendix G: Interview Questions

1. Are you familiar with the Dr. Ruben Puentedura's SAMR model?
2. Prior to the one-to-one device implementation during the 2020-2021 school year, can you explain a typical use of Chromebooks/laptops in your classroom?
3. Can you describe how your district implemented the one-to-one program for the 2020-2021 school year?
4. What was the purpose of the one-to-one program?
5. Were criteria given to determine the success of the one-to-one program?
6. Were there any expectations and/or policies regarding student device usage?
7. What were some of the professional development activities and programs created to support teachers prior to and during the implementation of the one-to-one devices being in the classroom (2020-2021)?
8. Describe some of the challenges with the one-to-one program.
9. Describe some of the successes with the one-to-one program.
10. Do you believe your students were prepared to transition to a one-to-one program?
11. Please share the changes that occurred as a result of the one-to-one program in your classroom.
12. As an educator with experience using technology both prior to and during the one-to-one device program, what do you believe is the best device configuration and why?
13. As an educator, do you believe that more access to technology can impact student achievement? Why or why not?
14. What are some of the benefits for students in a one-to-one device environment?
15. Holistically, do you see a device used in the classroom as supplemental or essential to student achievement?

16. Did your district continue or discontinue the one-to-one program after the 2020-2021 school year?
17. Did the one-to-one environment change how students learn or the way you teach?
18. Was student engagement in the learning process affected in the one-to-one environment? If yes, how so?
19. Was it worth implementing the one-to-one program?
20. Is there any other information you'd like to share?

Appendix H: Parent/Guardian Permission Form

Dear Parent/Guardian,

My name is Jennifer Hignite and I am a doctoral student at Arkansas Tech University in Russellville, Arkansas. I am researching the relationship between one-to-one technology in the classroom and student reading achievement as measured by archived student achievement data from the Renaissance Star Reading assessment. The study will also examine teachers' perceptions of technology as to whether one-to-one technology is supplemental or essential within the classroom.

Your child will not be asked any questions, nor will they be asked to participate in any additional assessment(s). The Renaissance Star Reading assessment is administered to your child in the Fall, Winter, and Spring each school year. The archived student reading achievement data will be collected from the 2018-2019, 2019-2020, and 2020-2021 school years. Your child's name or any other information that could be used to identify him or her directly or indirectly will **NOT** be used for any part of this study.

Because you are the parent or legally authorized representative of a child identified to participate in the study, I am seeking your permission to access and use your child's archived achievement data from the Renaissance Star Reading assessment. Involvement in the study is voluntary, so you may decide whether to let your child participate or not. I will only collect the archived achievement results from the indicated school years with your permission.

If you have any questions about the study, please feel free to email me at any time at jyeager2@atu.edu.

Thank You,

Jennifer Hignite

Please fill out and return to your child's current literacy teacher by _____. You may keep the top portion for your own records.

__ I grant permission for my child _____ to participate in this study.

__ I do not grant permission for my child _____ to participate in this study.

_____ _____

Parent/Guardian Signature **Date**