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NO MORE PENCILS, NO MORE BOOKS:  
A ONE-TO-ONE DIGITAL DEVICE IMPLEMENTATION 
AND ITS EFFECT ON THE DIGITAL DIVIDE

by

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ABSTRACT

Digital divide scholars suggest that the speed and scope of the digital precipitates unique catalysts of societal inequity, which public schools have long sought to mitigate by democratizing access to education. This study investigates a one-to-one digital device program in one of the largest public school districts in the United States, and its impact on literacy achievement in varying socioeconomic climates and the attitudes and beliefs of marginalized parent populations. Previous studies on one-to-one programs are largely qualitative, and existing quantitative studies suffer too many variables for reliable conclusions. Through a mixed methods design, this study centers on a highly-standardized implementation across 200,000 students, controlling for variables plaguing existing work, and offering a breadth of comparable data previously unavailable. The quantitative phase analyzed standardized test scores over seven years surrounding the implementation, and the qualitative phase analyzed survey data gathered from parents in varying socioeconomic climates. These analyses found no statistically significant change in the literacy achievement gap between low and high-income communities, and no concerns unique to any particular parent demographic, negating concerns of some scholars that one-to-one programs might exacerbate the digital divide. This study also found that parents—regardless of language, income, or educational background—generally believe this program eased the transition to remote learning when schools closed due to Covid-19 in 2020, and will better prepare students for a digitized workplace. Recommendations are made for existing and future digital learning and one-to-one laptop programs, and suggestions are offered for future research in or tangential to the fields of digital learning and digital inequity.
I dedicate this dissertation to my daughter, Elle, the greatest gift I have ever received. My most fervent prayer is that I have modeled for you a life of love, passion, curiosity, truth, continuous growth, and commitment to excellence. May you find a cause that truly moves your soul, and may you pursue it joyfully, and with every fiber of your being. I love you always.
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CHAPTER 1: INTRODUCTION

In 2013, a large public school district in Florida, consistently ranked one of the ten largest in the United States, introduced an initiative described as a “digital learning program” and “an immersive and interactive learning experience” with a small cohort of three elementary schools (grades K-5), three middle schools (grades 6-8), and one high school (grades 9-12). The primary marker of this program is the one-to-one digital device rollout that has placed school-issued laptops in the hands of all students in participating schools (About LaunchED, n.d.).

In tandem with the distribution of a digital device to every student in each school, the Curriculum and Instruction department in this district (now called the Curriculum and Digital Learning department) also launched a plan to streamline the delivery of standardized curriculum modules. The goal of this plan was for students at all schools, regardless of socioeconomic designation, to engage in learning the same curricular skills and content through the same mode of instructional delivery at the same time throughout the school year, to the greatest extent possible given obvious natural variations in teacher experience and skill. To this end, the district’s Curriculum and Digital Learning department webpage houses what are known as CRMs—Curriculum Resource Materials—that outline the plan that all teachers of a particular course across the district should follow in their classroom. For many courses, specific daily lesson plans are provided so that a teacher in one high school should conceivably be presenting the same lesson about the same text on the same day in any given year. And while district level personnel may claim these CRMs are to be viewed as guidance and not mandate, the reality is often not so flexible. Having personally worked for the district office as a Literacy Coach, I have walked through Reading classrooms of many high schools to conduct what were known as
fidelity checks, classroom visits designed to ensure that teachers were on the right page of the right lesson, on the right day. Of course, as a humanistic enterprise with countless variables including teacher skill, teacher experience, student preparedness, etc., teaching does not allow for absolutely perfect adherence to standardized plans. However, this sharp aim at standardization in this district—while perhaps stifling to passionate educators—does provide a relatively controlled environment for the assessment of how a digital device program may affect students in varying socioeconomic climates.

Now that this one-to-one digital learning plan has been fully implemented in all district schools, the use of textbooks of the ink and parchment variety has been essentially eliminated, as almost all textbooks have been digitized and made accessible only online. Work—including multi-step mathematical proofs, graphed solutions, and art projects—must be submitted digitally. This district’s website does note that parents have the option to opt out of digital learning for their child, but at the same time advises that some digital learning activities will simply not have a non-digital alternative. Opting out of digital learning may be offered (LaunchED Family Technology Handbook, n.d.), but it is also prudent to consider that the developmental state of high school students renders them highly unlikely to select a modality of study that identifies them as different from their peers.

This plan has been rolled out to additional schools each year since 2013, starting with the remainder of the county’s high schools, then the middle schools, and originally set to be completed with implementation in all elementary schools by the start of the 2021-2022 school year. As of Fall 2019, all traditional middle and high schools were active participants, meaning every middle and high school student of a traditional brick and mortar school in this district had
been assigned a school-issued laptop, and in addition, 50 elementary schools were active participants. However, the COVID-19 pandemic, which forced all students in this district into remote learning in March of 2020, required that the timeline for the elementary school rollout be advanced. At the close of the 2019-2020 school year, this district had distributed 142,816 digital devices to students (Anonymous, 2020), and as of Fall 2020, all students in this district in grades kindergarten through 12 had received a school-issued device.

This school district is of course implementing this one-to-one program at least in part to ensure that all students have equal access to digital tools, in line with the belief that “equitable access to high quality learning environments is the social justice issue of our time” (Evans, 2018). The parent handbook for the program identifies four possible models of devices that may be issued to students, and further specifies that all will be equipped with at least a keyboard, microphone, webcam, and an 11-inch screen, with most also including a touchscreen and convertible keyboard. The rationale for students receiving the same digital device is to make instruction more efficient and facilitate a leveled playing field. A quick internet search reveals that the laptop most high school students receive from the district, the Lenovo ThinkPad 11e, retails for anywhere from approximately $300 to $900, depending on variable features such as storage and processing speed (LaunchED Family Technology Handbook, n.d.). This program was implemented with a forward-thinking, social justice-oriented intent, but the actual impact of such a program on the divide between the haves and the have nots must be investigated. It does stand to reason that the provision of such expensive technology to students who cannot afford to purchase it will aid in closing the achievement gap, but “more technology is not necessarily better; how resources are used matters most” (Martin et al., 2017, p. 253), so problematic
concerns surrounding this program and other similar programs must be investigated. Research has been done on both digital learning and one-to-one devices, but most studies suffer from limitations caused by variances in the student population, the curriculum, and the devices used (Stone, 2016; Warschauer, 2005; Warschauer et al., 2014; Zhang et al., 2015), leaving a gap in the research that can be addressed by a study of this particular program because of the standardization in curricular materials and delivery, and the size of the student body in which it has been implemented.

Research Problem

Qualifying for free or reduced-price breakfast and/or lunch is a common indicator that a student is part of a low-income family, and 69% of students in this district qualified for this meal price reduction in 2018-2019 (Anonymous, 2019). According to data from the United States’ Bureau of Labor Statistics (BLS), income and level of education attained generally share a direct correlation, so students from homes with lower incomes likely have parents who are less educated than those who come from homes with moderate or high incomes. Income has also been proven to affect how technology is used in the homes of students by parents of differing socioeconomic status (Swindle et al., 2014), with low-income, Hispanic immigrant children often being the least prepared for school and a digitized curriculum (Marrapodi, 2016; Moon & Hofferth, 2018), a group strongly and increasingly represented in Florida and this particular school district. So, though all students may be learning on and bringing home the same device, the preparedness of students to use this device may not equitable. Such is also the concern about
the preparedness of parents and guardians in all homes to support their children in this digitized learning.

There is a good deal of research about the digital divide, the opportunity and achievement gap that exists between socioeconomic groups in a world saturated with digitized information and the devices required to make use of that information. There is also a good deal of research about what students want from digital learning environments, and about what students and teachers or administrators have liked and disliked about one-to-one digital device and/or laptop programs that have been designed to bridge the digital divide. Existing research on student and educator perspectives on digital learning environments elucidates findings on matters such as the need and potential for a greater sense of safety and opportunity to make mistakes in learning (Hrepich, 2016; Lehman & Conceição, 2014; Zheng et al., 2014), the need and potential for increased engagement and authenticity of content and assignments (Cook & Davie, 2017; Gee, 2013; Mayer, 2009/2020), concern about the dependability of devices and infrastructure (Stone, 2016), and concern about increasingly unrealistic student expectations of teachers (Bailie, 2014; Linton & Journell, 2015). The literature on these topics will be reviewed in the next chapter, but there is a need for more research that focuses specifically on the relationship between one-to-one device programs and student achievement across socioeconomic variables, and on the impact of such one-to-one programs on student learning experiences in the home across varying family income levels (Stone, 2016). Based on the limited research that has been done, some findings point to the possibility that one-to-one laptop learning programs may exacerbate the digital divide (Warschauer, 2005; Zhang et al., 2015), so though well-intended, it is possible that the one-to-one program that is the focus of this study, and other similar programs, could actually
impair the academic progress of the very students it most aims to benefit. Nonetheless, wide variances in previous studies have left a gap in the research (Warschauer et al., 2014) that this particular study can address, due to the scope and standardization of the implementation in the target district.

**Research Questions**

As such, the following research questions are set forth in this study:

1. How does the one-to-one digital device program in this district impact student scores on the FCAT/FSA ELA Reading and Writing, the Advanced Placement (AP) English Language and Composition exam, and the Advanced Placement (AP) English Literature and Composition exam in high schools of varying socioeconomic status?

2. To what extent does the socioeconomic status of a high school (as defined by the income of its students’ families) relate to the attitudes and beliefs of students and families towards this one-to-one digital device program and its potential impact on student achievement and learning?

**Positionality Statement**

Humanistic and social research is almost impossible to conduct with pure objectivity, as all researchers bring to a study an infinitely possible amount of unique personal characteristics and lived experiences that have shaped their ideas, beliefs, and understandings about the world, and likely the subject of their research. To conduct ethical research, then, it is critical that a researcher engage in reflexivity regarding their positionality. This consideration of one’s positionality demands “self-assessment by the researcher about their views and positions and
how these might, may, or have, directly or indirectly influenced the design, execution, and interpretation of the research” (Holmes, 2020, p.2). As such, I believe it necessary in this study to explicate my positionality about socioeconomics, education, literacy, and digital learning.

Though my father began but never completed college and my mother went only to a three-year nursing school after high school, some of my grandparents hold graduate degrees, and all of my siblings and cousins have at least an undergraduate education. Education has always been an explicitly communicated priority in my family. As an English Language Arts educator with a graduate degree and in pursuit of a doctorate, I am markedly passionate about literacy and the power of education to change lives for the better. As I am also a long-time digital educator, I tend to seek out ways that the affordances of educational technology and digitized curricula outweigh the constraints. I certainly rely on digital devices to facilitate learning, so this will bear some weight on my positionality as a researcher investigating the outcomes of a digital learning program. I have also always been comfortably middle-class, and have never felt the insecurity of not having a stable home address, or wondering if there would be enough money for entertainment, much less food, power, or new clothing and shoes. And as I have never experienced the struggles of attending a school designated as low-income, I must be intentional in removing my own worldview and values from my interpretations of study results that center on socioeconomics in education. Holmes (2020) asserts the importance of recognizing one’s position specifically as an insider or an outsider in their research, even in non-ethnographic studies. I am both. I am an insider with regard to the digital learning community as an online teacher, and as the parent of a student engaged in digital learning. On the other hand, as a middle-class individual in pursuit of a PhD, studying the impact of digitized learning, I am an
outsider to those parents in the lower rungs of the income and education ladder who may struggle to support their students’ digital learning at home (Holmes, 2020).

Creswell and Creswell (2018) present four specific worldviews that researchers may bring to a study, and insist that researchers examine the assumptions each of these specific views may cause them to bring to their research. Two such worldviews, which Creswell and Creswell (2018) also reference as paradigms, epistemologies, or ontologies, through which I view this study are the transformative worldview and the pragmatic worldview. A transformative worldview is concerned with matters of power and justice that impact marginalized individuals and communities, and is oriented towards change. My personal paradigm leans heavily in this direction, but is not wholly transformative according to Creswell and Creswell’s (2018) definition, as I am not looking for the root cause of the digital divide, but for the implications of it and success of programs aimed at mitigating it. These research goals map to Creswell and Creswell’s (2018) pragmatic worldview, an epistemology grounded in real-world problem solving, and one that often results in less structured research methods as the goal is to use all means necessary to understand and arrive at solutions for existing problems. This pragmatic worldview, then, lends itself directly to the type of mixed-methods study presented herein.

As my contact with study participants is extremely limited, and entirely mediated by the electronic media used to send and receive the study survey, the impact of my positionality on respondents and their responses is surely minimal. I must pay closest attention, then, to my interpretations of survey responses from respondents whose worldview and lived experiences may be different than my own. Acknowledging one’s positionality allows for a researcher to shed the notion that any social research can be fully positivistic, as varying cultural constructs
will always influence humanistic activity. While these statements of reflexivity cannot guarantee neutrality, they can serve as an ethical revelation of how who I am may affect my interpretations of the data contained herein.

**Outline of Dissertation**

This chapter included an overview of the particular digital learning and one-to-one digital device program being investigated, and the demographics of the school district in which the program exists. It also introduced the theoretical construct of the digital divide as the impetus for the investigation of the impact of the program. Then, as no position can ever be fully objective, I concluded with an explication of my worldview and positionality as a teacher researcher.

The next chapter will review the current scholarly literature on several topics central to the understanding of this study. I begin with a thorough review of the historical and current perspectives on the theory of the digital divide. Having laid that foundation, I then review the scholarly knowledge about digital learning, and how digital devices and communications have impacted both the cognitive processes required of learning and knowledge acquisition, and the skills and capital needed to be successful in the digital age. Finally, beyond how this particular digital learning and one-to-one digital device program in traditional schools has impacted student achievement in literacy across socioeconomic levels, this study also investigates parent perception of this program. As this learning program was implemented to mitigate the academic digital divide, I also review the surprisingly extensive history of distance learning in the United States, a history that began with the same educational aim of leveling the playing field. I trace this history from the 1700s through the COVID-19 prompted mass-distance learning movement.
in the spring of 2020, to preface the discussion of how well parents believe this program
prepared students for the shift to fully-online distance or remote learning when COVID-19
emerged.

In chapter three, I reintroduce the research questions guiding this study. I also introduce
the specific mixed-methods approach I took in investigating this program and parents'
perceptions of it, and why my particular method was selected. I explain in depth why particular
schools were selected, how I acquired the quantitative testing data, why certain assessments were
chosen for analysis, and how I analyzed this data. I also discuss the procedures taken to design
and disseminate the parent survey, and how I analyzed the qualitative data produced by the
survey.

Chapter four presents the objective findings of this data analysis and these surveys.
Quantitative data findings are presented first, and are grouped by test and presented in the
following order: Grade 9 ELA, Grade 10 ELA, Advanced Placement Language and
Composition, and Advanced Placement Literature and Composition. Qualitative data findings are
presented next and in the following order: demographic statistics of respondents, closed-ended
survey question statistics, and finally open-ended survey question statistics.

In chapter five, I discuss the findings outlined in chapter four. I will first discuss potential
implications of and causes for certain findings among the standardized testing data analyses.
Next, I will discuss the closed-ended survey question results that were found to have statistically
significant interactions with certain respondent demographics, as well as potential causes for and
implications of these interactions. This chapter will continue with discussion of the parent
responses to the open-ended survey questions, with special emphasis placed on responses from

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the most marginalized parent populations—non-English speakers, the economically
disadvantaged, and those with little formal education. Potential causes for and implications of
parent responses to these open-ended questions will close this chapter.

Finally, chapter six will represent the conclusion of this body of work. It will begin with a
delineation of the limitations of this study, and then a general summary of answers to the
research questions that guided it. Next, I will offer both Education and Digital Humanities
scholars ideas for future investigation that were born of the findings and intellectual work of this
study. Finally, this chapter and dissertation will conclude with pragmatic, solution-oriented
suggestions for individuals responsible for any part in the management and implementation of
both existing and new digital and one-to-one learning programs.
CHAPTER 2: LITERATURE REVIEW

The Digital Divide

This study of the impact of a one-to-one digital device and digital learning program in one of the ten largest public K-12 school districts in the United States will be grounded in the theoretical construct of the digital divide (van Deursen & van Dijk, 2014; van Dijk, 2005; van Dijk, 2020), a contemporary account of the burgeoning social and economic gap that has long existed between the haves and the have-nots.

Evolution of the Theory

Eager and early adopters of information and communication technologies (ICT) across multiple disciplines have long touted technology “as offering an unprecedented opportunity to overcome social divisions and inequalities” (Selwyn, 2004, p.342). This promise has yet to come to fruition. Prior to the 1990s, technology-based inequalities were largely discussed within the frame of information inequality, the unequal distribution of access to information, a concept of interest in academia since the 1960s. By 1975, information inequality was recognized as a legitimate field of study, with over 700 documents in the field, mostly authored by library information science and communication scholars (Yu, 2006). Research about the gap in the availability of information among various populations continues within these academic communities, but the focus has largely shifted from interest in this information gap to what has become known as the digital divide.

The term digital divide originated in the mid-1990s, and is often cited as being first used in 1995 in a U.S. report called Falling Through the Net that surveyed Americans to determine the
extent to which inequalities existed in the use of and access to information technologies (Selwyn, 2004; van Dijk, 2005; van Dijk, 2020). Communication science professor, Jan van Dijk (2020), offers a common definition of the digital divide as "a division between people who have access and use of digital media and those who do not" (p.1). The U.S. Organization for Economic Cooperation and Development (OECD) defines the digital divide as a gap between both individuals and groups “at different socio-economic levels with regard to both their opportunities to access ICTs and to their use of the Internet for a wide variety of activities" (Pick & Sarkar, 2016, p.3888). Most definitions of the digital divide follow along these lines, but because of the breadth of interpretations of what counts as digital, ICT scholars have also had to define this term.

Neil Selwyn (2004), a professor of education who studies digital media and the sociology of technology, defines the digital as the content provided by information and communication technology (ICT), and he cites ICT as an "umbrella term" that includes the hardware, software, and electronic resources used to access digital information (p.346-347). Generally speaking, the digital is largely understood to be the content accessible via any one of a multitude of specialized ICT tools and/or devices, such as laptops, tablets, computers, cell phones, smartwatches, etc., that have been developed specifically to access, use, and/or produce that content. And though the digital in the electronic, Internet-age sense, may be a new phenomenon, unequal access to resources is far from new, so there is some debate regarding the validity of the theory of the digital divide. While some argue that it presents novel concerns, some assert it is simply the most recent iteration of social inequalities that have existed for time immemorial.
Not long after its naming in 1995, the digital divide was declared to be either resolved or a mere myth by many scholars. One theory skeptics have proposed as evidence that the digital divide is nothing to be newly alarmed by is the **trickle-down principle**. This economic concept holds that all new technologies create an initial gap in possession or ownership between those of lesser and those of greater economic means. However, the principle posits, once production capabilities increase and costs decrease, such products naturally trickle down to the less wealthy, so that most or all individuals eventually obtain access (van Dijk, 2005; van Dijk, 2020). Others have attempted to normalize the concerning indicators of the digital divide via theories of **technology diffusion** that propose that a gap in implementation and usage of new technologies is to be expected and accepted as an organic part of “the process of adopting an innovation for use and diffusing its use within a population of potential users over time” (Pick & Sarkar, 2016, p.3889). Be that as it may, multiple studies have shown that even when the problem of physical access is solved, disparities remain, supporting van Dijk’s insistence that notions such as technology diffusion or the trickle-down principle are too simple and deterministic to apply to the digital divide.

Van Deursen & van Dijk (2014) instead suggest that the digital divide is in fact, novel and unique, and a greater threat to longstanding societal inequities than previous gaps because “the Internet has more functions than traditional media have” (p.522), and they cite evidence that shows the digital divide to be deepening. Van Dijk (2020) proposes a framework of the digital divide that identifies four phases of access to digital media: motivational, physical, skills, and usage. Each of these phases demonstrates that the digital divide continues to reflect both old inequalities and new ones born of the information age.
Motivational access can be seen as the primary difference between the "have-nots and want-nots," as van Dijk (2005) explains that about 50% of non-users in developed countries simply do not want to use digital technology. The next phase of access van Dijk discusses is physical access, whereby individuals either possess or do not possess the devices and internet services required to make use of digital content. The term "first-level divide" is often used to reference this gap between those who do and do not have physical access to either devices or an internet connection, whether by choice or by circumstance. The physical access gap was the focus of digital divide research from 1995 until about 2003, when the gap significantly narrowed such that most individuals in developed nations had at least some access to devices and internet connectivity, regardless of income (van Dijk, 2005; Wei, 2012). Still, a "second-level divide" remained, based more on skills and types of internet usage, and van Dijk (2005) delineates five technological characteristics that continue to either enable or prevent access to ICT even once a first-level divide is resolved.

According to van Dijk (2005), this second-level divide hinges on five factors: complexity, expense, network effects, multiple facets, and multiple functions. He also offers six properties of ICT that affect usage when one or more of the aforementioned characteristics does not completely prevent it: approachability, usability, information overload, reflection of culture and language, relevant information, and conditional access. Approachability—not to be confused with accessibility—is the perceived ease of completing a task, but not necessarily the actual likelihood of completing that task. Van Dijk gives the example that most people would perceive a Google search to be easier than a trip to the local library, with its subsequent search through a physical card catalog and then the stacks. So whether or not one has access to a search engine,
the task seems doable. The usability of a tool refers to the ability of a user to actually take advantage of the full suite of its features, and move beyond superficial application. Continuing to lean on the Google example, most users use only a fraction of its capabilities, and rarely navigate beyond the first few search results. This is certainly due in part to information overload, van Dijk’s third of these six properties of ICT. Particularly for those who have not had access to digital technologies for their entire lives, the prospect of filtering through the massive amount of information now available at a keystroke is debilitating. The fourth property that van Dijk cites as a potential roadblock to usage is culture and language, which will be discussed a bit later, and which relates to the level of comfort one would or would not feel not only in ICT, but in any environment created by someone of a completely different culture or language. With specific regard to ICT, van Dijk suggests this to mean anyone who is not young, male, educated, and English-speaking is outside of the original culture of the digital revolution.

Relevant information and conditional access—the final two of van Dijk’s (2005) six identified properties which affect usage—stem from the culture of ICT origin. There is naturally more information generated in physical areas of high-tech usage, so the amount of information that is relevant to residents of less central locations is naturally lesser as well. For example, densely populated cities will generate more user reviews of local restaurants, which will also be more plentiful. Where there is more information available, users will become more adept at using that information in its various forms. The reverse is also true. And finally, as the amount of digital content creation increased, so did concerns about protecting that content. And while many champion the prospect of open access to information on the web, others seek to limit access in the (usually financial) interests of the creators. Despite the physical access gap now being
arguably negligible, the persistence of this gap in skills and usage across age, race, income, and education further precipitates a "third-level divide" which impacts outcomes, the interrogation of which is the focus of most contemporary digital divide research (van Dijk, 2020).

Based on this continued presence of digital inequities in this third-level divide, van Dijk (2020) developed the resources and appropriation theory which holds that different amounts of resources are available to individuals based on personal categorical inequalities such as cognitive intelligence, age, gender, ethnicity, personality, and health/ableness, and positional categorical inequalities such as education, labor, nation/region, household, and social network. The resources and appropriation theory further posits that these categorical inequalities “determine the process of technology appropriation in four phases of ICT access...and the outcomes of this process lead to more or less participation in society" (p.31). This resultant greater or lesser degree of participation in society then leads to further personal and positional inequalities, forging a cycle that is difficult to break. Ultimately, this perpetuates the "Matthew Effect" in which the rich get richer, or whereby those who already have more are able to take better advantage of a new resource than those who have little (van Dijk, 2005, ch. 5).

Another reason van Dijk (2005) argues this current epoch is distinguishable from those before is its functioning as a "network society" in which people and organizations are the basic units in flat networks with overlapping connections, rather than a society comprising hierarchical ladders or pyramids. Van Dijk asserts that this network society, in which the digital enables connections to reach exponentially farther and faster than ever before, can both mitigate and exacerbate social inequality in novel ways. Van Dijk claims the connectivity and flat, rather than hierarchical, structure of our network society can help to decrease social inequality as
connections can more easily be made across such a structure. However, in such a society, information alone does not equate to power, as one must also have proper social position to exercise power. Thus, although van Dijk illuminates the possibility of a networked society to level the playing field, he also acknowledges that the selectivity, variation, and uneven distribution of position and number of connections across almost all networks often leads to increased social inequity (van Dijk, 2005). In other words, in the digital age, it’s still who you know that largely facilitates success.

Divides Beyond Mere Access to Technology

Like van Dijk (2005), Selwyn (2004) insists that a uniquely digital divide exists, and that it has moved well beyond simplified notions of access. Selwyn argues that there is a fundamental conceptual difference between the simplicity of obtaining physical access, a problem that has largely been addressed, and the complexity of being able to effectively use the information and tools to which one has physical access. He leans on the concept of situational relevance as central to his framework of the digital divide, a concept which emphasizes the many ways in which having or not having access to certain technologies from a contextually situated perspective and/or position impacts the importance and usefulness of that access (Selwyn, 2004). In contrast to van Dijk’s flat network society, Selwyn presents a clearly hierarchical model of the digital divide in his effort to expand upon the outdated "mainstream political discussion over 'information haves' and 'information have-nots,' [and] 'information and communication poverty,'" (p.344) from the 1990s and early 2000s that promotes a too-basic, binary conceptualization of the divide. Like van Dijk, Selwyn discusses several types of activity that count as participation in
society such as production activity, political activity, social activity, consumption activity, and savings activity. He also expresses concern about the potential of exaggerating the importance of “the role of income with regard to ICT and overlook the important social and cultural dynamics that structure participation and exclusion” (Selwyn, 2004, p.353), and cautions readers against overemphasizing economics in digital divide research.

Akin to van Dijk’s four phases, Selwyn (2004) presents “four stages” of the digital divide: formal/theoretical access, effective access, engagement, and outcomes. The formal/theoretical stage is similar to van Dijk’s (2005) description of physical access: devices or wireless connectivity are placed in the hands or homes users, but said users may or may not be able to make use of the provision. The effective access stage moves beyond this theoretical access to a sense in the user that they are actually able to use the technology, and the engagement phase suggests that this use is truly meaningful, paralleling the notions of approachability and then usability in van Dijk’s terms. Finally, Selwyn explains that outcomes are the ultimate consequences of moving through each of the three prior stages, and can be evaluated in terms of a user’s contribution to society, whether it be producing or consuming content, or one’s level of participation in political or social activity.

Each of these stages requires different forms of capital, Selwyn (2004) argues, not the least of which is economic. As mentioned previously, though, he warns of negative consequences of considering economic capital to be the supreme determinant of the stage in which someone operates. He stresses the importance of an individual possessing both cultural and social capital in order to fully participate in society. Perhaps most significant, according to Selwyn, is that "possession of technological capital enables individuals to become producers and
distributors of their own cultural products, rather than active or passive consumers of the products of others” (p.355). It is thus the possession of technological capital, which requires all three other forms of capital and an ability to apply those forms in technological contexts, that enables technology to fulfill its promise as a liberator.

Pick and Sarkar (2016) argue that because “environments and technologies continue to evolve rapidly” (p.3894) a single theoretical perspective on the digital divide may not be possible or beneficial. Perfect consensus on what defines the digital divide may not be reachable, but few scholars would deny the need to further develop and implement frameworks or policies that attempt to bridge or at least mitigate this information-oriented gap. Both Selwyn (2004) and van Dijk (2005, 2020) agree the digital divide continues to improve in some ways, but widen in others, and call for further research that is sensitive to the complexities and multiplicity of human interaction in a highly connected society. Selwyn (2004) in particular is hopeful, and suggests that “although the patterns of uptake and use of new technologies do appear to be falling into existing and deep-rooted patterns . . . there is still the potential for change” (p.357-58). In pursuit of this change, van Dijk (2020) insists that “potential solutions should always be relevant and adopted to the particular needs, social relationships, lifestyles, and cultures of potential users” (p.154). In a global society, curating an understanding of what various cultures genuinely need carries significant ethical implications, and requires careful consideration of how traditional ethical perspectives must be reframed to accommodate the new ontologies, ways of being and knowing, that the digital world has introduced. Unfortunately, when new initiatives are designed with the aim of mitigating this gap, they are often implemented in top-down fashion, and these particular needs of users from various cultures and with different lifestyles are not considered.
The Digital as Liberator? Or Perpetuator of Inequity?

Providing increased access to the internet and digital tools can still be seen as the silver bullet of democratization—the equalizing of access and opportunity. This is a misguided belief. Particular technologies are certainly required to broaden access to the ideas or tools responsible for the circulation and enactment of power within a society, and the provision or facilitation of access is a critical matter that must be attended to. The cost-prohibitive nature of digital devices such as smartphones or laptops can certainly preclude individuals of lesser economic means from acquiring these tools. Social programs in place, however—including those found in U.S. public schools—usually focus too heavily on simple-to-solve financial issues, when the matters of the greatest concern lie much deeper. Physical access alone will never level the playing field. In actuality, a society increasingly reliant on such technologies can threaten to exacerbate notions of both individual and social inequities even by way of unintentional bias in technological design (boyd, 2014; Eubanks, 2012; Birkerts, 2015).

Just as matters of inequity in access to resources and information is not new, matters of bias in design leading to the silencing of some social groups is not a development of the digital age. danah boyd (2014) shares the oft-cited story of the oppressive design plans of Robert Moses, who engineered the bridges required to access public beaches in Long Island, New York. Upon completion, Moses’ bridges turned out to be too low to accommodate the buses that transported New York City residents to the beach, residents that were most often low-income minorities (p.157). Clearly, the design in this case was not inclusive of the concerns of disadvantaged residents that did not have vehicles of their own, and who relied on public transportation to travel. Such oppressive design effects have not been ameliorated with the
advent of modern information technologies (IT), as the tech industry is not known for its inherent diversity. A quick Google search of “most profitable tech companies” generates the following list, in order of market value: Apple, Microsoft, Alphabet (aka Google), Amazon, Facebook, Taiwan Semiconductor Manufacturing, Tencent Holdings, Nvidia, ASML, and Samsung. Another quick search of “founder of...” followed by the name of each of these companies identifies a list of 15 white men and eight Asian men. As a result, despite good intentions, tech designs often become reflective of the needs and experiences of a narrow representation of society, and fail to represent those who are not part of the process. boyd asserts that “the utopian idea that technology will solve inequality” (p.15) only covers up such systemic matters. Virginia Eubanks (2012) also tackles the matter of a need to change the mindset in IT work, and like boyd, recognizes the persistence of a “collective, consensual hallucination about the power of technology, particularly information technology (IT), to ‘level the playing field,’” (Eubanks, 2012, p. xv).

Echoing van Dijk’s (2005) concerns about social position and Selwyn’s (2004) concerns about situational relevance, Eubanks (2012) asserts that tech inequity in America has moved well beyond matters of access, and hinges more on what she calls social location, or an individual’s place in hierarchies of power. Because many groups are underrepresented at the helm of development for the technologies we use on a day to day basis, Eubanks insists that individuals of all backgrounds must have not only equal access to mobile devices and technologies, but equal opportunity to contribute to their development. And though frustrated with the lack of diversity in design teams and the IT world in general, Eubanks is hopeful, insisting that "just as the flattening of opportunity is not a natural or inevitable consequence of the information age,
neither is increasing stratification and inequity” (p.79). Eubanks comments largely on the
development of technology itself, but when social institutions design programs delivered through
technology that are aimed at mitigating the digital divide, they too should make intentional use of
research and design methodologies such as participatory action research, participatory design,
and interaction design. These methodologies have the potential to increase the diversity of
research and design teams, and thereby mitigate the disconnect between creators and end users
and “reform the information age so that it can support fuller humanity for all people” (Eubanks,

In addition to the effects of lack of diversity in teams that design technology and the
programs that employ it, also of concern is the potential for the reproduction of troubling
material social dynamics in the online environment (boyd, 2014; Birkerts, 2015; Eubanks, 2012).
danah boyd (2014) largely discusses the use of social media, an internet technology that connects
people via virtual networks, in a positive-leaning neutral light, suggesting, "What the drive-in
was to teens in the 1950s and the mall in the 1980s, Facebook, texting, Twitter, instant
messaging, and other social media are to teens now” (p.20). She also acknowledges its more
troubling qualities in warning of the possibility of digital technologies to cement existing social
problems, particularly with regard to racism. boyd shares her experience in interviewing an
inner-city teen about her online experiences, and when the topic turned to race, the teen became
defensive and explained that despite the appearance of social and racial diversity in her school,
racial divisions and gang culture mediated her every move. boyd reminds us that these material
experiences do not disappear when one’s “moves” are online, and that “when teens go online,
they bring their friends, identities, and network with them” (p.160). Sven Birkerts (2015) also
notes that digital technologies can lead to stark divisions online between social groups of varying ages, as users of different generations use tools in markedly different ways. He expresses further concern that the digital can rob both individual and interpersonal agency from end users in traditionally marginalized populations.

According to Birkerts (2015), increased access to digital tools and digitized information has been less than liberating. He expresses significant concerns about the shifting power relationship between man and machine, citing the GPS technologies we now use instead of print-based maps in our travels as something that "represented a giving over of agency" (p.54). He laments the loss of control this represents, because he sees it as antithetical to the democratizing notions of technology held by many. Birkerts explains his concern, asserting that "we have little or no conception of how these trusted powers work, only that they do" (p.56), and specifically comments on how the increasing presence of digital technologies in classrooms threatens the agency of parents to choose what is best for their children. As public school districts nationwide implement digital initiatives in virtuous attempts to prepare students for an increasingly tech-driven professional world, some schools are unilaterally replacing paper-based textbooks with online versions, and requiring students to both access and submit all work through online learning platforms. This certainly presents concerns about socioeconomic and who can or cannot afford to bring such devices into the classroom, and though many districts have been purposeful about providing devices free to all children in an attempt to mitigate that ever present economic divide, Birkerts asks, "how much can, or should, a parent control the influence of what are fast becoming ubiquitous technologies?" (p.117). Concerns about bullying, sexual predators, internet addiction, and mere distractibility are on the minds of many parents (Katz et al., 2019;
Rideout & Katz, 2016). danah boyd (2014) argues that we should not give supreme credence to such concerns, as they are often overmagnified. Yet, one should certainly consider how the agency of parents in their children’s technology use has been usurped by schools who implement digital programs without parental input. Even in cases where schools may invite parental input before the implementation of large scale technology initiatives, the parents most likely to be absent or to remain silent in the face of such removal of agency are of lower socioeconomic means, thus exacerbating the divide between who has influence and who does not.

**The Digital Divide in Education**

Given the previous arguments, it is clear that there are concerns to be investigated within school districts that implement significant use of digital tools in the classroom. However, regarding progress and the integration of any technology into K-12 education, it is generally understood that with new affordances also come constraints. There are always further ethical considerations to unpack, but the perceived merit of any large-scale bureaucratic initiative ultimately lies in the belief of those in charge of the implementation that the good will outweigh the bad. Thus, while concerns about potential bias in the design of educational technologies and the potential for the digital to aggravate existing social dynamics in a school are something to discuss, the core purpose of a school is to prepare its students for the world they will enter upon completing their education. It could be argued, then, that failing to implement technology in the classroom would be failing to prepare today’s student. In fact, today’s educators must begin to be as comfortable with the use of electronic devices as they are with a pen or pencil. The digital revolution is nearing its end and the discussion about 21st century education as something to
prepare for is no longer appropriate—we are over twenty years in. Digital simply is, and teachers must embrace it and be equipped to pedagogically support technology integration. They must purposefully prepare students to interrogate matters of design, agency, and equality in a globally connected and wired world. As danah boyd (2014) points out, “many teens are more likely to be digital naives than digital natives” (p.22); in other words, they need support and guidance to do this well. They need instruction on how to move beyond the social applications of technology that drive their current worlds, towards the more critical uses that will be required of them in the real world. Ultimately, schools are responsible for doing something to mitigate this digital divide.

As put forth by Edmonds (1979), “inequity in American education derives first and foremost from our failure to educate the children of the poor” (p. 15), and federal and state education mandates have long sought to provide for the needs of low-income students in an attempt to mitigate this gap. But wealthy students continue to significantly out-achieve poor students, with achievement scores on traditional measures of learning following almost directly along the parental income curve. In fact, achievement gaps between students at each income bracket have dramatically increased over time, with Reardon (2012) finding that over a period of 25 years, the income-based achievement gap grew by 30 to 40 percent. Add the digitizing of curriculum to the mix, with its innate requirement that students possess expensive devices capable of accessing said curriculum, and despite the need for public schools to prepare all students for an increasingly digitized workplace, tech-driven learning may actually exacerbate the achievement gap.
Though recent surveys have shown that most low-income families do have at least some access to digital devices and/or internet access at home, immigrant students and students classified as economically disadvantaged still lack the same quality of technology at home that is required to access or complete tech-driven assignments (Marrapodi, 2016; Moon & Hofferth, 2018; Scherer & Siddiq, 2019). As the access of children and students is inarguably dependent on what parents can or do provide at home, Katz et al. (2019) investigated parental attitudes about technology use in a nationwide survey of low-income family households. In light of the digital divide shifting from physical access to skills and usage access (Selwyn, 2004; van Dijk, 2005; van Dijk, 2020; Wei, 2012; Yu, 2006), Katz et al. (2019) privilege the term digital inequality, reflecting not only concerns of disparity in general access to devices and the internet, but disparity in the specific type of access present in the homes of lower-income children. Parents were queried regarding not only if internet access was available in their home, but also what type, including mobile only connectivity, broadband only connectivity, both mobile and broadband connectivity, and intermittent connectivity. Not surprisingly, it was found that “greater internet connectivity has direct effects on children’s technology experiences” and “perceptions of the opportunities that connectivity can offer their children” (p.332), and these growing means of connecting to the internet add a level of complexity to this issue. Multiple studies have shown that though low-income parents are concerned about the inappropriate things their children may encounter online, they are also astutely aware of the opportunities that will be limited or lost if their children do not have access to and become skilled in using and applying digital technologies (Katz et al., 2019; Rideout & Katz, 2016). Many studies have explored in-school technology use, with one study showing that 80% of low-income and mid-income parents
feel it has a positive impact on their child’s education (Rideout & Katz, 2016), but it is certainly more challenging to explore how digital technologies are used at home. Research supports that parents have significant influence on the online activities of their children and how children use digital devices in the home, regardless of who provides those digital devices (Katz et al., 2019). Research also suggests there is not necessarily great variance across income levels with regard to the attitudes of parents towards the use of digital devices in schools. It will be interesting, then, to see if this remains to be the case as these devices are increasingly provided by public schools through one-to-one programs that not only offer, but require use of digital devices to access and present the majority of learning.

It is certainly clear that currently in-use digital technologies like laptops and tablets could not have created the digital divide; educational achievement gaps and inequities have long existed. It is also clear that as some gaps close, others emerge, or at least widen and deepen. To interrupt this cycle in a more globalized society, where have and have-not lines have become increasingly blurred and almost all activities extend beyond their traditionally situated physical context, it is likely necessary to more deeply examine the educational world of students beyond the walls of classrooms, and inside their homes.

**Digital Learning**

*As this study investigates the impact of a fully digitized curriculum on high school literacy achievement as measured through standardized reading and writing test scores, a review of the literature on digital learning is necessary.*
Digitally Driven Changes in Literacies and Human Cognition

Technology integration and curriculum expert David Warlick (2004) asserts, “For the first time in history, our job, as educators, is to prepare our students for a future that we cannot clearly describe” (p. 15). Some would argue that this sentiment is overreaching, as the future has always been inherently uncertain. However, it is undeniable that the speed and scope with which new technology is developed in this digital age has increased dramatically. Software applications and operating systems on digital devices are updated regularly, sometimes completely changing user interfaces overnight. As such, educators responsible for equipping students with the means to keep pace with the technological changes they will encounter in the classroom and the workplace must radically reconsider the meaning of and practices surrounding literacy, and the thinking processes altered by digital technologies.

Starting in the late 1990’s, around the time of the birth of the term “digital divide,” U.S. public schools began emphasizing the importance of digital literacy, and more recently, the importance of digitizing curriculum (Taylor & Gunter, 2006; Warlick, 2004). Stuart Selber (2004) specifically defines three categories of literacy that students must acquire in the digital age: functional, critical, and rhetorical. Functional literacy can be seen as the most fundamental of these digital-age literacies, and refers to the basic ability to access, read, write, and make meaning out of information in both print and digital environments, and to be able to reasonably navigate and problem-solve in the various traditional and digital environments in which one encounters information. Critical literacy, according to Selber, is the ability to not only understand, but to also question and challenge the politics of computers, while rhetorical literacy
requires an even more evasive ability to integrate the functional and the critical to effectively design and evaluate digital interfaces.

Each of these literacies require schools to move beyond teacher use of technology for lesson delivery to student uses of technology that will prepare them for a digitized workplace and society. Selber (2004) implores educators to help students develop these new literacies required of new media reading situations so they are prepared to “recognize and articulate the ways power circulates in technological contexts” (p.133). In the same vein as van Dijk’s (2020) and Selwyn’s (2004) concerns about participation outcome inequities, Selber stresses that acquiring such literacies will help people better navigate new interactive environments like social media, blogs, and video games—all now considered valid forms of text—and to retain or even increase their agency, as these environments offer the ability to not only consume text and author-intended messages, but also to creatively contribute to and thus shape the meaning of texts in such domains. Ian Bogost (2010) also argues for a need to develop new and more critical reader or consumer approaches for differing types of rhetoric that exist in various forms of new media text.

Like Selber, Bogost (2010) leans heavily on the concept of literacy, particularly procedural literacy, a necessary ability to maintain awareness of how learning occurs through one’s actions when navigating a rhetorical environment, whether print-based or digital. And though the importance of teaching students to critically navigate interactive reading and writing environments cannot be overstated, Bogost expresses concern that many “still privilege verbal and especially written expression, castigating visual and computational media” (p.248). He suggests that students must also be exposed to non-print texts via digital technologies, and to the
concepts of code as text or image as text, emergent concepts that require both secondary and post-secondary educators to embrace new literacy practices (Bogost, 2010; Hayles, 2012).

N. Katherine Hayles (2012) also expresses concern about a widening gap between scholars who privilege print and those who privilege the digital with regard to their ability (or willingness) to understand the implications of increased digitization in our world. She explores how the digital age has reshaped human cognition, and posits that digital literacy practices such as reading and writing on the web rewire the brain, leading to issues of attention and distraction that impact students’ abilities to learn in more traditional ways. Web pages, Hayles explains, are naturally read in an "F" pattern, whereby readers read the first two complete sentences of text on a site, and then proceed by quickly scanning down the left margin to decide what is of interest to them for further reading. In the short term, the distractions of clicking and linking and reorienting eyes during web reading and interacting with hypertext add to the cognitive load on working memory, lessening the amount of new information that the working memory can hold in that session. In the long term, this type of fragmented, hyper reading necessary in the digital may change the brain in ways that impede the ability to read closely, as these small habitual actions of clicking and scanning lead to new neural pathways very different from those that traditional reading practices were designed for (p.61-64).

Hayles (2012) cites a University of California at Los Angeles (UCLA) study in which five days of web searching led to significantly changed brain scans in a group of 50-60 year-olds who had never used the web before, supporting her position that a significant change in human cognition is underway. The ability of students to pay deep and focused attention to one or a few matters is giving way to the new scanning processes of digital media and websites, and the
younger the brain, the more extreme the shift has been (p.69). In accordance with Hayles’s claim that the modern human brain is often at odds with the tasks required of traditional approaches to education, James Paul Gee (2013) argues that human cognition and the world around it are out of sync. Nevertheless, whereas Hayles identifies ways in which the brain has begun to adapt to a changing world, Gee (2013) takes the angle that "the human mind is not modern" (p.59), and posits that because the brain evolved in an epoch nothing like our modern, digitized world, schools must adjust learning outcomes to better match the physiology of the brain.

Gee (2013) explains that unlike the way a computer indefinitely retains the information it stores unchanged, human memory retrieval is not objective or grounded in an absolute truth, but rewritable and reflective based on emotional associations. Because of the enormous amount of information created and now accessible via digital technologies like the Internet, Gee holds that traditional modes of formal schooling that require humans to use their memories like computer memories have made people increasingly "seem stupid" (p.26-27). Based on the human brain’s natural orientation, Gee proposes five conditions that must be met for learning to occur: mentorship, experience, clear goals, a high level of concern for the goal, and opportunity to act. Once these five conditions are effectuated, Gee argues, people are cognitively motivated to then act, reflect and adjust, and act again in a "circuit of reflective action" (p.16), or essentially, a feedback loop of learning. This is not how most modern curriculum is designed.

Both Gee (2013) and Hayles (2012) also discuss the idea that cognition is now distributed through the digital tools we use. While Gee (2013) admits that "human + tool is a winning combination" (p.122), he also tends to caution against outsourcing too many cognitive tasks to our digital devices, and maintains that humans need to continue driving the train. Hayles (2012)
instead tends to celebrate the idea of distributed cognition, and believes human thinking must be
distributed through digital devices in order to make sense of the increased and massive quantities
of information that now exist. She suggests that such tools not only distribute human cognition,
but facilitate extended cognition, whereby the tool, such as a pencil, becomes a necessary part of
the human user’s cognitive process, as evidenced by the act of thinking while writing. Extended
cognition supports Hayles's view that humans and technology need to co-exist in a more
balanced symbiosis, such that neither is seen as superior to the other.

Gee (2013), on the other hand, believes that humans need to remain at the helm and not share too much of the cognitive load with the digital tools we have developed. He does admit that "human intelligence and creativity, today more than ever, are tied to connecting—synchronizing—people, tools, texts, digital and social media, virtual spaces, and real spaces in the right ways" (p.196). However, echoing the concerns of Birkerts (2015), Gee (2013) also cautions that humans are starting to lose the upper hand in the distributed cognition balance because we no longer fully understand the machines we have created, underscoring the need for pedagogical practices that will encourage patterns of inquiry. Gee warns against designing further educational tools that are so intuitive that they don't arm users with transferable skills, but also postulates optimistically that the use of tools towards a distributed cognition need not necessarily undercut human intelligence (p.122-125).

Richard E. Mayer (2009/2020) writes extensively about multimedia content and how people best learn through multimedia instruction, which he defines as teaching based on the multimedia principle that "people learn better from words and pictures than from words alone" (p.4). Teaching through this multimedia principle is better suited for human learning, Mayer
argues, because it allows for more information to be received and processed. According to Mayer’s Cognitive Theory of Multimedia Learning, human learning occurs through a complex system that processes verbal and nonverbal materials in two separate channels in the brain. While acquiring the fullest spectrum of learning requires both channels to be activated, each channel has only so much capacity. So, beyond simply learning best through a combination of words and pictures, Mayer also argues that effective multimedia learning relies on different modalities to process five different forms of material: words and pictures, acoustic and iconic, sounds and images, verbal and pictorial, prior knowledge. For example, this modality principle posits that content delivered through pictures and a spoken narrative is more effective than content delivered through pictures and printed words, because the latter overloads the capacity of the brain’s visual input processing system. This principle can be seen in action in non-digital environments through traditional intervention strategies like shared reading, which relies on the modality of image as a student reader’s eyes move across a printed text, plus the modality of sound as a fluent reader reads that same text aloud to the student to support the student’s reading. The modality principle also jibes with, at least in part, Hayles’s (2012) assertions that contemporary literacy instruction should recognize that the various actions unique to digital reading increase the cognitive load on working memory.

We have clearly, over time, made more and more information available, so our brains have at least somewhat naturally adapted to the need to make meaning out of our own inventions. While there is magnified and fairly universal concern about attention and distraction, and the physiological ability of today’s students to engage in close reading of complex texts, it is not difficult to locate indications of concern about the ability of learners to focus that date back
more than a century. Even Plato, in the *Phaedrus*, proposed the notion that writing as a
technology would bring the demise of human intellect through the elimination of the need for
memory (Ong & Hartley, 1982/2012). In the *Phaedrus*, Socrates supports the Egyptian god
Thamus’ rebuke of the recent invention of letters, asserting that the new technology of writing
“will create forgetfulness in the learners’ souls, because they will not use their memories; they
will trust to the external written characters, and not remember of themselves” (Plato, 360
B.C.E./2009). Socrates does not denigrate the use of letters altogether, but rather too great a
reliance on the written word, as he posits that intellect can best be measured by one’s ability to
engage in interactive dialectic, and to reciprocate using language, rather than one’s ability to
merely read what is already written.

This literary exchange from 360 B.C.E. hearkens the naysaying of today’s math teachers
who chastise any use of calculators, or English teachers against any application of hyper reading.
Socrates would instead reiterate that technology’s educational value lies in how it is used, not
mere possession of it. Considering the amount of information available in the digital age, both
close and hyper reading are valuable, and neither should be practiced or taught to the exclusion
of the other. Despite acknowledgment that some existing pedagogical practices can be merely
modified and applied to the digital or online environment (Bates, 2020; Cronin, 2020; Journell,
2015; Warnock, 2009), there is fairly clear and consistent evidence that both societal and
cognitive changes brought about by the digital age call for a full reimagining of how to best
deliver and/or facilitate course content through digital media (Bogost, 2010; Gee, 2013; Hayles,
2012; Mayer, 2009/2020; Selber, 2004). The next section presents a review of the literature on
practices that have been, can, and should be implemented in digital environments.
The Need for New Pedagogical Practices

Initially, technology use in classrooms barely scratched the surface of true digital learning, with many teachers superficially prettying up lessons through fairly static Powerpoint slideshows as sideshow supplements, rather than teaching the critical skills needed to function in a highly tech-driven world. Educators quickly recognized, though, that digital tools offer more than "eye-candy" (Selber, 2004, p. 9), and should be used to facilitate deep learning rather than to merely make lessons more fun or visually engaging. In the contemporary educational landscape, digitized classrooms—both face-to-face and online—must rely on innovative strategies of engagement and the deployment of multimodal curricular content through increasingly varied tools and devices students may encounter in the real world. For many reasons, including the fact that some of these tools and devices are used interchangeably for entertainment, education, and professional purposes alike, there can be some resistance to or disagreement on the best tools to use and how to best use them to meet learning outcomes. And as online and digitized education become ever more popular, there is increased scrutiny on how—and if—pedagogical practices must change. Some educators argue that modality does not dictate what qualifies as effective teaching, so there is little difference between pedagogy and digital pedagogy, and established effective teaching practices should simply transfer to the online or digital space. In fact, there exists some debate over the meaning of pedagogy, so it is worthwhile to define this term, and to further define what qualifies as traditional pedagogy versus online or digital pedagogy.

As educational practitioners have recently begun to move towards more student-centered models of learning, the traditional understanding of pedagogy to be the art and science of
teaching has been eschewed in favor of definitions that privilege the learner and the learning over the teacher and the teaching (Beetham & Sharpe, 2007/2020). Beetham and Sharpe (2007/2020) offer a definition of pedagogy that reflects a more symbiotic relationship between the actors in an educational system, referring to pedagogy as “learning in the context of teaching, and teaching that has learning as its goal” (p.2). As learning outcomes continue to become more process- than product-oriented in this digital age (Shearer et al., 2020; Zheng et al., 2014), pedagogy can also be understood as the skilled facilitation of epistemological development, the ways that students come to think and know. N. Katherine Hayles (2012) positions the digital as forms of media in direct opposition to print-based resources and information. From these interpretations of what qualifies as digital and what qualifies as pedagogy, we can derive an understanding of digital pedagogy to be the facilitation of thinking and knowing in and through non-print, largely electronic media.

Digital pedagogy, then, can be employed in a face-to-face classroom environment, where teachers serve as facilitators of learning for students using digital tools like laptops, computers, tablets, and smartphones to access texts and information rather than using more traditional print-based forms of media. Digital pedagogy and curriculum certainly exists in traditional brick and mortar classrooms, but online learning environments necessitate the use of digital pedagogy and curriculum. As such, when referencing online learning, it is generally understood to also be a reference to digital learning. Similarly, it is clear that multimedia learning—learning through both words and pictures (Mayer, 2009/2020)—is not restricted to digitized environments. But as digital curriculum is necessarily multimedia driven, for the purpose of this paper, a reference to digital learning or curriculum may also be understood as multimedia learning. Regardless of the
specific terms used by various educators, some educators steadfastly contend that digital technologies have not so radically altered human learning and education so as to warrant a need to develop entirely new pedagogies for digital or online learning (Bates, 2020; Journell, 2015; Warnock, 2009).

In his treatise on how to teach writing online, Scott Warnock (2009) suggests that it is entirely possible to simply transfer your personal teaching style and favored instructional strategies from traditional, face-to-face classroom instruction to the digital environment (p.ix). Warnock contends that though clearly different from the physical classroom, the online environment also replicates many traditional classroom features in such a way that this transfer is possible, equating such features as a course home page or announcement page to the instance of a teacher greeting a student in person at a classroom door. Possibly due in part to the aforementioned ability of digital curriculum to be deployed in either face-to-face or online environments, many educators and researchers ascribe to the belief that "good teaching is good teaching, regardless of the medium" (Journell, 2015, p.102). However, research in K-12 online education does not necessarily support "that teachers who are well versed in content and pedagogy can easily adapt their classroom instruction to an online environment" (Linton & Journell, 2015, p.46). Instead, evidence that suggests good teaching is not simply good teaching, and that digital pedagogy should be unique, and represent a radically altered approach to a radically altered relationship between the world and human cognition (Gee, 2013; Hayles, 2012; Mayer, 2009/2020).

Richard E. Mayer (2009/2020) claims what is most important in designing digital educational environments is that they become learner-centered. Although, as we move towards
an understanding that learner-centered instruction benefits students more than a top-down, hierarchical approach to teaching, it can be difficult to uncouple what students need from what they simply want. The notion of students as consumers has been discussed and contested in higher education for many years, because of its commodification of knowledge as a capitalistic enterprise (Bailie, 2014)—degrees on a shelf and ready-to-wear are not an appealing prospect to most academics. The student-as-consumer idea is even more concerning in K-12 education, as young children are developmentally unprepared to determine the best policies or practices for a classroom, and may offer feedback in search of the path of least resistance rather than the path of greatest learning and growth. Despite this concern, research has shown that what students want is, to a great degree, precisely what they need (Bailie, 2014; Shearer et al., 2020; Zheng et al., 2014), and that students are more likely to thrive in academic environments they perceive to be engaging, relevant, and oriented toward authentic tasks (Cook & Davie, 2017; Gee, 2013; Mayer, 2009/2020).

Mayer (2009/2020) narrows in on the idea of “learner-centered” as beginning “with an understanding of how the human mind works” (p.13) and then using the tools available to design courses accordingly, rather than creating technology-centered learning environments that begin with consideration of the tools on hand. Unfortunately, with new technologies seeming to emerge daily, teachers can get derailed from this approach and fall into a more technology-centered mindset which seeks to fit learning into the tools available. This overprivileging of the tool is ineffective, and an approach that must be shifted to break the long cycle of ed tech failures. Mayer traces this cycle back to 1922, when Thomas Edison claimed motion pictures would completely change education. He goes on to share that in 1932, Benjamin Darrow said
radio would do the same; in the 1950s, educational television was the ticket; and as far back as the 1960s, computer tutors were predicted to replace teachers altogether. In tracing the history of failures of technology to deliver on promises to revolutionize learning, Mayer warns that if we do not shift curriculum and pedagogy to learner-centered models, we are doomed to repeat this cycle. In support of his suggestion to move away from models of pedagogy that view the teacher as a mere disseminator of information through technological tools, Mayer (2009/2020) urges those in charge of designing digital curriculum to understand that "in the twenty-first century students also need to be able to use that information to solve new problems" (p.99).

Gee (2013) agrees, asserting that because formal schooling is not action-oriented, it is at odds with natural cognitive processes, and needs to be reoriented towards problem-solving initiatives. He suggests that "we need to stop defining 'courses' in terms of bodies of facts called 'content.' We need to define them in terms of hard problems that recruit facts as tools for problem solving" (Gee, 2013, p.207). In this increasingly globalized world, students need to be able to operate in highly connected digital environments in ways that are sensitive to diverse perspectives that inevitably present problems to be solved. Though Gee (2013) argues that we do not yet do it well, he claims "pooling experience across diverse people with diverse experiences can be a powerful force for correcting errors and discovering new and better associations and patterns" (p.57), a cornerstone of human learning.

Like Gee (2013) and Mayer (2009/2020), Hayles (2012) also calls for “moving from content orientation to problem orientation” (p.9) in digital curricula. Because online courses in particular require a significant increase in reading from more traditional models, Hayles (2012) focuses a great deal on how pedagogical practices surrounding reading must change in the
digital. She specifies that the digital has changed reading and writing processes by shifting text structures to comprise shorter paragraphs that will fit on one screen without scrolling. Hayles also points out that as digital screen reading continues to rise, traditional literary reading and student reading scores at all levels continue to decline, suggesting a causal relationship. Though the data Hayles cites on student reading proficiency does not necessarily consider digital reading, she argues that it still reflects the existence of a reading crisis impacting young people in the digital age, and thus a need for pedagogical change. She also expresses concern that though evidence suggests students are doing more reading and writing than ever, albeit in non-academic, non-traditional ways, there is a disconnect in pedagogy between the choice reading and writing in which students actually engage, and academic instruction.

Hayles (2012) is thus in favor of instruction that meets students where they are with regard to reading, and she insists that the shift in society to digital reading may require acceptance that not all students will excel as strong close, literary readers. She argues instead, for a broader appreciation for and sampling of reading styles in instruction beyond close reading alone. Hayles promotes three very different, and, she argues, all necessary types of reading for the digital age: close reading, hyper reading, and machine reading.

Hayles (2012) loosely defines close reading as “learning to read complex texts” (p.11). She expands upon that definition by highlighting the deep and focused attention and persistence it entails, with the aim of obtaining in-depth and insightful understandings of rich texts which often offer multiple layers of meaning. In direct contrast to close reading, hyper reading is “skimming, scanning, fragmenting, and juxtaposing texts” (p.12), and is required when confronted with a massive quantity of information that cannot possibly be read closely, but that
must be efficiently sorted through, sometimes to discern which of a number of texts should be read closely. Hayles calls upon educators in the digital age to recognize that both hyper and close reading are critical to students' success. She contends that while educators must intervene to stop the decline of close reading skills, hyper reading is too often ignored in explicit instruction. Effective digital pedagogy, then, would build an instructional bridge between the two, as students will be required to engage in both when they enter the real world. Finally, Hayles mentions machine reading, the coded, algorithmic processes through which computers extract information from data sets, as a third digital-age reading strategy that students would benefit from exposure to. Still, she clearly privileges close and hyper reading as strategies to be more immediately acted upon in digital pedagogical design.

In discussing how and why English classes must begin to include strategies for hyper reading alongside close reading, Hayles (2012) offers the idea of scale as one of the greatest changes brought about by the digital. To illustrate how digital age changes in scale have significantly impacted our ability to think and process through reading, Hayles puts forth an estimate that one (very determined) person can read a maximum of 25,000 books in a lifetime. She then compares that amount to the more than one million titles that now exist thanks to digital publishing, arguing in favor of distributed cognition through machine reading as the only way all of these titles can be queried. In the digital age, Hayles contends, this type of distant reading—surveying a wide, thematic selection of texts—should count as reading, though it doesn't involve actually reading a single text. Though likely an idea that would have some educators in fits, we should acknowledge that machine reading can pinpoint patterns and connections on a grander
scale than ever humans could alone, and therefore access information we would never otherwise be aware of.

In addition to the need to address matters of cognitive load and memory in literacy instruction and digital course design, researchers also propose that effective digital environments must provide students with a sense of safety. In “a psychologically safe online environment, where they feel that they can fail without any detrimental consequences” (Shearer et al., 2020, p.45), students will be more willing to take measured academic risks, positioning themselves to achieve greater growth, regardless of whether or not they achieve their intended goals. In an article delineating her experience in digitizing her curriculum as a middle school English teacher, Jeana M. Hrepich (2016) suggests that “multimodal, digital curriculum offers opportunity and insight by forcing participants to encounter failure” (p.18), and further asserts that such confrontation with failure in a safe space is something students deeply need in order to succeed in the real world. Lehman & Conceição (2014) agree that with specific regard to online learning, students need “opportunities to make mistakes as they learn and not be penalized for it” (p.100).

Relevance and authenticity are also key elements that many researchers agree students need in the digital learning environment. Shearer et al. (2020) contend that effective digital curriculum “mainly favors learning on action within authentic real-life environments” (p.43), an element Gee (2013) also insists is necessary, but absent in traditional pedagogies. Zheng et al. (2014) stress the importance of the ways in which the digital affords students the opportunity “to write for and interact with authentic audiences” (p.291) including both outside audiences and students within their own digital classroom. Though the general consensus is that students need to engage in such authentic experiences in autonomous and self-directed ways, Shearer et al.
Zheng et al. (2014) insist there is still a need for instructor monitoring and constructive feedback. Gee (2013), too, cautions that we cannot favor student-led activities or group discussion over all instructional critique, because when educators go too far in trying to make students feel comfortable, it actually restricts rather than supports their learning.

With new understandings of human cognition and the needs of students in digital environments afoot, several theoretical pedagogical frameworks have been promoted as specifically appropriate for digital learning. Hayles (2012) advocates for Comparative Media Studies as an effective approach and conceptual means of bridging the print and digital worlds by comparing and exercising various ways of evaluating print and other forms of media. Comparative Media Studies was not designed specifically with pedagogy in mind, and has been recognized in humanities—particularly digital humanities—research for many years as a means of studying and synthesizing meaning and effect of various modes of communication. Nevertheless, Hayles insists that applying the principles of Comparative Media Studies to the design of digital curriculum would result in highly effective learning environments, and would certainly meet Mayer’s (2009/2020) criteria for efficient multimodal learning. Another example of an academic program specifically focused on bridging the gap between traditional and digital pedagogy is The University of Lincoln's cutting edge 'Student as Producer' program, which aims to better prepare students for success in a professional world that will require problem-solving and knowledge construction to a much greater degree than content recitation. This University of Lincoln program epitomizes student-centered learning, as "the instructor is no longer a delivery vehicle" (Winn & Lockwood, 2020, p.230). In ‘Student as Producer,’ students and faculty are often seen as collaborators, and students have agency over their own learning. It is this innate
human need to make meaning that experts believe should drive design in digital pedagogy, and that is also at the foundation of Communities of Inquiry, another frequently referenced framework for online learning. Communities of Inquiry was developed by Garrison, Anderson, and Archer (2000) as a means of best serving students in online learning environments, and it centers on a specific combination of cognitive, social, and teaching presences. This model posits that online learning best occurs when students work in social groups to cognitively engage in course content designed by the teacher (Beetham & Sharpe, 2007/2020; Heafner et al., 2015).

Research does not pinpoint any singular model as most effective, so there is a clear need to continue developing and investigating evolving models of digital learning designed to contend with a changing world. The omnipresence of internet connectivity has all but eliminated the physical boundaries that once limited the businesses and organizations that comprise the workforce that students will enter once their schooling is done. Students will be expected to know how to operate within a world not defined by their physical surroundings, so a digital pedagogy should prepare students for that responsibility. As such, and as researchers agree, a pedagogy for the digital age must be reoriented towards helping students acquire problem-solving skills that are transferable to various environments, as opposed to mastery of factual content that can quickly be found online. Practices in digital pedagogy should also be learner-centric versus technology- or teacher-centric, and oriented towards more authentic applications of learning that make use of, but are not defined by, a variety of multimedia tools and digital devices in a variety of physical environments. However, in order to effectively implement such pedagogies on a wide scale so that all students benefit from them, it is necessary to ensure to all students are able to access such programs. The next section presents a review of K-12 programs
that have been implemented with the specific aim of providing students with increased exposure
to and practice in digital literacies and learning.

Providing Access to Digital Learning in K-12 Schools

In one response to the need for effective digital learning, public schools began to explore
the possibilities of full-time K-12 virtual schools such as Florida Virtual School (FLVS), which
opened its “doors” in 1997 as the first online, statewide public high school (About Florida
Virtual School). By offering a fully online curriculum to public school students, FLVS was a
trailblazer in the development of a genuinely digital curriculum that also simulated the types of
digitized communication and collaboration often required in the digital age workplace. Though
exciting, such initiatives invite criticism for various reasons. Teacher concerns about losing
control, and too heavily weighing student input in student-centered digital learning environments
can stem from the discomfort of decentering authority in an unfamiliar space. Everyday
expectations born of our highly digitized and increasingly “on demand” society also prompt
teacher concerns about unrealistic student expectations, and not without cause. One study of
online university students indicated that students expect their teachers to work seven days every
week, respond to emails within 12 hours, and have papers graded within three days (Bailie,
2014). Another study involving online high school teachers indicated that teachers were required
to respond to all student inquiries within 24 hours (Linton & Journell, 2015).

Teachers in virtual environments must also be especially mindful that an “emphasis on
information technologies . . . pushes presence/absence into the background” (Hayles, 1999,
p.48). Students often fail to recognize the materiality of the teacher on the other side of their
screen. And while seasoned educators may have the fortitude to find humor in being equated with Netflix—on demand at a keystroke—children need teachers to acknowledge that they are real, embodied little humans, with very real material concerns. Live video sessions can certainly mitigate some of the physical disconnect, but especially in asynchronous online learning platforms, a perceived lack of materiality can lead teachers to reduce students to the information they transmit. Some argue that the interface of a learning management system or curriculum delivery platform can neutralize biases by making race, gender, or class invisible, but such characteristics are often critical to one’s identity (Hayles, 1999). Finally, practitioners of digital pedagogy must always keep in mind that “the gap between the haves and the have-nots has widened significantly since the advent of personal computers” (Selber, 2004, p.108). We can make no assumptions about why students are “absent” from online classes, or haven’t submitted assigned work, or refuse to activate webcams. We can only work to mitigate the circumstances that created this divide and develop processes that will move us toward more equitable digital learning experiences.

It is not a surprising revelation that vast differences exist in digital literacies from one socioeconomic group to another (Scherer & Siddiq, 2019), making equitable delivery of digital curricular methods to students both problematic and critical, especially as being college and career ready inarguably means being digitally literate. When colleges and universities expressed concern in the early 2000s about the lack of digital literacy among entering freshmen, particularly with regard to success in online courses, the state of Florida made the completion of at least one online course a high school graduation requirement in the 2011-2012 school year (Stewart, 2012). In making moves to ensure students can best take advantage of all the
affordances of such digital learning environments, schools must work to ensure that students have consistent, daily access to reliable digital devices and wireless networks, as well as dependable IT support, and supportive teachers that have been effectively trained to teach in and through digital learning environments. In recent years, K-12 school districts nationwide have sought to bridge the technology access gap through the implementation of one-to-one device initiatives that place technology such as laptops in the hands of all students for no cost (Stone, 2016; Warschauer, 2005; Warschauer & Tate, 2015; Zheng et al., 2014).

Zheng et. al (2014) reviewed student blog posts centered on a one-to-one laptop program implemented in all fifth, sixth, and ninth grade language arts classes in one school district to determine trends and themes in student attitudes towards the program. Based on an analysis of 362 blog posts, researchers determined seven consistent themes regarding what students expressed a need for in their digitized learning environment: efficiency, tools for better writing, easy access to information, engagement, relevance, collaboration with peers, and individualized instruction (Zheng et al., 2014). Several students also commented in their blog posts that they felt a greater sense of safety participating in a digital classroom environment, in part because the asynchronicity of the environment allowed them to reflect on their responses before giving them, and because they “were not confronted with face-to-face criticism” (Zheng et al., 2014, p.291). There is also a general call from students for a high level of communication and feedback from both peers and teachers, a sense of agency or ownership in pursuing assignments or content relevant to them as an individual, the ability to quickly and easily access information via dependable devices and/or networks, and quick support from either a tech representative or a teacher when something does go wrong (Shearer et al., 2020; Zheng et al., 2014). Student
attitudes towards digital curriculum in this one-to-one study was generally positive, but it seems
the dependability of the infrastructure or devices used to access a program of digitized
curriculum may have a significant impact on student attitudes towards that program.

Jeffrey A. Stone (2016) surveyed a group of ninth through twelfth grade students engaged
in a one-to-one laptop program, and the primary issue commented on by the students was
frustration with technical failures of both the individual laptops they were each given, and the
infrastructure in place at their school. These students universally reported concerns with laptops
freezing, batteries dying abruptly, and poor wireless connectivity at school. Likely as a result of
their frustration, these students often abandoned their school-issued digital devices and
completed course assignments using paper and pencil whenever they could. Survey responses
included comments such as “We learned on paper and it should stay that way” and “Taking
quizzes and tests online is HORRIBLE” (Stone, 2016, section 6.1.4). Ironically, in the Zheng et
al. (2014) study, many students reflected the opposite sentiment regarding a return to paper and
pencil assignments, explaining that the physical strain or pain of writing by hand had previously
caused them to avoid writing, and that when writing with paper and pen, they were “forced to
work at a slower pace due to the pain and inconvenience from handwriting” (p.286).
Interestingly, the majority of the students from the Stone (2016) study lived in homes with
dependable wireless service, and were comfortable with and had ready access to digital devices.
It is reasonable, then, to consider that it was the poor technical implementation of their school’s
digital curriculum that may have led them to prefer more traditional pedagogy.

There is a great deal of information about what students feel they need to succeed in a
digital classroom environment, but there is a dearth of research on the relationship between the
adoption of a fully digitized curriculum in a one-to-one learning environment and subsequent student achievement on standardized assessments, and on the impact of such programs on the whole child, including the child’s learning experience at home. Studies that specifically focus on one-to-one programs have been largely qualitative and highlight the feelings of students, teachers, or administrators about the implementation of such programs in their schools. Few have investigated quantifiable changes in academic achievement as related to the implementation of such a device program, or how it affects the home environment of students (Stone, 2016). There are some indicators that one-to-one programs may actually have a detrimental effect on the digital divide from an academic perspective (Warschauer, 2005; Zhang et al., 2015), though much existing research is predicated on devices being used in widely variant ways from one school to another, or in schools of widely variant socioeconomic climates (Warschauer et al., 2014). This lack of standardization has left a gap in the research that makes it difficult to ascribe generalizations regarding the implementation of these one-to-one programs across various socioeconomic environments, making this study of a very large, very standardized implementation a valuable undertaking.

**COVID-19 and the Switch to Remote/Distance Learning**

*Though the impact of the current pandemic on digital learning is not the central focus of this study, it is impossible to ignore the COVID-19 prompted mandate to move almost all U.S. students to online, digitized learning environments. This case study provides a unique and valuable opportunity to explore the perceived relationship between one-to-one laptop programs and online learning readiness, and to what degree this particular one-to-one program bridged*
the digital divide in preparing students for the most recent iteration of distance learning, a model of learning that has always had the aim of better serving marginalized populations.

The History of Remote/Distance Learning in the U.S.

Reports of a novel coronavirus, also labeled COVID-19, emerged from China in late 2019. In February 2020, concerns magnified in the United States, and by mid- to late-March, travel bans were in place, with most U.S. cities issuing orders to either stay at home or practice social distancing. Colleges and universities began closing doors to protect communities from spread of the virus, and public K-12 school districts quickly followed suit. Entire school districts shut down to prepare for a shift to online learning, advising not only students, but faculty members to work from home. As it was generally expected that learning must continue, this health crisis forced educators everywhere to rapidly implement sweeping changes to traditional and familiar models of curricular delivery (Hammond et al. 2020; Kurtz, 2020; Map: Coronavirus and School Closures, 2020; Weingarten & Whitfield, 2020).

COVID-19 notwithstanding, the overwhelming majority of instruction in the U.S. still occurs in traditional face-to-face environments, and distance learning can be seen as lower quality in the eyes of many (Allen & Seaman, 2017). Something many do not realize is that distance learning initiatives in America existed via mail as far back as the 1700s, to ensure that students unable to access traditional classrooms were provided opportunities to expand their intellectual pursuits. Leaning on Headrick’s (2000) identification of the postal service as an early example of an information management system—and thus, a technology—it is clear that such initiatives always relied on technology as a vehicle, and often developed in response to some
level of real or perceived inequitable access to education—a divide—due either to geographic location or constraints placed on certain populations because of gender, race, or other personal characteristic (Bergmann, 2001; Caruth & Caruth, 2013; Fudge, 2019; Pittman, 2008).

The earliest documented distance-learning initiative is seen in a Boston newspaper advertisement in 1728 for short-hand and accounting lessons to be delivered through the postal service. This was the first known instance of a correspondence course (Fudge, 2019), the entire notion of which was only conceivable after the invention of the printing press, a 15th century innovation that perhaps unwittingly unseated traditional theoretical frameworks of learning like “the traditional master-apprentice relationship” (Eisenstein, 2012, p. 244). As these print-based correspondence courses were run through the postal service, an early information management system (Headrick, 2000), one might argue they are the earliest examples of technologically-mediated curriculum developed specifically to reach out-of-reach students.

Students can be deemed hard-to-reach for various reasons. Women in particular “simply had few opportunities to learn in an organized curriculum” (Fudge, 2019, p. 1), so Anna Elliot Ticknor established the Society to Encourage Studies at Home in 1873, perhaps the most widely recognized instance of the first organized American distance learning program. While Ticknor’s program specifically targeted women “to provide to women what men had previously refused them” (Caruth & Caruth, 2013, p. 143), the university extension movement of the late 1800s developed separately to more generally fulfill the “university’s responsibility to reach all of society and provide education for all” (Caruth & Caruth, 2013, p. 144).

William Rainey Harper of the University of Chicago and Richard Moulton of both Cambridge and University of Chicago pioneered this university extension movement to
democratize higher education by delivering the rich resources of their highly respected universities off-campus. This non-traditional program comprised an entire department at the University of Chicago in which professors were hired specifically to deliver curriculum and grade assignments via the postal service, and also to travel to give lectures at off-site locations for students that could not avail themselves of traditional on-campus opportunities (Caruth & Caruth, 2013; Fudge, 2019; Pittman, 2008). Other examples of early, pre-21st century distance learning efforts to bring education to marginalized populations include the Colliery School of Mines, which became the International Correspondence Schools (ICS) and grew to serve 2.5 million mining, railroad, and iron-working students over the course of 20 years, the University of Arizona, the University of Wisconsin-Madison, Coastline Community, and in 1999, Jones International University in Colorado, the first accredited fully-online university (Fudge, 2019).

Despite these efforts, romanticized notions of “the traditional classroom, filled with students holding divergent opinions, and a mentor/teacher to lead them through a Socratic experience as they search for intellectual truth” (Duncan, 2005, p. 403) bred a skepticism that led many early distance learning models to fail. From the beginning, these non-traditional programs faced consistent critique by educational traditionalists, particularly among the academic elite (Caruth & Caruth, 2013; Cohen et al., 2014; Duncan, 2005; Fudge, 2019; Pittman, 2008). In classifying the University of Chicago’s Correspondence-Study Program as only an arm of University Extension and not a division unto itself, Harper unwittingly set this model apart as “other.” And while the initial plan was for a completely off-site program, in-person entrance and final exam requirements were added to appease less forward-thinking professors, causing transportation-related constraints to effectively limit rather than democratize access (Pittman,
The next section will address the emerging research on how the COVID-19 pandemic forced remote learning on all American students and their families, how various stakeholders responded, and how it may serve as an impetus for lasting change in the way remote learning is viewed.

A Pandemic Prompted Paradigm Shift? Or Perpetuation of Inequity?

Skepticism and uncertainty continue to plague remote learning, even in the 21st century (Duncan, 2005). In a March 21, 2020 television interview with Frederica Whitfield of CNN, Randi Weingarten, President of the American Federation of Teachers, discussed the coronavirus-prompted “mass distance-learning movement,” and commended U.S. educational administrators, teachers, and students for the shift they made to online learning “within the span of a week.” Within moments, ironically, Weingarten attempted to quash fears about the impact of this shift by assuring her audience, “we’ve had seven months of meaningful school” (Weingarten & Whitfield, 2020), insinuating that online school may not be so meaningful. Even as essentially 100% of U.S. teachers and students were exclusively engaging in remote learning environments, the integrity of such environments was openly challenged by renowned educators. However, a 2017 Distance Education Enrollment report showed that over 6 million U.S. higher education students took at least one online class in 2015. This represents a total of 29.7% of all enrolled college and university students, up from 28.3% in 2014, 27.1% in 2013, and 25.9% in 2012 (Allen & Seaman, 2017), and public K-12 online enrollments also continue to grow yearly. So, with such continuous growth leading up to the COVID-19 pandemic, it is reasonable to speculate about whether the forced transition to digital learning for all could prompt a true pedagogical
paradigm shift (Kuhn, 2012) that will validate the use of digital tools as a primary mode of curriculum delivery.

In *The Structure of Scientific Revolutions*, Thomas Kuhn (2012) discusses the nature of revolutionary paradigm shifts within professional scientific communities. Kuhn defines scientific communities as being held together by the glue of a paradigm—a common set of principles, beliefs, and expectations. Though the debate continues over whether pedagogy is an art or a science, members of the educational community generally rely on a shared symbol system, shared commitments, shared values, and shared exemplars—Kuhn’s markers of a paradigm. Mere growth in the use of technologically-mediated pedagogy, though, may be more indicative of general progress than an actual revolution (Kuhn, 2012; Winner, 1986). For true revolution to occur, there must be sudden and significant changes in the ways of thinking and being upheld by communities—paradigm shifts—and these changes must be unexpected and uncharted discoveries, sometimes even due to accident or error, and a crisis of sorts. According to a digital *EdWeek* publication that tracked the impact of COVID-19 on the American K-12 school system, by April 2020 “school closures due to coronavirus [had] impacted at least 124,000 U.S. public and private schools and affected at least 55.1 million students” (Map: Coronavirus and school closures, 2020). A crisis, indeed. And as “a crisis may end with the emergence of a new candidate for paradigm and with the ensuing battle over its acceptance” (Kuhn, 2012, p. 84), the COVID-19 pandemic rendered the centuries-old, but still dominant, paradigm of age-grouped, face-to-face curriculum delivery in America suddenly defunct, and remote digital learning emerged—at least temporarily—as the only alternative candidate for a new paradigm in education.
Of course, with revolutionary models being forcibly implemented at breakneck speed, scholars were interested in the fallout. Just weeks after COVID-19 began significantly impacting U.S. schools, educational researchers began assessing the initial perceptions of this abrupt shift on students, faculty, and staff (Hammond et al., 2020; Kurtz, 2020). At the K-12 level, the research staff of *Education Week* implemented a survey to gather data on how the coronavirus crisis impacted school communities. In the first round of this online survey, 1,720 educators responded, and 10 key findings emerged:

1. Both teacher and student morale were down, while the morale of school administrators and hourly employees remained unchanged.
2. The time teachers spent contacting families increased, and through these communications, the issue of inequity was amplified.
3. Email was the most common form of communication between teachers and students and families.
4. Over 20% of students were “truant,” meaning they had either not submitted work or not communicated with a teacher. Students from economically disadvantaged homes were significantly overrepresented in this group, with a truancy rate of almost 33% in schools where 75% or more families are low-income, as opposed to a 12% truancy rate in schools where 25% or fewer families are low-income.
5. 100% of district leaders were seeking creative ways to ameliorate equity issues by providing low-income families with free wi-fi, digital devices, meals, online or telephone counseling services, extra tutoring, and more.
6. Math teachers were especially concerned about delivering content remotely.
7. Arts teachers were especially concerned about delivering content remotely.

8. Educators did not agree on how to handle truancy or missing assignments.

9. Most schools were still unsure when they would re-open.

10. 93% of schools did not have a solid plan in place for how to proceed if school closures continued into the Fall of 2020 (Kurtz, 2020).

As these findings indicate, particularly findings 2, 4, and 5, matters of inequity continue to emerge within remote learning environments. Some students and school communities were clearly better prepared to make this shift than others. It may seem reasonable that a school district such as the one in this case study, whose students are already accustomed to a fully-digitized curriculum via a one-to-one laptop program, would be better prepared than others. It is also likely that differences in readiness existed across socioeconomic groups even within this one program. Further, as an increasing number of university courses and entire degree programs are offered online, it is also worth exploring how well parents of students in high schools of various socioeconomic status perceive such a program to have prepared their children for the shift to online learning.

The inherent interdisciplinarity of this study required this review of literature from seemingly disparate fields, all of which have the potential to interact under the umbrella of digital humanities, a field that remains ill-defined twenty-two years into the twenty-first century. At the functional level, the digital device program being investigated herein is technological in nature, and so fits within the realm of all things digital, computing, and technology. The study of the digital devices used in this program, however, is decidedly situated in K-12 classroom environments, rendering this project also beholden to the academic discipline of pedagogy.
Further, as this study aims to critically examine the impact of this laptop program on the most marginalized or disadvantaged student populations, it addresses concerns of inequity and social justice that are the hub of much humanities scholarship. And finally, the intersection and interweaving of the digital and the human in this study raises much more obscure digital humanities questions about agency and transformation, and just who or what is affecting whom in digitized classroom environments. The next chapter will detail the research methods used in evaluating the impact of the target district’s one-to-one laptop learning program to determine whether this program has aided in reducing achievement gaps between children of disparate socioeconomic backgrounds, and how it has affected traditional human relationships in educational contexts. The analysis and discussion of the data derived from these methods should enable this study to become situated within multiple fields of scholarship including digital learning, digital inequity, and—more broadly—the digital humanities, and fill existing gaps in the decidedly interdisciplinary body of literature referenced in this chapter.
CHAPTER 3: RESEARCH METHODS

Research Questions and Design of Study

Two research questions were set forth in the introduction chapter of this paper:

1. How does the one-to-one digital device program in this district impact student scores on the FCAT/FSA ELA Reading and Writing, the Advanced Placement (AP) English Language and Composition exam, and the Advanced Placement (AP) English Literature and Composition exam in high schools of varying socioeconomic status?

2. To what extent does the socioeconomic status of a high school relate to the attitudes and beliefs of parents towards this one-to-one digital device program and its potential impact on student achievement and learning?

I also intend to address a third question that was alluded to in the introduction chapter of this study: to what extent do the quantitative and qualitative data gathered to answer the questions above support or refute current theoretical perspectives on the digital divide? The answer to this third question will situate this study in the body of literature reviewed in Chapter Two, and help to support and advance the work of educational professionals who dedicate their work to equity in digital education for students from marginalized populations.

To answer these questions, I designed a mixed methods study loosely based on Creswell and Creswell’s (2018) participatory-social justice framework, with its aim being the acquisition of information that may help other school districts most effectively and ethically implement one-to-one digital device programs, and that can drive the development of modifications to the
specific one-to-one digital device program in this study to mitigate any elements found to be negatively affecting marginalized populations, particularly students from low-income communities. Creswell and Creswell (2018) identify a set of ten criteria for a study under such a participatory-social justice framework:

1. Identifying a problem in a marginalized community
2. Declaring a theoretical lens
3. Planning to advocate for the study’s participants
4. A literature review that addresses oppression
5. Consideration of the labeling of participants
6. Data collection intended to benefit a community
7. Participants that either initiated or were engaged in the research
8. The illumination of power relationships
9. The facilitation of social change
10. A plan to effectuate transformation

This study clearly meets most of these criteria, as explained below:

Identifying a problem in a marginalized community. This project was born out of concern for the students and families in the target district that fall into lower income levels, and thus may be at a disadvantage in a program that relies on expensive technologies to facilitate education. So, while the clear emergence of a measurable problem was not the impetus for this project, concern for the potential of such a problem was the driving force.
Declaring a theoretical lens. The theory of the digital divide, which was deeply dissected in the previous chapter, is the lens through which this entire project is being presented. Does this specific one-to-one laptop program reinforce the validity of this theory, and actually exacerbate the gap between the haves and have-nots, specifically through the use of digital devices and digital learning? Or does the data reflect a mitigation of that gap, refuting rather than upholding the theory of the digital divide?

Planning to advocate for the study’s participants. If this study reinforces the theory that a deepening digital divide does exist, and is seemingly maintained or worsened through the specific program in this study, it is absolutely my intent to bring this to the attention of district officials with a proposition to make changes that will benefit the marginalized participants being negatively affected by the program.

A literature review that addresses oppression. Chapter 2 of this dissertation explores existing literature on the digital divide, and the concerns that it brings into the public school system with regard to justly serving its most economically disadvantaged students and families. Oppression as related to this study can be viewed as placing students in learning conditions they may not be prepared for, as well as minimizing the agency of parents from marginalized populations in the planning for the digital learning programs in which their children are required to participate.

Consideration of the labeling of participants. Because being a part of a lower income bracket can certainly be a sensitive and very personal issue, I gave much thought to the labeling of both the participants and the target schools within this study. In my initial draft of the email that included the parent survey in this study, I intentionally excluded any language that revealed that parents
were selected in part because their children attended a school classified as a low-income school. However, because the research requirements of the district in this study prevented me from surveying all district schools, I was forced to select just a few schools, each representative of a specific income level. The institutional review board then required that I specify why each school was selected in the spirit of providing full disclosure to study participants. It was also important to me to use a word in addition to ‘parent’ in addressing participants, as low-income students disproportionately reside with or are under the care and supervision of someone that is not their biological parent. To be more inclusive, the word ‘guardian’ was thus added to the body of the email sent to participants.

*Data collection intended to benefit a community.* As mentioned above, the goal of collecting both the quantitative and qualitative data in this study is to determine if this one-to-one laptop learning program may be related to the exacerbation of a digital divide in the school district. If it is, the goal is to work with district officials and parents in the affected school communities to make changes that will benefit their children.

*Participants that either initiated or were engaged in the research.* Participants did not initiate this research study, nor were they engaged in the design of the study. They were, however, engaged through the parent survey, and if action needs to be taken towards making changes in the one-to-one program studied, these participants will most certainly be invited to take on a greater role in the work.

*The illumination of power relationships.* It is obviously common, and perhaps critical, for an individual or very small group to be at the helm of the decision making for any project as large in
scale as the implementation of this one-to-one digital device program in a district comprising over 200,000 students. But the open-ended questions in this survey were crafted to help provide a more complete picture of how parents across various socioeconomic groups within the district feel about their place in this implementation. Less directly, the survey response rate across socioeconomic groups may be an indication of who actually has and/or exercises a voice in such matters.

*The facilitation of social change.* Public schools are complex social systems, and this dissertation aims to identify changes that may be needed within that social system. Changes to school programs are typically driven by data, and not emotional appeal, making the quantitative piece of this study critical towards this end. Attempts to increase parental involvement, agency, and voice within that system may be even more complex because of social structures in place outside of the school building. Parents working multiple jobs to stay financially afloat may not have time to participate as much as they would like. Cultural factors can also come into play that influence parent feelings about their place in the schools, or how much they can or should participate. However, a goal of this study is to identify ways that these two social systems can better support one another.

* A plan to effectuate transformation.* Again, this is dependent on the findings of this study. As mentioned above, my goal is to determine if and how this program may be related to the presence of a digital divide in the target school district. If the program is found to be potentially worsening a divide, the goal is to work with district officials and parents to transform the program in ways that will instead benefit the children and families who are negatively affected.
If the program is found to be potentially related to improvements and to a closing of a divide, a plan will be developed to help other districts across the country implement similar programs in an effort to do the same.

**A Mixed Methods Design**

As the success of any given public education program is increasingly measured by data sets derived from standardized test scores, such scores are an important part of this study. On the other hand, because these test scores represent the output of children, it would be irresponsible to take a strictly objective and quantitative approach to understanding the situation. The quantitative research in this study included the mining, synthesis, and analysis of reading and writing achievement test data and school and student demographic data, the details of which will be discussed later in this chapter. The qualitative research comprised the surveying of parents whose children are participants in this one-to-one digital device and digital learning program, also to be further discussed in this chapter. With these varied data elements in play, a mixed methods approach that incorporates a combination of quantitative and qualitative methods for investigating the impact of this one-to-one program on both the test scores and the at-home experiences of the students and families participating in the program offers the most comprehensive look into this matter. More specifically, I used a hybrid of a convergent mixed methods approach and an explanatory sequential mixed methods approach (Creswell & Creswell, 2018).
Convergent Mixed Methods

In a convergent mixed methods approach, both quantitative and qualitative data is gathered and reviewed concurrently, and the results of each are evaluated for associations. Because I knew from the outset of this project that I would rely on a mixed methods design, and because neither the quantitative test results data nor the qualitative parent survey data I sought would change the other after its analysis, I collected both data sets simultaneously. This simultaneous collection of data conforms to a convergent mixed methods design, as seen in Figure 1 (below).

Figure 1: Convergent Mixed Methods Design

Because I also sought a possible, if only partial, explanation of the quantitative test result data in the more humanistic, qualitative parent survey response data, particularly in the responses
to the open-ended questions, I blended this convergent design with an explanatory sequential mixed methods design.

**Explanatory Sequential Mixed Methods**

In an explanatory sequential mixed methods study, data is typically gathered in two distinct phases. Quantitative data is gathered and analyzed first, and the results of this quantitative data analysis typically drive the development of the instruments used in the next, qualitative phase, in search of an explanation for the results of the first, quantitative phase. This design is represented graphically in Figure 2 (below).

**Explanatory Sequential Mixed Methods Design**

![Explanatory Sequential Mixed Methods Design](image)

**Figure 2: Explanatory Sequential Mixed Methods Design**

As previously mentioned, however, neither the quantitative nor qualitative data in this study would be impacted by the order in which it was collected. I also did not plan to use the results of the quantitative test result data analysis to develop the parent survey questions, as I sought the same parent feedback regardless of whether this one-to-one laptop learning program was found to have mitigated, exacerbated, or had no evident effect on a digital divide in the school district. As such, I collected both sets of data simultaneously as one would in a
convergent mixed methods study. But, as I did hope to glean insight about the quantitative test result data from the qualitative parent survey response data, the final stage of this study includes an interpretation of how the qualitative may explain the quantitative, as in a traditional explanatory sequential mixed methods design. Though the quantitative data did not inform the type of qualitative data gathered as in traditional convergent mixed methods, it could be useful in understanding how such programs can better serve marginalized student populations. Essentially, this study followed a convergent design for collecting data, but a sequential design for analyzing it.

Especially because the rollout of this specific digital device program has occurred in stages, the mixed methods style described herein will lend itself to a more iterative approach to answering the research questions with potential subsequent repeat studies to determine a more longitudinal impact of the program. As mentioned in the introduction chapter, the one-to-one digital learning and laptop program investigated in this study began in 2013 with a small beta group of three elementary schools, three middle schools, and one high school. A full two years was given to evaluate the program in these pilot schools, and starting in 2015, it expanded to additional schools every year, with all district high schools being the first level to reach full participation, followed by all middle schools, and lastly all elementary schools. The entire rollout was initially expected to begin its eighth and final phase of implementation in the Fall of 2021, but when the COVID-19 pandemic forced all students into remote learning in March of 2020, the timeline for this eighth and final phase was advanced to immediately include all students in all schools, regardless of grade level (Anonymous, 2020). This staggering of the program’s implementation requires a flexible approach and multifaceted approach to analyzing its
longitudinal effectiveness. Ideally, the methods employed in this study will be repeated to evaluate results in future work, perhaps five and ten years post implementation at each school.

Description of Participants and Data to be Collected

Quantitative Data

The State of Florida has a long history of leading the charge in the United States with regard to public school accountability programs. At the center of Florida’s efforts is the Florida Statewide Assessment Program, which dates back to 1971 and comprises an extensive battery of standardized achievement tests designed to assess whether or not Florida’s public school students have made adequate progress each year. Though the breadth and depth of the curricular content measured by such tests has certainly expanded over time, the foundation of this program was built on the assessment of basic core skills like reading, writing, and math (*History of Florida's Statewide Assessment Program*, n.d.). It makes sense, then, to lean on such standardized tests for information when evaluating the quantitative academic impact of a learning program such as the one-to-one digital device program discussed herein. This particular study focuses on literacy proficiency as measured through:

1. the state required annual grade-level reading and writing assessment (the Florida Comprehensive Assessment Test [FCAT] 2.0 Reading and Writing exams and the Florida Standards Assessments in English Language Arts [FSA ELA])
2. the Advanced Placement (AP) exam for English Language and Composition
3. the Advanced Placement (AP) exam for English Literature and Composition.
In evaluating the impact of this one-to-one digital learning program on literacy proficiency at each of the target schools in this study, the percentage of students passing these ELA assessments at each school will be compared before and after the implementation of the program.

Though the pilot for this district’s one-to-one program was implemented in the 2013-2014 school year, the earliest implementation for the specific schools targeted in this study was 2015-2016. Five of the nine target schools selected for this study introduced the one-to-one program in the 2015-16 school year, while the remaining four target schools implemented the program the following year, in 2016-2017. In order to get a baseline of the general level of literacy proficiency at each target school prior to the implementation of this one-to-one program, a review of the percentage of students passing the assessments mentioned in the previous paragraph will begin with the 2012-2013 school year, allowing for a minimum of three years of schoolwide literacy achievement data from each school to be reviewed prior to implementation. To pass these assessments, students must demonstrate a level of literacy proficiency on or above grade level by scoring a 3, 4, or 5 on the statewide English Language Arts (ELA) assessment. The reason for choosing the specific schools targeted in this study will be detailed later in this chapter.

The required annual English Language Arts (ELA) assessment in the Florida Statewide Assessment Program was changed from FCAT 2.0 to FSA in the 2014-2015 school year. Prior to this change, reading proficiency was assessed at every grade level through Grade 10, but writing proficiency of high school students was assessed only in Grade 10. As such, data reported to the state regarding the percentage of Grade 9 students passing the state ELA assessment at each
school only included a standardized assessment of writing proficiency beginning in the 2014-2015 school year. Despite this adjustment, the assessment data reported for each year in this study for Grade 9 and Grade 10 students reflects the only consistent measure of literacy proficiency required and available for all students at all schools in the target school district and in the entire state of Florida. Further, this study does not aim to statistically validate any particular test instrument, but to present a snapshot of literacy proficiency for all students in all schools during each year in this study. Finally, depending on the school, this adjustment was made either a full year or two years prior to implementation of the one-to-one digital device program investigated in this study. As such, any inconsistency exists only in the data either two or three years prior to the implementation of the digital device program. The baseline literacy proficiency data for the year before, during, and all years after implementation is based on the FSA, which included a writing assessment in both Grade 9 and Grade 10.

Because Florida’s annual English Language Arts (ELA) assessment is universally administered only in Grade 9 and Grade 10 at the high school level, more limited options exist for the standardized assessment of literacy for this district’s Grade 11 and Grade 12 students. Students who do not pass the FCAT 2.0 or FSA in Grade 10 are required to participate in retakes in Grade 11 and/or 12, but passing rates on these exams represent only students who initially failed, and would not accurately represent overall student achievement. Another potential standardized assessment, the National Assessment of Educational Progress (NAEP), is administered to Grade 12 students across the country to assess both reading and writing. However, this test is given only every two years, providing gaps in assessment years that would
render interpretations of data unreliable across the short span of the six years covered in this study.

Unlike the NAEP, Advanced Placement (AP) exams in English are administered annually by the College Board, an organization devoted to expanding access to college for all students, and thus one whose mission is in alignment with the concerns of this study. The AP English exams are administered primarily to Grade 11 and Grade 12 students, and like the ELA FSA, both the AP English Language and Composition exam and the AP English Literature and Composition exam assess a combination of reading and writing proficiency. It is worth noting that unlike the FCAT 2.0 and FSA, taking an Advanced Placement course or exam is not required. AP Exams are paid for by the district to ensure equitable access for all students, but exam results do likely reflect a student population more inclined to be college-bound and high-achieving on the whole than a subsample of the general population. However, the goal of this study is to evaluate changes in performance across socioeconomic community lines after the implementation of the one-to-one device program. As long as the content and aim of the test whose results are being evaluated remains comparable from year to year, patterns of improvement or decline against the same measurement are still observable and valuable. Any notable differences in losses or gains between FSA and AP exam data would also serve as valuable information for further study.

The quantitative data analyzed in this study reflects:

1. The total percentage of students at each school with passing FCAT, FSA, and AP exam scores, respectively (A score of 3 or higher is considered “passing” on all exams in this study, and reflects literacy proficiency at or above grade level);
2. The percentage of students at each school who have been classified as economically disadvantaged and passed the FCAT/FSA exams (this data was not available for AP exams);

3. The percentage of students at each school who designated English as their second language and passed the FCAT/FSA exams (this data was not available for AP exams).

Quantitative Data Sample/Participants

The one-to-one digital device program that is the focus of this study was selected in part because of the size of the district in which it is being implemented. Because it is one of the ten largest public school districts in the United States, and located in a highly diverse geographic location comprising families of widely variant cultural, social, and economic backgrounds, it represents a promising population to study when seeking knowledge that is broadly relevant. Like many large-scale bureaucratic entities, though, this school district’s Research and Evaluation department is quite restrictive, and requires an extensive vetting process to ensure that all research conducted in the district meets strict standards and limitations.

This large district comprises over 200 schools in total, 20 of which are traditional, brick-and-mortar high schools, but it does not permit any single research project to target more than 10 of those schools. Because Florida statute requires all students to take an online course to graduate from a publicly funded high school, students from all 20 traditional high schools enroll as part-time students of the district’s virtual school every year, making the virtual school population a representative subpopulation of the larger district. Thus, I chose to conduct my research through
the district’s virtual school for the efficiency and time-savings of needing only one principal’s approval, while still being able to target parents from multiple schools of varying socioeconomic status. Because the virtual school counts as one of the 10 schools allowed, I was limited to identifying an additional nine schools to remain in compliance with the district’s research scope limitations. I used a stratified sampling procedure to ensure that brick-and-mortar schools of low, mid, and high socioeconomic status (SES) are represented. Later in this chapter, I will detail the process by which I was able to contact parents from only the nine schools selected, and to validate that these selected schools are, in fact, a representative subpopulation of the entire district.

To determine which schools should be the focus of this study, I visited www.fldoe.org, clicked on the “Accountability” tab, then clicked on the “Know Your Schools” section of the drop-down menu. I then clicked on the “School Report Cards” link, and entered the district’s name, and then the school name for each of the 20 traditional high schools in this district. Once I arrived at the 2019-2020 report card for each of the schools, I clicked on the “Population and Enrollment” tab to identify the percentage of students at each high school that were classified as economically disadvantaged for the 2020-2021 school year.

In a Microsoft Excel document, I entered the name of all 20 high schools in alphabetical order, along with their corresponding percentage of economically disadvantaged students. Each high school was assigned an alternate name (i.e., A High School, B High School, C High School) based on its place in the alphabetized list, and each is referred to by its alternate name from here forward, because the district does not allow for its name or the full name of any school to be revealed to the public in a research project. Because socioeconomic status (SES) is often defined
by quartiles in education work, I sorted this spreadsheet by the percentage of economically
disadvantaged students from low to high, and then divided the list of 20 schools into quartiles.
Each of the five schools in the first quartile—those with the five lowest percentages of
economically disadvantaged students—is designated as a high-SES school; each of the five
schools with the highest percentages of economically disadvantaged students is designated as a
low-SES school, and each of the 10 schools in the middle is designated as a mid-SES school.
The AutoSum average function in Excel revealed the mean percentage of students at each school
that is classified as economically disadvantaged to be 63.47%.

The high school with the lowest percentage of economically disadvantaged students in
the district (26.2%) did not exist until 2017, a full year after all other district high schools had
fully implemented the one-to-one laptop program featured in this study. Because this school
never operated without this one-to-one laptop program in place, no baseline literacy proficiency
data was available, so it was eliminated from the study. The schools with the next three lowest
percentages of economically disadvantaged students were then selected to represent the high-
SES schools. Based on their placement in the alphabetized list mentioned above, these schools
will be referred to as O High School, R High School, and T High School throughout the
remainder of this paper. Similarly, to represent the low-SES schools, the schools with the three
highest percentages of economically disadvantaged students were selected. These schools will be
referred to as H High School, J High School, and L High School throughout the remainder of this
paper, all of which have 100% of their students classified as economically disadvantaged.
Finally, from those schools designated as mid-SES schools, the three schools closest to the mean
percentage of students designated as economically disadvantaged across the entire district
(63.47%) were selected. These schools will be referred to as F High School, I High School, and P High School throughout the remainder of this paper. Table 1 (below) identifies the specific percentages of students classified as ED in each school and in each SES category.

Table 1: Percentage of students classified as economically disadvantaged (ED)

<table>
<thead>
<tr>
<th>% ED at each school</th>
<th>Low-SES Schools</th>
<th>Mid-SES Schools</th>
<th>High-SES Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>% ED at each school</td>
<td>High School H</td>
<td>High School J</td>
<td>High School L</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Average % ED in SES category</td>
<td>100</td>
<td>63.8</td>
<td>35.9</td>
</tr>
</tbody>
</table>

Once I identified the specific schools to target, I needed to obtain the relevant exam data for each school selected. The percentage of students passing AP exams at each school is not publicly available, so I requested this report from the target school district’s Research and Evaluation office. It was sent to me by email in an Excel spreadsheet that included the number of students taking each test at each school, the number of students passing each test at each school, and the percentage of students passing each test at each school for all years dating back to 2011.

FCAT 2.0 testing data for the school years 2012-2013 and 2013-2014, and Florida Standards Assessments (FSA) testing data for school each year from 2015 through 2019 is publicly available at www.fldoe.org. This data can be found for each year by selecting the “Accountability” tab at the top of the page, then “Assessments,” then “K-12 Student Assessment,” and finally “Results”. From there, selecting for the target year and grade will
generate data for all Florida schools, and the filter function can be used to select for county and then the specific schools targeted in this study. The percentage of all students scoring 3 or higher at each school during each year from 2012 through 2019 was exported into an Excel spreadsheet that I alphabetized by school name. Because all state testing was cancelled due to COVID-19 in 2020, and because 2021 data was not available at the time of this research, 2019 was the last year in which standardized data was available for all targeted groups. It may also be worth noting that in the 2013, 2014, and 2018 results, one of the high schools was reported under a slightly different name than the 2015, 2016, 2017, and 2019 results. In 2013, 2014, and 2018, the school’s testing results were reported under the full first and last name of the person for whom the school was named, rather than the last name only, as is typically the case.

Procuring the data on the percentage of students specifically classified as English Language Learners (ELL) or Economically Disadvantaged (ED) that passed each assessment at each school was not as straightforward. Percentages were available for these student classifications at each grade level for the FCAT 2.0 results in reporting years 2013 and 2014. However, for all remaining years after the switch was made to test through the FSA ELA, grade-specific subgroup percentages were not available. Only schoolwide percentages were available for the percentage of ELL and ED students passing the exams. Further, pass rates for these specific subgroups were not made available to me for the AP Language and Composition or the AP Literature and Composition exams. For these reasons, and to limit the scope of this study amidst the massive amount of data available, I decided not to include data on ELL or ED students in further analysis.
Qualitative Data

Any humanistic study of an educational program generates concerns that cannot be addressed or answered with numbers alone. Studies such as this one, that specifically investigate a program’s impact on marginalized populations, render it critical to explore the personal perspectives of the people involved in the program. Parental views on and use of technology in the home have been shown to impact those of their children (Katz et al., 2019; van Deursen & van Dijk, 2014; Wei, 2012), so parents of children whose schools have implemented this specific one-to-one program were surveyed regarding their attitudes, feelings, and beliefs about the program through an online survey using Qualtrics. The survey link was sent by email, with the results remaining anonymous, and the survey was made available via drop-down selection box in both English and Spanish. Spanish language responses were translated through Qualtrics' integrated translation feature. Responses to the open-ended qualitative survey questions provide further insight into any possible relationships between variables.

Surveys are often considered tools for quantitative research, and the survey used in this study does include closed-ended questions with forced responses, whose results are quantified for the sake of data analysis. However, scholars in the humanities generally recognize more openly structured surveys as effective tools for qualitative research when they utilize open-ended questions designed to offer participants an authentic voice and means of elaborating on the reasons for and feelings driving their responses (Jansen, 2010). Further, the closed-ended survey responses in this study were quantified via a Likert scale, a tool developed specifically to analyze such inherently qualitative attributes as attitudes, beliefs, perceptions, and opinions that are “amenable for quantitative transformation” (Joshi et al., 2015, p. 397). As such, though a portion
of the survey data output was evaluated using quantitative means, all survey data in this study is reported under the umbrella of qualitative research as all results were generated in response to questions that are qualitative in nature. The original guiding questions for the survey are below, and more information about the development of the survey instrument is presented in the next section. The complete survey is located in the Appendix.

Central research question: To what extent does the socioeconomic status of a high school relate to the attitudes and beliefs of parents towards this one-to-one digital device program and its potential impact on student achievement and learning?

Example subquestions:

- How do you feel the LaunchEd program and provision of school-issued digital devices has affected you/your child?
- How do you feel about learning from a digital textbook versus a hardcopy paper textbook?
- What benefits has the LaunchEd program provided you/your child?
- What struggles has the LaunchEd program presented for you/your child?
- How effective do you feel the LaunchEd program has been at meeting the needs of students in a world of constant technological change?

Qualitative Data Sample/Participants

As mentioned above in the section outlining the quantitative data collection process, the selection of schools and parents/guardians for this study was driven by the requirements of the Research and Evaluation department of the target school district. Because the school district in
this study limits all research projects to a focus on 10 or fewer schools, I was unable to survey parents from all schools across the district as I originally hoped to do. As such, I used a stratified sampling procedure to select target schools that would ensure that all socioeconomic populations were represented. In the section above, I described in full detail the process by which I determined which schools should be included in this study, but I will review that process briefly here.

Because of the district’s policy against naming it or any of its schools in a published research project, each of the district’s 20 traditional high schools was entered into a spreadsheet, alphabetized, and assigned an alternate name (i.e., A High School, B High School, etc.). After adding the percentage of students classified as economically disadvantaged (ED) at each school based on data available at www.fldoe.org, the spreadsheet was sorted from lowest to highest percentage. The school with the lowest percentage of ED students was eliminated because it was a new school lacking the historical data required for the quantitative portion of this study. From the list of nineteen remaining schools, the schools with the three lowest, three highest, and three closest to the mean percentages of ED students were selected and identified as either low-SES, mid-SES, or high-SES, to ensure that an equal number of schools from each SES category was represented.

Once the target schools were identified, the district’s virtual school was used as a single source of contact information for survey respondents to reduce the sample size to a more manageable number, and to simplify the process of gathering the email addresses of parents from each school. Because all Florida students must take an online course to graduate, students from all district high schools enroll as part-time students of the district’s virtual school every year,
making the virtual school population a representative subpopulation of the larger district.

Requesting this information from only one principal, the principal of the virtual school, offered a much more efficient and manageable data gathering process.

Once the principal of the district’s virtual school granted approval of this study on her parent population, I requested the email addresses of all current-year (2020-2021) parents of part-time students from H High School, J High School, L High School, F High School, I High School, P High School, O High School, T High School, and R High School. A second school administrator was appointed to pull a report listing only email addresses and the associated school of all parents of any student that registered for or that was activated into a district virtual school course on or after August 1, 2020, and that is a full-time student of one of the nine schools selected for this study. These search parameters initially generated a list of 5,696 email addresses that were sent to me in a Microsoft Excel spreadsheet. A quick review of these email addresses revealed that some belonged to students, as identifiable by the student-specific domain used in the district. These were removed, leaving me with 5,428 email addresses designated as parent email addresses. To further ensure that these email addresses constituted a representative subpopulation of the larger school district, I reviewed the number of addresses generated from each target school and the number of total students at each school as listed on the target district’s website, and grouped these addresses by SES classification.

Starting with an analysis of the parent emails from the low-SES schools in this study, I found that of the total of 5,428 email addresses received, 1,302 total parent email addresses came from the low-SES schools on the list, which comprise a total combined student population of 6,603 students. Therefore, the emails used to survey parents from these schools represent
approximately 20% of the low-SES school population, and 24% of all emails on the distribution list. The complete data set for parent emails received for low-SES schools is represented in Table 2 (below).

Table 2: Representation of Low-SES Population in Study

<table>
<thead>
<tr>
<th></th>
<th>High School H</th>
<th>High School J</th>
<th>High School L</th>
<th>All Low-SES Schools in Study</th>
</tr>
</thead>
<tbody>
<tr>
<td># of parent email addresses received</td>
<td>287</td>
<td>273</td>
<td>742</td>
<td>1302</td>
</tr>
<tr>
<td># of students in school</td>
<td>2513</td>
<td>1577</td>
<td>2513</td>
<td>6603</td>
</tr>
<tr>
<td>% of student population represented in parent emails</td>
<td>11%</td>
<td>17%</td>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td>% of total survey population represented in parent emails</td>
<td>5%</td>
<td>5%</td>
<td>14%</td>
<td>24%</td>
</tr>
</tbody>
</table>

In analyzing the parent emails from the mid-SES schools, I found that out of the total of 5,428 email addresses received, 1,954 total parent email addresses came from the mid-SES schools on the list, which comprise a total combined student population of 8,566 students. Therefore, the emails used to survey parents from these schools represent approximately 23% of the mid-SES school population, and 36% of all emails on the list. The complete data set for parent emails received for low-SES schools is represented in Table 3 (next page).
Table 3: Representation of Mid-SES Population in Study

<table>
<thead>
<tr>
<th></th>
<th>High School F</th>
<th>High School I</th>
<th>High School P</th>
<th>All Mid-SES Schools in Study</th>
</tr>
</thead>
<tbody>
<tr>
<td># of parent email addresses received</td>
<td>301</td>
<td>1352</td>
<td>301</td>
<td>1954</td>
</tr>
<tr>
<td># of students in school</td>
<td>2035</td>
<td>3829</td>
<td>2702</td>
<td>8566</td>
</tr>
<tr>
<td>% of student population represented in parent emails</td>
<td>15%</td>
<td>35%</td>
<td>11%</td>
<td>23%</td>
</tr>
<tr>
<td>% of total survey population represented in parent emails</td>
<td>6%</td>
<td>25%</td>
<td>6%</td>
<td>36%</td>
</tr>
</tbody>
</table>

Finally, with regard to parent emails from the high-SES schools, out of the total of 5,428 email addresses received, 2,172 total parent email addresses from the high-SES schools on the list, which comprise a total combined student population of 9,368 students. Therefore, the emails used to survey parents from these schools represent approximately 23% of the high-SES school population, and 40% of all emails on the list. The complete data set for parent emails received for low-SES schools is represented in Table 4 (next page).
Table 4: Representation of High-SES Population in Study

<table>
<thead>
<tr>
<th></th>
<th>High School O</th>
<th>High School R</th>
<th>High School T</th>
<th>All High-SES Schools in Study</th>
</tr>
</thead>
<tbody>
<tr>
<td># of parent email addresses received</td>
<td>787</td>
<td>798</td>
<td>587</td>
<td>2172</td>
</tr>
<tr>
<td># of students in school</td>
<td>3492</td>
<td>2449</td>
<td>3427</td>
<td>9368</td>
</tr>
<tr>
<td>% of student population represented in parent emails</td>
<td>23%</td>
<td>33%</td>
<td>17%</td>
<td>23%</td>
</tr>
<tr>
<td>% of total survey population represented in parent emails</td>
<td>14%</td>
<td>15%</td>
<td>11%</td>
<td>40%</td>
</tr>
</tbody>
</table>

While it is initially concerning that the representation of parents on this email distribution list seems to heavily favor schools of higher socioeconomic status, with the smallest percentage being from low-SES schools and the greatest percentage being from high-SES schools, these percentages are actually somewhat representative of the greater district population. It just happens that the low-SES schools, on average, have smaller student populations. The total student population of all target schools combined is 24,587. Thus, the 6,603 students at low-SES schools represent 27% of the total combined student population from all nine schools targeted, the 8,566 students at mid-SES schools represent another 35%, and the 9,418 students at high-SES schools represents the last 38%. These percentages align closely with the percentages represented by each category on the email distribution list for this study, which can be seen in Table 5 (next page).
Table 5: Representation of Parents in Study Compared to Total Survey Population

<table>
<thead>
<tr>
<th>SES Group</th>
<th>Total # of students in schools surveyed</th>
<th>% of total student population of all schools in study</th>
<th>% of total survey population represented in parent emails</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-SES</td>
<td>6603</td>
<td>27%</td>
<td>23%</td>
</tr>
<tr>
<td>Mid-SES</td>
<td>8566</td>
<td>35%</td>
<td>36%</td>
</tr>
<tr>
<td>High-SES</td>
<td>9418</td>
<td>38%</td>
<td>40%</td>
</tr>
</tbody>
</table>

Further, the number of emails on the distribution list represents a fairly consistent percentage of the student body across each SES group. More specifically, the survey in this study was emailed to the parents of 20% of the combined student population from schools designated as low-SES, 23% of the combined population from schools designated as mid-SES, and 23% of the high-SES school population. This can be seen in Table 6 (below).

Table 6: Representation of Parents in Study Compared to Total School Populations

<table>
<thead>
<tr>
<th>SES Group</th>
<th># of parent email addresses received</th>
<th>Total # of students in schools surveyed</th>
<th>% of total SES population represented in parent emails</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-SES Schools</td>
<td>1302</td>
<td>6603</td>
<td>20%</td>
</tr>
<tr>
<td>Mid-SES Schools</td>
<td>1954</td>
<td>8566</td>
<td>23%</td>
</tr>
<tr>
<td>High-SES Schools</td>
<td>2172</td>
<td>9418</td>
<td>23%</td>
</tr>
</tbody>
</table>

After determining that the email distribution list to be used to disseminate the survey was reasonably representative of the overall district population, and after doing a cursory search for information regarding the best times for survey response rates, I uploaded this email list to Qualtrics and sent the survey on a Thursday afternoon. After almost two full weeks, 120 responses had been recorded, and a reminder email was sent on a Wednesday evening. The
survey was closed after a full four weeks of data collection with a total of 249 recorded responses: 209 from users who selected to respond in English, and 40 from users who selected to respond in Spanish. Based on an initial audience of 5,428 parent email addresses, this reflects a response rate of 4.6%.

**Qualitative Survey Instrument**

The survey instrument used in this study, the Digital Device Program Parent Survey (DDPPS), was built in and delivered through Qualtrics, an online survey tool that allows for the creation and dissemination of surveys, and the analysis and manipulation of the data derived from distributed surveys. The DDPPS was modeled after the Tablet Acceptance Questionnaire (TAQ), an instrument developed for a study on the use of tablets in schools (Zhu et. al, 2018) that was published in the *International Review of Research in Open and Distributed Learning*, a peer-reviewed e-journal. The TAQ measured five specific dimensions of both parent and student attitudes towards the use of tablets in schools: negative potential, educational benefits, technical awareness, prior experience, and general attitude. According to the authors, the content validity of the TAQ was evaluated by multiple educational technology research professionals, and found to be acceptable. Further, each of the five dimensions of the model were found to have acceptable validity and reliability measures, with convergent validity measures between .6 and .74, and composite reliability measures between .82 and .87 (Zhu et al., 2018).

Modeled after the TAQ, the Digital Device Program Parent Survey (DDPPS) developed for use in this study comprises 20 items in total. Eleven of these items lean heavily on original items from the TAQ and measure parent attitudes and beliefs about varying aspects of the one-
to-one digital device program on a 5-point Likert scale from strongly agree to strongly disagree. The language of these eleven items was modified only where needed to better reflect the specifics of the specific one-to-one digital device program investigated in this study. Both the original wording of the items from the published study and the modifications made for the DDPPS can be seen in Table 7 (next page).

Four additional DDPPS items measure demographic or descriptive information including the high school attended by the parent’s child, household income, extent and purpose of internet use by the parent taking the survey, and the level of education attained by the parent taking the survey. The remaining five items are open-ended questions designed to retrieve information about how parents perceive this one-to-one laptop program to have impacted their child, how parents perceive this one-to-one laptop program to have impacted their role in their child’s education, how parents perceive digital textbooks in comparison to hard copy textbooks, how well parents perceive this one-to-one laptop program to meet the general educational needs of students in the context of a technology driven world, and how well parents perceive this one-to-one laptop program to have prepared students for the fully remote, digitized learning that was mandated when COVID-19 closed brick and mortar schools in the spring of 2020. The complete survey was shared with all four members of my dissertation committee. It was also pilot tested by two educators, one with a Master’s degree in Instructional Design, and the other with a doctorate in education, and both of whom are familiar with the one-to-one program being evaluated in this study. Upon receiving feedback from those who reviewed the survey, I revised the wording of items to ensure face and content validity (Creswell & Creswell, 2018). Based on these recommendations, I also simplified the language in the survey to ensure an accessible
readability level. The spelling and grammar check feature available in Microsoft Word will generate readability statistics based on the Flesh-Kinkaid model, a model often used in K12 education to ensure that content is appropriate for target students. I revised this survey recursively until the Flesh-Kinkaid index reflected a sixth-grade reading level.

Table 7: Original Questions from TAQ and Modifications Made for DDPPS

<table>
<thead>
<tr>
<th>Comparison of Survey Item Wording: TAQ and DDPPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item wording from TAQ (Zhu et al., 2018)</td>
</tr>
<tr>
<td>N/A</td>
</tr>
<tr>
<td>I would recommend using tablets for learning to other friends.</td>
</tr>
<tr>
<td>I would be happy if tablet usage was continued in education.</td>
</tr>
<tr>
<td>[Subject’s] learning interest and motivation improved after using tablets.</td>
</tr>
<tr>
<td>Using tablets in class is much more interesting than traditional classes.</td>
</tr>
<tr>
<td>Tablets can facilitate [subject’s] academic performance. AND Tablets have a positive impact on [subject’s] learning.</td>
</tr>
</tbody>
</table>
## Comparison of Survey Item Wording: TAQ and DDPPS

<table>
<thead>
<tr>
<th>Comparison of Survey Item Wording: TAQ and DDPPS</th>
<th>TAQ</th>
<th>DDPPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablets may damage eyesight, reduce face-to-face time or deprive [subject] of exercise.</td>
<td>7. Devices like the laptop my child received from their school may damage eyesight, reduce face-to-face communication, or deprive them of exercise.</td>
<td></td>
</tr>
<tr>
<td>The use of tablets may cause video game addictions or result in distraction.</td>
<td>8. Devices like the laptop my child received from their school may lead to distraction or video game addiction.</td>
<td></td>
</tr>
<tr>
<td>Tablet usage may cause imbalanced access to educational resources.</td>
<td>9. Devices like the laptop my child received from their school may result in unequal access to educational resources between homes.</td>
<td></td>
</tr>
<tr>
<td>Tablet attributes can enhance engagement and improve communication.</td>
<td>10. Devices like the laptop my child received from their school can improve student communication skills.</td>
<td></td>
</tr>
<tr>
<td>Tablets provide great mobility and flexibility for connectivity.</td>
<td>11. Devices like the laptop my child received from their school make it easy for students to do schoolwork anywhere.</td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td>12. I am just as able to help my child with homework on their school-issued laptop as I was before this laptop/digital learning program.</td>
<td></td>
</tr>
<tr>
<td>I have used computers for a long time. AND I use the internet almost every day.</td>
<td>13. Which of the following best describes how you use the internet?</td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td>14. Which best describes the highest level of education completed by the adult in your household that usually helps your child with homework?</td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td>15. Which of the following best represents your total household income?</td>
<td></td>
</tr>
</tbody>
</table>
### Comparison of Survey Item Wording: TAQ and DDPPS

<table>
<thead>
<tr>
<th></th>
<th>16. Please share any ways in which this laptop/digital learning program has affected <em>your role</em> in your child's education.</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>17. Please share any ways in which this laptop/digital learning program has affected your child.</td>
</tr>
<tr>
<td>N/A</td>
<td>18. Please share how you feel about your child having access to online, digital textbooks instead of hard copy, paper textbooks as a result of this laptop program.</td>
</tr>
<tr>
<td>N/A</td>
<td>19. Please share how this laptop/digital learning program does or does not meet the educational needs of students in this world of constant technological change.</td>
</tr>
<tr>
<td>N/A</td>
<td>20. Please share how your child's experience with this laptop/digital learning program did or did not prepare them for success with remote learning when schools closed due to COVID-19 in March 2020.</td>
</tr>
</tbody>
</table>

When the survey wording was finalized, I used the automated translation feature in Qualtrics to translate the survey into Spanish. I then added a feature that allowed users to choose either English or Spanish from a drop down menu at the very top of the screen. Once the survey was translated and the language selection box was in place, I sent the survey to a co-worker whose native language is Spanish to review and ensure the accuracy of the translations. This colleague’s primary professional role is to serve as a support specialist for students and families that are non-native English speakers. She is fluent in English and Spanish, state certified in Spanish, state certified in English for Speakers of Other Languages (ESOL), and familiar with the one-to-one device program investigated in this study. She suggested a few minor revisions, which I made and sent to her for review again. After reviewing and approving of the final survey and translation, she signed a translation verification form asserting the accuracy of the English-
to-Spanish translation. I submitted this form to UCF’s IRB for documentation, and it can be accessed in the Appendix.

**Data Analysis Plan**

Because this study was built as a combination of a convergent mixed methods design and an explanatory sequential mixed methods design, the data analysis plan blends elements of data analysis approaches typified by each design. As mentioned earlier, as in a convergent mixed methods design, and unlike in a pure explanatory sequential design, the qualitative data collection in this study was not driven by an analysis of the quantitative data. As such, the order in which the data was collected and/or analyzed did not matter. Data collection for both the quantitative and qualitative phases of this study began around the same time, and until the collection phase was complete, attention was given to collecting this data alternatively at some times, and simultaneously at others.

With regard to data analysis, however, this study employed an approach more reflective of an explanatory sequential mixed methods design in which the qualitative data was sought to explain or give insight into the quantitative results. For this reason, and once the qualitative data was fully coded, an in-depth analysis of the quantitative results preceded an in-depth analysis of the qualitative results. As in both the convergent and explanatory sequential mixed methods models, results of the quantitative data analysis is reported separately in this study from results of the qualitative data analysis, both in the results chapter. Also reflective of both models, the integration of these data sets and suggestions of how the qualitative findings might explain the
quantitative are presented in the discussion chapter (Creswell & Creswell, 2018). The specific plans for analysis of each data set is delineated below.

**Quantitative Data Analysis**

The following questions were developed to guide the quantitative analysis of testing data:

**Descriptive questions:**
- What were reading/writing achievement scores across the three years prior to the implementation of the LaunchEd program in each high school?
- What were reading/writing achievement scores in the year of implementation of the LaunchEd program in each high school?
- What were reading/writing achievement scores in the two years following implementation of the LaunchEd program in each high school?
- Is there a pattern of consistent improvement or decline? Does such a pattern vary based on SES?

**Inferential question:** How does the one-to-one digital device program in this district impact student scores on the FCAT/FSA ELA Reading and Writing, the Advanced Placement (AP) English Language and Composition exam, and the Advanced Placement (AP) English Literature and Composition exam in high schools of varying socioeconomic status?

A mixed design, two-factor analysis of variance (ANOVA) was used to analyze the testing data in this study. Two independent variables were identified: time and socioeconomic status (SES) of the school community. Time was identified as the within subject factor and SES was identified as the between subject factor for this analysis.
Six levels, or categories, of time were used in completing the two-factor ANOVA analysis: three years prior to implementation of the one-to-one laptop program, two years prior to implementation of the one-to-one laptop program, one year prior to implementation, the year of implementation, one year after implementation, and two years after implementation. Using data from the target school district’s website, I identified the year in which each school implemented the one-to-one digital device program, and labeled that year “I” for implementation year. Testing data was classified according to the six levels of time identified here as opposed to the numerical calendar year in which the test was administered. The representation of time in reference to the year of implementation as opposed to a calendar year is a benefit to this analysis as it mitigates any potential impact of year-specific events that might affect testing data on the whole. For instance, though 2020 data was not available for this analysis, the year-specific external factor of the COVID-19 pandemic had a measured impact on calendar year 2020 testing data (Office for Civil Rights, 2021). Three levels, or categories, of SES were used to classify all nine schools in accordance with the previous description of the schools targeted: low, mid, and high.

Once testing data was reorganized in an Excel spreadsheet according to the six levels of time discussed in the previous paragraph, the spreadsheet was uploaded into IBM’s SPSS, a software program that facilitates advanced statistical data analysis. The two-factor ANOVA used in this analysis was set up to test for three things simultaneously, with SES as a moderating variable:

1. How does SES affect the percentage of students passing each test each year?
2. How does time affect the percentage of students passing each test each year?
3. Is there an interaction between time and percentage of students passing?
The results of this analysis will be presented in Chapter 4.

Qualitative Data Analysis

After closing the parent survey in Qualtrics, I began the qualitative data analysis by translating the Spanish language responses into English using Qualtrics’s internal translation feature. This is accomplished by opening the survey in Qualtrics, clicking on the ‘Data and Analysis’ tab, then the ‘Tools’ tab, and selecting ‘Translate Comments.’ This prompted me to add a specific field from the survey to be translated, so I selected survey questions 16 through 20 from a drop down box, and marked the box that enabled all English language responses to be skipped. This resulted in a total of 630 English responses to skip, and 124 Spanish language responses to translate into English. Once I submitted the request, it took approximately ten minutes to complete the translation. I had a colleague review these response translations as well, and they were found to be accurate.

With all responses in English, I exported the survey results from Qualtrics into an Excel document. Though the survey comprised only 20 questions, the exported data generated a 43-column Excel spreadsheet. I saved this original document, then, excluding column I, I highlighted and deleted columns A through P, which represented the following column headings: (a) survey start date; (b) survey end date; (c) and (d) respondent IP address; (e) percent of survey completed; (f) time taken to complete survey; (g) whether or not the respondent finished the survey; (h) date survey was recorded; (j) respondent last name; (k) respondent first name; (l) recipient email address; (m) external data reference; (n) respondent’s latitude; (o) respondent’s longitude; and (p) the method of survey distribution. Column I included a unique
response ID code for each survey response, so I did not delete this as I thought it might be useful later in analyzing the data for relationships between variables. Some of the columns deleted were irrelevant to my research questions. Other columns I deleted were blank, such as the respondent’s name and email address, as this was an anonymous survey and this data was not collected. I also deleted columns AH, AI, AJ, AK, and AL, as the translation feature generated duplicated responses for each of the five open-ended survey questions in columns AM, AN, AO, AP, and AQ. In this case, one column represented the original response as typed by the respondent, and the duplicated corresponding column represented the translated response. For example, all responses in column AH matched all responses in column AM, with the exception of column AM containing only English language translations for all Spanish language responses in column AH. Finally, Column R represented the response given to the following question: Do you give your consent to participate in this study by completing this anonymous survey? In checking to ensure that all participants did grant consent, I discovered that, despite spending almost eight minutes completing the survey, a single respondent selected “No” for this consent question. I deleted that entire response row, and with all of the aforementioned information deleted, I saved the cleaned version of the survey responses in a new document.

With regard to the 15 close-ended survey responses, I originally intended to group questions by categories such as attitude toward program, attitude toward learning, parent demographics, beliefs about negative effects of technology, etc., a plan which would have required some survey items to be scored in reverse because of question design, and to then import this data into SPSS for analysis. However, because of the large volume of data available for analysis within the constraints of this one study, I decided instead to run a simpler statistical
analysis using the Stats iQ feature under the “Data Analysis” tab in Qualtrics to look for five potential relationships:

- the presence or lack of a correlation between each Likert item response and the SES level of the school attended by the respondent’s child as reported in survey question 1
- the presence or lack of a correlation between each Likert item response and the internet use of the respondent as reported in survey question 13
- the presence or lack of a correlation between each Likert item response and the education level of survey respondents as reported in survey question 14
- the presence or lack of a correlation between each Likert item response and the income level of survey respondents as reported in survey question 15
- the presence or lack of a correlation between each Likert item response and the preferred language of survey respondents

Because the SES level of each school was not identified in the survey as distributed, it was also not identified in the raw survey data. However, the Stats iQ feature in Qualtrics allows for the categorization of multiple responses through a feature called “buckets.” So, for question 1, which asked survey respondents to identify the school attended by their child, I created a low-SES bucket, a mid-SES bucket, and a high-SES bucket, and placed each of the nine target schools into the appropriate bucket. Next, because user language was not a separate item in the survey, it was not automatically included in the list of variables available for analysis, so I had to add it manually. To run the statistical analysis for each of the five items identified above, I then selected each pair of variables I sought to compare, and clicked on the “relate” button in
Qualtrics. Once the “relate” button is selected, Stats iQ automatically chooses to run either a Pearson or a Spearman correlation based on the data set being analyzed.

I approached the analysis of the text responses in the spirit of Braun and Clarke’s thematic analysis (Braun et al., 2019), which allows for the emergence of initial themes or topics from a review of textual data. I first read through all responses, focusing on one question at a time, to get a general sense of ideas that were represented in the data and to begin the manual coding process. Though I did anticipate certain specific issues being raised in the parent responses, I did not approach the data with the intention of confirming the mention of any particular topic. I used a primarily inductive approach to coding, allowing the data to drive the coding by transcribing the major ideas expressed in each individual comment into a notebook. As I completed the first reading of the survey responses, I wrote a word or brief phrase that captured the essence of each comment, and when I encountered responses that expressed very similar ideas to already coded responses, I added an asterisk next to the appropriate existing code.

This in vivo coding, however, generated as many as 60 themes for each question, so after completing this first phase of coding, I returned to my handwritten notes to identify more broad emergent codes. I aimed to condense my original notes into no more than 10 themes per question, but I ultimately arrived at fewer than 20 for all questions. Question 17, which asked parents to comment on the one-to-one device program’s effect on their child, was the most challenging to categorize succinctly as it generated the greatest variation in responses. I then imported the aforementioned excel survey data file into Dedoose, which automatically created a code for each of the five open-ended questions from the survey using the title of each question as
a parent code. I added child codes to each of these, based on the themes I mentioned above, and began to manually code each response to each open-ended question by highlighting and dragging it to the appropriate code.

Once I had coded all responses, I found that analyzing data based on up to 20 thematic codes per question still generated too fractured a picture, so I created another project in Dedoose in which I coded very broadly, generally marking responses only as positive, negative, or neutral. Finally, I used the analyze features to look for patterns among all responses and variables. Specifically, I used the “Descriptor Fields x Codes Grid” feature to generate descriptive and relationship statistics for:

- the relationship between each open-ended item response and the SES level of the school attended by the respondent’s child as reported in survey question 1
- the relationship between each open-ended item response and the internet use of the respondent as reported in survey question 13
- the relationship between each open-ended item response and the education level of survey respondents as reported in survey question 14
- the relationship between each open-ended item response and the income level of survey respondents as reported in survey question 15
- the relationship between each open-ended item response and the preferred language of survey respondents

The results of this analysis will be presented in Chapter 4.
CHAPTER 4: RESULTS

This chapter will present the objective results obtained through the methods explicated in the previous chapter. The quantitative results of the standardized testing analysis will be presented first, followed by the qualitative results from the DDPPS. The demographic statistical breakdown of survey respondents will be presented first, to be followed by the results of the closed-ended Likert survey questions. This chapter will close with a presentation of the results of the open-ended survey questions.

Quantitative Data Results

As described in the previous chapter, a mixed design, two-factor analysis of variance (ANOVA) was used to analyze the testing data in this study. A two-factor ANOVA is run when one seeks to compare changes in a measurement (dependent variable) that has two outside forces (independent variables) acting on it. In this analysis, the dependent variable is the percentage of students passing a particular standardized test, and the two independent variables are identified as time and the socioeconomic status (SES) of a school community. Time was identified as the within subject factor (a variable measured at multiple levels of the same element), and SES was identified as the between subject factor (a variable that comprises distinct things in each group) for this analysis.

Six levels, or categories, of time were used in completing the two-factor ANOVA analysis: three years prior to implementation of the one-to-one laptop program, two years prior to implementation of the one-to-one laptop program, one year prior to implementation, the year of implementation, one year after implementation, and two years after implementation. The two-
factor ANOVA used in this analysis was set up to test for three things simultaneously, with SES as a moderating variable:

1. How does SES affect the percentage of students passing each test each year?
2. How does time affect the percentage of students passing each test each year?
3. Is there an interaction between time and percentage of students passing?

I ran this statistical analysis for each test separately, and the results for each test will be presented separately in this chapter. The results for each individual literacy achievement test will be followed by the results of the parent survey.

Grade 9 ELA Test

In running an ANOVA, it is important to evaluate the data for a condition known as sphericity, which enumerates the degree of differences between measures in a study. If sphericity is violated, it indicates the possibility that the differences between items to be compared is too great, and that an analysis is a great risk for error. Mauchly’s Test of Sphericity is a standard often used to measure sphericity, and in the analysis of the Grade 9 ELA testing data, Mauchly’s Test of Sphericity generated a Sig. of 0.091 as seen in Table 8 (next page). Sphericity is generally assumed if Sig. is greater than 0.05, so there was no violation of sphericity within this data set.
As such, I used only the results in the “sphericity assumed” row and ignored results in the Greenhouse-Geisser, Huynh-Field, and lower-bound results rows in Table 9 (next page). Because the primary aim of this study is to determine the extent to which a one-to-one laptop program mitigates or exacerbates the digital divide in schools of various socioeconomic status (SES), the focus of this data analysis will be on the second row of results in the “Source” column of the Tests of Within-Subjects Effects in Table 9 (next page): the interaction between levels of time, which measures the distance in years from the implementation of this one-to-one program, and SES.
Table 9: Tests of Within-Subjects Effects for Grade 9 ELA Data

A p-value of less than 0.05 is generally accepted as indicating statistical significance in the relationship between two variables. In Table 9 (above), it is clear with a Sig. of 0.165 that statistical significance between the year of implementation and the Grade 9 ELA test results was not found. However, because the sample size \(n\) is so small in this case—only nine schools in total, and only three in each SES category—it is especially important to evaluate the effect size to identify potential relationships between variables that might simply be unidentifiable because of an underpowered study due to small sample size. Effect size in Table 9 (above) is displayed in the Partial Eta Squared column. A small effect size is identified by a partial eta value of .01, a medium effect size is identified by a partial eta squared value of .06, and a large effect size is identified by a partial eta squared value of .14. As shown in Table 9 (above), the partial eta squared value for the interaction between levels of time and SES when sphericity is assumed is .343, a massive effect size. So, though statistical significance was not identifiable in this study, it
is impossible to definitively state that no interaction exists between levels of time and SES because of the extreme magnitude of the effect size.

The descriptive statistics generated with regard to the Grade 9 ELA test show that the percentage of students passing is clearly separated by SES as reflected in Figure 3 (below), which reflects the mean percentage of students passing at all three high schools in each SES category during each year reviewed in this study.

![Figure 3: Percentage of Students Passing Grade 9 ELA Each Year in all SES Categories](image)

Worth noting here, as related to the year of implementation for the one-to-one digital device program, is that while the mean percentage of students passing the Grade 9 ELA test in the year of implementation did not increase or decrease by more than a single percentage point in
any SES category, the low-SES category of school showed the steepest decline by far in percentage passing in the year following implementation. Specifically, the mean percentage of students passing this exam in the year following implementation in low-SES schools declined by 5.34 percentage points (from 27.67% to 22.33 %), whereas this same statistic in mid-SES schools declined by only 0.67 percentage points (from 52.33 percent to 51.67 percent), and the high-SES schools actually increased by 0.67 percentage points (from 65 percent to 65.67 percent). And while the mean percentage of students passing quickly rebounded in low-SES schools in the second year post-implementation, moving back up 4.67 percentage points to 27 percent, mid-SES schools actually decreased by two percentage points to 49.67 percent, and high-SES schools increased another 2.33 percentage points to 68 percent. These shifts are all reflected in the line graph in Figure 3 (previous page), and potential reasons for and implications of this finding will be discussed in the quantitative results section of the next chapter.

**Grade 10 ELA Test**

Remember it is important to evaluate the data for a condition known as sphericity to ensure that the differences between items to be compared is not too great, putting the analysis at a great risk for errors. In the analysis of the Grade 10 ELA testing data, Mauchly’s Test of Sphericity generated a Sig. of 0.199 as seen in Table 10 (next page). Sphericity is generally assumed if Sig. is greater than 0.05, so there was no violation of sphericity within this data set.
Table 10: Mauchly’s Test of Sphericity for Grade 10 ELA Data

<table>
<thead>
<tr>
<th>Within Subjects Effect</th>
<th>Mauchly’s W</th>
<th>Approx. Chi-Square</th>
<th>df</th>
<th>Sig.</th>
<th>Greenhouse-Geisser</th>
<th>Epsilon&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Huynh-Feldt</th>
<th>Lower-bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>.008</td>
<td>19.746</td>
<td>14</td>
<td>.199</td>
<td>422</td>
<td>872</td>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + SES
   Within Subjects: Design: Time

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

As such, I used only the results in the “sphericity assumed” row and ignored the results in the Greenhouse-Geisser, Huynh-Field, and lower-bound results rows in Table 11 (next page). Because the primary aim of this study is to determine the extent to which a one-to-one laptop program mitigates or exacerbates the digital divide in schools of various socioeconomic status (SES), the focus of this data analysis will be on the second row of results in the “Source” column of the Tests of Within-Subjects Effects shown in Table 11 (next page): the interaction between levels of time, which measures the distance in years from the implementation of this one-to-one program, and SES.
A p-value of less than 0.05 is generally accepted as indicating statistical significance in the relationship between two variables. In Table 11 (above), it is clear with a Sig. of 0.554 that statistical significance between the year of implementation and the Grade 10 ELA test results was not found. However, because the sample size ($n$) is so small in this case—only nine schools in total, and only three in each SES category—it is especially important to evaluate the effect size to identify potential relationships between variables that might simply be unidentifiable because of an underpowered study due to small sample size. Effect size in Table 11 (above) is displayed in the Partial Eta Squared column. A small effect size is identified by a partial eta value of .01, a medium effect size is identified by a partial eta squared value of .06, and a large effect size is identified by a partial eta squared value of .14. As shown in Table 11 (above), the partial eta squared value for the interaction between levels of time and SES when sphericity is assumed is .229, an extremely large effect size. So, though statistical significance was not
identifiable in this study, it is impossible to definitively state that no interaction exists between levels of time and SES because of the extreme magnitude of the effect size.

Like with the Grade 9 test data, the descriptive statistics generated with regard to the Grade 10 ELA test show that the percentage of students passing is clearly separated by SES as reflected in Figure 4 (below), which reflects the mean percentage of students passing at all three high schools in each SES category during all years reviewed in this study.

![Figure 4: Percentage of Students Passing Grade 10 ELA Each Year in All SES Categories](image)

Worth noting, as related to the year of implementation for the one-to-one digital device program, is that the mean percentage of students passing the Grade 10 ELA test in the year of implementation actually increased by two percentage points in both the low- and mid-SES
categories (from 21.67 percent to 23.67 percent in the low-SES schools, and from 48.67 percent to 50.67 percent in the mid-SES schools), but decreased by more than two percentage points in the high-SES category (from 64.67 percent to 62.33 percent.) In the year following the implementation, the mean percentage of students passing in low-SES and high-SES schools increased slightly again to 24 and 64 percent respectively, whereas the mean percentage of students passing in mid-SES school decreased over a full percentage point to 49.33 percent. Two years post-implementation, the mid- and high-SES school saw slight increases of 1 and 1.67 percentage points, whereas the low-SES schools decreased to 23%, lower than the year of implementation. These shifts are all reflected in the line graph in Figure 4 (previous page).

**Advanced Placement (AP) Language and Composition Test**

Again, I began by evaluating the data for sphericity to ensure that the variances between data points is not too great, putting the analysis at risk for errors. In the analysis of the AP Language and Composition testing data, Mauchly’s Test of Sphericity generated a Sig. of 0.337 as seen in Table 12 (next page). Sphericity is generally assumed if Sig. is greater than 0.05, so there was no violation of sphericity within this data set.
As such, I used only the results in the “sphericity assumed” row and ignored the results in the Greenhouse-Geisser, Huynh-Field, and lower-bound results rows in Table 13 (next page). Because the primary aim of this study is to determine the extent to which a one-to-one laptop program mitigates or exacerbates the digital divide in schools of various socioeconomic status (SES), the focus of this data analysis will be on the second row of results in the “Source” column of the Tests of Within-Subjects Effects shown in Table 13 (next page): the interaction between levels of time, which measures the distance in years from the implementation of this one-to-one program, and SES.

<table>
<thead>
<tr>
<th>Measure: MEASURE_1</th>
<th>Mauchly’s Test of Sphericity&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Approx Chi-Square</th>
<th>df</th>
<th>Sig.</th>
<th>Greenhouse-Geisser</th>
<th>Epsilon&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Huynh-Field</th>
<th>Lower-bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within Subjects Effect</td>
<td>Mauchly’s W</td>
<td>Time</td>
<td>.016</td>
<td>16.932</td>
<td>14</td>
<td>.337</td>
<td>.529</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + SES
   Within Subjects Design: Time

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.
A p-value of less than 0.05 is generally accepted as indicating statistical significance in the relationship between two variables. In Table 13 (above), it is clear with a Sig. of 0.739 that statistical significance between the year of implementation and the Grade 10 ELA test results was not found. However, because the sample size ($n$) is so small in this case—only nine schools in total, and only three in each SES category—it is especially important to evaluate the effect size to identify potential relationships between variables that might simply be unidentifiable because of an underpowered study due to small sample size. Effect size in Table 13 (above) is displayed in the Partial Eta Squared column. A small effect size is identified by a partial eta value of .01, a medium effect size is identified by a partial eta squared value of .06, and a large effect size is identified by a partial eta squared value of .14. As shown in Table 13 (above), the partial eta squared value for the interaction between levels of time and SES when sphericity is assumed is .184, a large effect size. So, though statistical significance was not identifiable in this study, it is impossible to definitively state that no interaction exists between levels of time and SES because of the magnitude of the effect size.
As was the case with both previous tests, the descriptive statistics generated with regard to the AP Language and Composition test show that the percentage of students passing is clearly separated by SES as reflected in Figure 5 (below), which reflects the mean percentage of students passing at all three high schools in each SES category during all years reviewed in this study.

Figure 5: Percentage of Students Passing AP Lang and Comp Each Year in All SES Categories

Worth noting, as related to the year of implementation for the one-to-one digital device program, is that the mean percentage of students passing the AP Language and Composition exam in the year of implementation decreased across all SES categories (from 6 percent to 4 percent in the low-SES schools, from 33 percent to 30.67 percent in the mid-SES schools, and
from 63 percent to 62.33 percent in the high-SES schools). In the year following the implementation, the mean percentage of students passing in low-SES and high-SES schools increased slightly to 4.67 and 63.33 percent respectively, whereas the mean percentage of students passing in mid-SES school decreased over a full percentage point to 29.33 percent. And while the low-SES schools almost doubled the mean percentage of students passing to 9 percent in the second year post-implementation, mid-SES schools remained exactly the same at 29.33 percent, and high-SES schools actually decreased to 61.67 percent. These shifts are all reflected in the line graph in Figure 5 (previous page).

Advanced Placement (AP) Literature and Composition Test

As with the previous three analyses, I began by evaluating the data for sphericity to ensure that the variances between data points is not too great. In the analysis of the AP Literature and Composition testing data, Mauchly’s Test of Sphericity generated a Sig. of 0.964 as seen in Table 14 (below). Sphericity is generally assumed if Sig. is greater than 0.05, so there was clearly no violation of sphericity within this data set.

Table 14: Mauchly’s Test of Sphericity for AP Literature and Composition Data

<table>
<thead>
<tr>
<th>Within Subjects Effect</th>
<th>Mauchly’s W</th>
<th>Approx. Chi-Square</th>
<th>df</th>
<th>Sig.</th>
<th>Greenhouse-Geisser</th>
<th>Epsilon</th>
<th>Huynh-Feldt</th>
<th>Lower-bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>.205</td>
<td>6.505</td>
<td>14</td>
<td>.964</td>
<td>6.66</td>
<td>1.000</td>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

- a. Design: Intercept + SES
  Within Subjects Design: Time

- b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.
As such, I used only the results in the “sphericity assumed” row and ignored the results in the Greenhouse-Geisser, Huynh-Field, and lower-bound results rows in Table 15 (below).

Because the primary aim of this study is to determine the extent to which a one-to-one laptop program mitigates or exacerbates the digital divide in schools of various socioeconomic status (SES), the focus of this data analysis will be on the second row of results in the “Source” column of the Tests of Within-Subjects Effects shown in Table 15 (below): the interaction between levels of time, which measures the distance in years from the implementation of this one-to-one program, and SES.

Table 15: Tests of Within-Subjects Effects for AP Literature and Composition Data

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
<th>Noncent. Parameter</th>
<th>Observed Power²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Sphericity Assumed</td>
<td>664.315</td>
<td>5</td>
<td>120.863</td>
<td>2.919</td>
<td>.029</td>
<td>.327</td>
<td>14.594</td>
</tr>
<tr>
<td>Time</td>
<td>Huynh-Field</td>
<td>604.315</td>
<td>5.000</td>
<td>120.863</td>
<td>2.919</td>
<td>.029</td>
<td>.327</td>
<td>14.594</td>
</tr>
<tr>
<td>Time</td>
<td>Lower-bound</td>
<td>604.315</td>
<td>1.000</td>
<td>604.315</td>
<td>2.919</td>
<td>.138</td>
<td>.327</td>
<td>2.919</td>
</tr>
<tr>
<td>Time * SES</td>
<td>Sphericity Assumed</td>
<td>337.630</td>
<td>1.0</td>
<td>33.763</td>
<td>.815</td>
<td>.616</td>
<td>21.4</td>
<td>8.154</td>
</tr>
<tr>
<td>Time * SES</td>
<td>Greenhouse-Geisser</td>
<td>337.630</td>
<td>5.653</td>
<td>50.700</td>
<td>.615</td>
<td>.581</td>
<td>21.4</td>
<td>5.430</td>
</tr>
<tr>
<td>Time * SES</td>
<td>Huynh-Field</td>
<td>337.630</td>
<td>10.000</td>
<td>33.763</td>
<td>.815</td>
<td>.616</td>
<td>21.4</td>
<td>8.154</td>
</tr>
<tr>
<td>Time * SES</td>
<td>Lower-bound</td>
<td>337.630</td>
<td>2.000</td>
<td>108.815</td>
<td>.815</td>
<td>.486</td>
<td>21.4</td>
<td>1.631</td>
</tr>
<tr>
<td>Error(Time)</td>
<td>Sphericity Assumed</td>
<td>1242.222</td>
<td>30</td>
<td>41.407</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error(Time)</td>
<td>Huynh-Field</td>
<td>1242.222</td>
<td>30.000</td>
<td>41.407</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error(Time)</td>
<td>Lower-bound</td>
<td>1242.222</td>
<td>6.000</td>
<td>207.037</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A p-value of less than 0.05 is generally accepted as indicating statistical significance in the relationship between two variables. In Table 15 (above), it is clear with a Sig. of 0.616 that statistical significance between the year of implementation and the Grade 10 ELA test results was not found. However, because the sample size (n) is so small in this case—only nine schools in total, and only three in each SES category—it is especially important to evaluate the effect size to identify potential relationships between variables that might simply be unidentifiable.
because of an underpowered study due to small sample size. Effect size in Table 15 (previous page) is displayed in the Partial Eta Squared column. A small effect size is identified by a partial eta value of .01, a medium effect size is identified by a partial eta squared value of .06, and a large effect size is identified by a partial eta squared value of .14. As shown in Table 15 (previous page), the partial eta squared value for the interaction between levels of time and SES when sphericity is assumed is .214, an extremely large effect size. So, though statistical significance was not identifiable in this study, it is impossible to definitively state that no interaction exists between levels of time and SES because of the extreme magnitude of the effect size.

As was the case with all previous tests discusses, the descriptive statistics generated with regard to the AP Literature and Composition test show that the percentage of students passing is clearly separated by SES as reflected in Figure 6 (next page), which reflects the mean percentage of students passing at all three high schools in each SES category during all years reviewed in this study.
Worth noting, as related to the year of implementation for the one-to-one digital device program, is that the mean percentage of students passing the AP Language and Composition exam in the year of implementation slightly increased in the low-SES category (from 3.67 percent to 4 percent), but dove in both the mid- and high-SES schools (from 38.67 percent to 31.33 percent in the mid-SES schools, and from 68 percent to 62.33 percent in the high-SES schools). In the year following the implementation, the mean percentage of students passing in low-SES and high-SES schools decreased to 2 and 58 percent respectively, whereas the mean percentage of students passing in mid-SES school increased over a full percentage point to 32.67 percent. Both the low- and high-SES schools rebounded slightly in the second year after
implementation with 3 and 62.67 percent of students respectively passing, while the mean of mid-SES schools dipped noticeably by over 6 percentage points to 26.33 percent passing. These shifts are all reflected in the line graph in Figure 6 (previous page).

**Qualitative Data Results**

**Demographic Statistics**

As was described in the previous chapter, the Digital Device Program Parent Survey (DDPPS) was sent to a total of 5,428 parent email addresses, and closed after a full four weeks of data collection. A total of 249 responses were recorded: 209 responses from users who selected to respond in English, and 40 responses from users who selected to respond in Spanish. This reflects a total response rate of 4.6%, and a ratio of 84% English speakers to 16% Spanish speakers. These percentages are reflected in Figure 7 (next page). According to this districts’ website, 14% of students are classified as active English Language Learners (ELLs) (ELL Report, 2021). Though these are clearly two different metrics, they are certainly related, so the similarity is indicative that the proportion of English speaking respondents in this study is not wildly out of alignment with the district on the whole.
Out of the 249 total responses received, 33 respondents indicated in their response to Question 1 that their child attended a low-SES school, 95 indicated that their child attended a mid-SES school, and 121 indicated that their child attended a high-SES school. These percentages are reflected in Figure 8 (next page).
With regard to reported household income level indicated by response to Question 15, 14.5% of respondents reported a household income at the highest level, above $175,000, which is almost double that of the 8% of respondents who reported a household income at the lowest level of below $25,000. The percentage of respondents reporting household incomes in the five categories between these two extreme levels ranged from 10.8% to 12.9%. The largest category selected was the group of respondents who preferred not to share their household income; this category represented 18.5% of all respondents. These percentages are reflected in Figure 9 (next page).
With regard to the level of education attained by the parent (or other adult at home) most likely to help with homework as measured by Question 14, the overwhelming majority of respondents reported this homework helper to have earned a college degree. Only 2.8% of respondents reported this person to have not graduated high school, and another 12.9% reported them having graduated only high school. Over 84% of respondents reported that the adult at home most likely to help with homework had a college degree, and 36.5% reported them also having earned a graduate or professional degree. These percentages are reflected in Figure 10 (next page).
Closed-Ended Likert-Item Statistics

To determine if relationships existed between the demographic factors of specific school attended, education level of parent/homework helper, household income, and user language, a correlation analysis was run between responses to all closed-ended Likert type survey items and each survey item mentioned above: the school attended by the respondent’s child, the level of education attained by the parent (or other adult at home) most likely to help with homework, the respondent’s household income, and the language (English or Spanish) in which the respondent chose to complete the survey. A correlation analysis was also run between all closed-ended Likert type survey items and Question 13, which asked respondents to identify their frequency
and type of internet use. Most of these relationships were found to lack statistical significance. However, four of these relationships were found to be statistically significant.

*Question 1 and Question 8*

A statistically significant relationship was found between Question 1 (Which school does your child currently attend?) and Question 8 (Devices like the laptop my child received from their school may lead to distraction or video game addiction.) The Chi-Squared test determined a P-Value of 0.028304, which indicates a very clearly significant relationship. The effect size based on Cramér’s V was 0.185728, indicating a small effect size. Of respondents whose children attend a low-SES school, 27.3% strongly agree that devices may lead to distraction or video game addiction, 21.2% agree, 6.1% neither agree nor disagree, 33.3% disagree, and 12.1% strongly disagree. Of respondents whose children attend a mid-SES school, 11.6% strongly agree that devices may lead to distraction or video game addiction, 8.4% agree, 23.2% neither agree nor disagree, 35.8% disagree, and 21.1% strongly disagree. Of respondents whose children attend a high-SES school, 18.2% strongly agree that devices may lead to distraction or video game addiction, 20.7% agree, 21.5% neither agree nor disagree, 26.4% disagree, and 13.2% strongly disagree. This data is represented in Figure 11 (next page).
Figure 11: Devices May Lead to Distraction or Video Game Addiction by SES of Child’s School

**Question 13 and Question 11**

A statistically significant relationship was found between Question 13 (Which of the following best describes how you use the internet?) and Question 11 (Devices like the laptop my child received from their school make it easy for students to do schoolwork anywhere.) The Chi-Squared test determined a P-Value of 0.001679, which indicates a very clearly significant relationship. The effect size based on Cramér’s V was 0.194512, indicating a medium effect size. Of those respondents who reported using the internet every day, for both entertainment and information seeking/professional purposes, 53.1% strongly agree that digital devices make it easy for students to do schoolwork anywhere, 37.6% agree, 4.1% neither agree nor disagree, 3.6% disagree, and 1.5% strongly disagree. Of those respondents who reported using the internet every day, mostly for information seeking or professional purposes, 61.4% strongly agree that
digital devices make it easy for students to do schoolwork anywhere, 27.3% agree, 9.1% neither agree nor disagree, 2.3% disagree, and 0% strongly disagree. Of those respondents who reported using the internet every day, mostly for entertainment, 40% strongly agree that digital devices make it easy for students to do schoolwork anywhere, 40% agree, 0% neither agree nor disagree, 0% disagree, and 20% strongly disagree. Of those respondents who reported using the internet no more than a few days each week, 40% strongly agree that digital devices make it easy for students to do schoolwork anywhere, 0% agree, 20% neither agree nor disagree, 40% disagree, and 0% strongly disagree. Of those respondents who reported using the internet rarely or never, 100% agree that digital devices make it easy for students to do schoolwork anywhere. This data is represented in Figure 12 (below).

![Figure 12: Devices Make it Easier to do Schoolwork Anywhere by Parental Internet Usage](image)

*Figure 12: Devices Make it Easier to do Schoolwork Anywhere by Parental Internet Usage*
**Question 13 and Question 12**

A statistically significant relationship was found between Question 13 (Which of the following best describes how you use the internet?) and Question 12 (I am just as able to help my child with homework on their school-issued laptop as I was before this laptop/digital learning program.) The Chi-Squared test determined a P-Value of 0.033175, which indicates a clearly significant relationship. The effect size based on Cramér’s V was 0.167143, indicating a small effect size. Of those respondents who reported using the internet every day, for both entertainment and information seeking/professional purposes, 28.4% strongly agree that they are just as able to help their child with homework done digitally as they were using pen and paper, 32.5% agree, 15.5% neither agree nor disagree, 18.6% disagree, and 5.2% strongly disagree. Of those respondents who reported using the internet every day, mostly for information seeking or professional purposes, 34.1% strongly agree that they are just as able to help their child with homework done digitally as they were using pen and paper, 20.5% agree, 27.3% neither agree nor disagree, 13.6% disagree, and 4.5% strongly disagree. Of those respondents who reported using the internet every day, mostly for entertainment, 0% strongly agree that they are just as able to help their child with homework done digitally as they were using pen and paper, 0% agree, 40% neither agree nor disagree, 20% disagree, and 40% strongly disagree. Of those respondents who reported using the internet no more than a few days each week, 20% strongly agree that they are just as able to help their child with homework done digitally as they were using pen and paper, 40% agree, 0% neither agree nor disagree, 40% disagree, and 0% strongly disagree. Of those respondents who reported using the internet rarely or never, 100% neither
agree nor disagree that they are just as able to help their child with homework done digitally as they were using pen and paper. This data is represented in Figure 13 (below).

**Figure 13: Parental Ability to Help with Homework Done Digitally by Parental Internet Usage**

<table>
<thead>
<tr>
<th>Respondent Language and Question 9</th>
</tr>
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| A statistically significant relationship was found between the language (English or Spanish) in which the respondent chose to complete the survey and Question 9 (Devices like the laptop my child received from their school may result in unequal access to educational resources between homes.) The Chi-Squared test determined a P-Value of 0.041905103, which indicates a significant relationship. The effect size based on Cramér’s V was 0.199535554, indicating a small effect size. Of those respondents who elected to complete the survey in English, 9.6% strongly agree that the use of digital devices in school can result in unequal access to educational resources between homes.
resources between homes, 19.1% agree, 23% neither agree nor disagree, 34.9% disagree, and 13.4% strongly disagree. Of those respondents who elected to complete the survey in Spanish, 5% strongly agree that the use of digital devices in school can result in unequal access to educational resources between homes, 7.5% agree, 20% neither agree nor disagree, 60% disagree, and 7.5% strongly disagree. This data is represented in Figure 14 (below).

Figure 14: Use of Digital Devices May Result in Unequal Access to Resources by Language

Open-Ended Question Statistics and Information

All responses to the five open-ended questions in the Digital Device Program Parent Survey (DDPPS) were manually coded and then analyzed using Dedoose. I initially exported the text-based responses from Qualtrics into a Microsoft Excel spreadsheet and used an inductive coding method to capture the most common themes that emerged from the responses to each question. This in vivo coding, however, generated as many as 60 themes for each question, so I collapsed these into 20 or fewer more broad concepts per question, and then coded all responses
again in a separate Dedoose project under even more generalized classifications of positive, negative or neutral responses. For all questions, there were a significant number of responses that were related to the question, but that did not directly answer the specific question being asked. Many of these responses included valuable information that will be discussed in the next chapter, but these responses were coded under a “miscellaneous/didn’t answer question asked” category that is reflected in all charts below. Results per question are given below.

**Question 16: Please share any ways in which this laptop/digital learning program has affected your role in your child’s education.**

Of those respondents whose children attend a low-SES high school, 35.3% reported a positive effect, 0% reported a negative effect, 29.4% reported no effect, and 0% reported both positive and negative effects. Approximately 35.3% of respondents in this category did not answer the question being asked. Of those respondents whose children attend a mid-SES high school, 22.2% reported a positive effect, 22.2% reported a negative effect, 22.2% reported no effect, and 1.9% reported both positive and negative effects. Approximately 31.5% of respondents in this category did not answer the question being asked. Of those respondents whose children attend a high-SES high school, 27.4% reported a positive effect, 38.4% reported a negative effect, 1% reported no effect, and 5.5% reported both positive and negative effects. Approximately 21.9% of respondents in this category did not answer the question being asked. This data is reflected in Figure 15 (next page).
Of those respondents who reported using the internet every day, mostly for information seeking or professional purposes, 11.1% reported a positive effect, 30% reported a negative effect, 25.9% reported no effect, and 7.4% reported both positive and negative effects. Approximately 25.9% of respondents in this category did not answer the question being asked. Of those respondents who reported using the internet no more than a few days each week, 50% reported a positive effect, and 50% reported a negative effect. Of those respondents who reported using the internet every day, for both entertainment and information seeking/professional purposes, 28.8% reported a positive effect, 27% reported a negative effect, 15.3% reported no effect, and 2.7% reported both positive and negative effects. Approximately 27.9% of respondents in this category did not answer the question being asked. Of those respondents who reported using the internet every day, mostly for entertainment, 50% reported a positive effect...
and 25% reported a negative effect. Approximately 25% of respondents in this category did not answer the question being asked. This data is reflected in Figure 16 (below).

![Figure 16: Perceived Effect of Digital Learning Program on Parent’s Role in Child’s Education by Parent Internet Usage](chart)

**Figure 16: Perceived Effect of Digital Learning Program on Parent’s Role in Child’s Education by Parent Internet Usage**

Of those respondents who reported the main household homework helper to have completed some high school, 0% reported a positive effect, 50% reported a negative effect, 0% reported no effect, and 0% reported both positive and negative effects. An additional 50% of respondents in this category did not answer the question being asked. Of those respondents who reported the main household homework helper to have graduated high school, 35% reported a
positive effect, 10% reported a negative effect, 35% reported no effect, and 5% reported both positive and negative effects. Approximately 15% of respondents in this category did not answer the question being asked. Of those respondents who reported the main household homework helper to have earned a college degree, 22.7% reported a positive effect, 24.2% reported a negative effect, 16.7% reported no effect, and 4.5% reported both positive and negative effects. Approximately 35% of respondents in this category did not answer the question being asked. Of those respondents who reported the main household homework helper to have earned a graduate or professional degree, 27.3% reported a positive effect, 38.2% reported a negative effect, 10.9% reported no effect, and 1.8% reported both positive and negative effects. Approximately 22% of respondents in this category did not answer the question being asked. This data is reflected in Figure 17 (below).

![Figure 17: Perceived Effect of Digital Learning Program on Parent’s Role by Education Level](image)

*Figure 17: Perceived Effect of Digital Learning Program on Parent’s Role by Education Level*
Of those respondents who reported a household income below $25,000, 22.2% reported a positive effect, 11.1% reported a negative effect, 22.2% reported no effect, and 0% reported both positive and negative effects. Approximately 44.4% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $25,001 to $45,000, 25% reported a positive effect, 18.9% reported a negative effect, 25% reported no effect, and 0% reported both positive and negative effects. Approximately 31.3% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $45,001 to $65,000, 19% reported a positive effect, 28.6% reported a negative effect, 33.3% reported no effect, and 4.8% reported both positive and negative effects. Approximately 14.3% of these respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $65,001 to $85,000, 35.3% reported a positive effect, 23.5% reported a negative effect, 5.9% reported no effect, and 5.9% reported both positive and negative effects. Approximately 35.3% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $85,001 to $125,000, 30% reported a positive effect, 20% reported a negative effect, 10% reported no effect, and 5% reported both positive and negative effects. Approximately 35% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $125,001 to $175,000, 29.4% reported a positive effect, 35.3% reported a negative effect, 11.8% reported no effect, and 5.9% reported both positive and negative effects. Approximately 17.6% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income above $175,000, 15% reported a positive effect, 70% reported a negative effect, 5% reported no effect.
effect, and 0% reported both positive and negative effects. Approximately 10% of respondents in this category did not answer the question being asked. This data is reflected in Figure 18 (below).

![Figure 18: Perceived Effect of Digital Learning Program on Parent’s Role in Child’s Education by Income](image)

**Figure 18: Perceived Effect of Digital Learning Program on Parent’s Role by Income**

Of those respondents who elected to complete the DDPPS in English, 25.8% reported a positive effect, 31.7% reported a negative effect, 12.5% reported no effect, and 4.2% reported both positive and negative effects. Approximately 27.5% of respondents in this category did not answer the question being asked. Of those respondents who elected to complete the DDPPS in Spanish, 29.2% reported a positive effect, 8.3% reported a negative effect, 37.5% reported no effect, and 0% reported both positive and negative effects. Approximately 29.1% of respondents in this category did not answer the question being asked. This data is reflected in Figure 19 (next page).
Figure 19: Perceived Effect of Digital Learning Program on Parent’s Role by User Language

Question 17: Please share any ways in which this laptop/digital learning program has affected your child

Of those respondents whose children attend a low-SES high school, 16.7% reported a positive effect, 38.9% reported a negative effect, 27.8% reported no effect, and 0% reported both positive and negative effects. Approximately 16.7% of respondents in this category did not answer the question being asked. Of those respondents whose children attend a mid-SES high school, 40% reported a positive effect, 32% reported a negative effect, 12% reported no effect, and 2% reported both positive and negative effects. Approximately 16% of respondents in this category did not answer the question being asked. Of those respondents whose children attend a high-SES high school, 29.1% reported a positive effect, 48.1% reported a negative effect, 38% reported no effect, and 6.3% reported both positive and negative effects. Approximately 13.9%
of respondents in this category did not answer the question being asked. This data is reflected in Figure 20 (below).

![Figure 20: Perceived Effect of Digital Learning Program on Child by SES of Child's School](chart)

*Figure 20: Perceived Effect of Digital Learning Program on Child by SES Category*

Of those respondents who reported using the internet every day, mostly for information seeking or professional purposes, 23.1% reported a positive effect, 38.5% reported a negative effect, 26.9% reported no effect, and 0% reported both positive and negative effects. Approximately 11.5% of respondents in this category did not answer the question being asked. Of those respondents who reported using the internet no more than a few days each week, 50% reported a positive effect, and 50% did not answer the question being asked. Of those respondents who reported using the internet every day, for both entertainment and information seeking/professional purposes, 33% reported a positive effect, 41.7% reported a negative effect, 6% reported no effect, and 5% reported both positive and negative effects. Approximately 15.7%
of respondents in this category did not answer the question being asked. Of those respondents who reported using the internet every day, mostly for entertainment, 25% reported a positive effect and 75% reported a negative effect. This data is reflected in Figure 21 (below).

![Figure 21: Perceived Effect of Digital Learning Program on Child by Parental Internet Usage](image)

Of those respondents who reported the main household homework helper to have completed some high school, 100% reported a negative effect. Of those respondents who reported the main household homework helper to have graduated high school, 30% reported a positive effect, 30% reported a negative effect, 30% reported no effect, and 0% reported both positive and negative effects. Approximately 10% of respondents in this category did not answer the question being asked. Of those respondents who reported the main household homework helper to have earned a college degree, 34.3% reported a positive effect, 40.3% reported a negative effect, 7.5% reported no effect, and 4.5% reported both positive and negative effects.
Approximately 16% of respondents in this category did not answer the question being asked. Of those respondents who reported the main household homework helper to have earned a graduate or professional degree, 28.1% reported a positive effect, 45.6% reported a negative effect, 5.3% reported no effect, and 5.3% reported both positive and negative effects. Approximately 16% of respondents in this category did not answer the question being asked. This data is reflected in Figure 22 (below).

![Figure 22: Perceived Effect of Digital Learning Program on Child by Education Level of Homework Helper at Home](image)

**Figure 22: Perceived Effect of Digital Learning Program on Child by Education Level**

Of those respondents who reported a household income below $25,000, 40% reported a positive effect, 40% reported a negative effect, 0% reported no effect, and 0% reported both positive and negative effects. Approximately 40% of respondents in this category included information in their response that did not answer the question being asked. Of those respondents who reported a household income of $25,001 to $45,000, 31.3% reported a positive effect, 25%
reported a negative effect, 12.5% reported no effect, and 0% reported both positive and negative effects. Approximately 31.3% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $45,001 to $65,000, 16.7% reported a positive effect, 50% reported a negative effect, 8.3% reported no effect, and 12.5% reported both positive and negative effects. Approximately 12.5% of these respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $65,001 to $85,000, 37.5% reported a positive effect, 56.3% reported a negative effect, 12.5% reported no effect, and 0% reported both positive and negative effects. There were no respondents in this category who did not answer the question being asked. Of those respondents who reported a household income of $85,001 to $125,000, 40% reported a positive effect, 40% reported a negative effect, 5% reported no effect, and 0% reported both positive and negative effects. Approximately 15% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $125,001 to $175,000, 27.8% reported a positive effect, 44.4% reported a negative effect, 0% reported no effect, and 5.6% reported both positive and negative effects. Approximately 22.2% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income above $175,000, 13.6% reported a positive effect, 63.6% reported a negative effect, 4.6% reported no effect, and 9.1% reported both positive and negative effects. Approximately 9.1% of respondents in this category did not answer the question being asked. This data is reflected in Figure 23 (next page).
Of those respondents who elected to complete the DDPPS in English, 30.9% reported a positive effect, 43.9% reported a negative effect, 5.7% reported no effect, and 4.9% reported both positive and negative effects. Approximately 15.4% of respondents in this category did not answer the question being asked. Of those respondents who elected to complete the DDPPS in Spanish, 33.3% reported a positive effect, 29.2% reported a negative effect, 29.2% reported no effect, and 0% reported both positive and negative effects. Approximately 12.5% of respondents in this category did not answer the question being asked. This data is reflected in Figure 24 (next page).
Figure 24: Perceived Effect of Digital Learning Program on Child by User Language

Question 18: Please share how you feel about your child having access to online, digital textbooks instead of hard copy, paper textbooks as a result of this laptop program.

Of those respondents whose children attend a low-SES high school, 55% reported a positive view of digital/online textbooks, 10% reported a negative view, 0% reported a neutral view, and 15% reported seeing value in and a need for both print and digital textbooks. Approximately 20% of respondents in this category did not answer the question being asked. Of those respondents whose children attend a mid-SES high school, 46.4% reported a positive view of digital/online textbooks, 14.3% reported a negative view, 12.5% reported a neutral view, and 26.8% reported seeing value in and a need for both print and digital textbooks. Approximately 8.9% of respondents in this category did not answer the question being asked. Of those respondents whose children attend a high-SES high school, 37.2% reported a positive view of...
digital/online textbooks, 31.4% reported a negative view, 2.3% reported a neutral view, and 31.4% reported seeing value in and a need for both print and digital textbooks. Approximately 3.5% of respondents in this category did not answer the question being asked. This data is reflected in Figure 25 (below).

![Parental Views About Digital Textbooks by SES Category](image)

*Figure 25: Parental Views About Digital Textbooks by SES Category*

Of those respondents who reported using the internet every day, mostly for information seeking or professional purposes, 40% reported a positive view of digital/online textbooks, 36% reported a negative view, 0% reported a neutral view, and 24% reported seeing value in and a need for both print and digital textbooks. There were no respondents in this category whose response did not answer the question being asked. Of those respondents who reported using the internet no more than a few days each week, 50% reported a positive view of digital/online textbooks, 0% reported a negative view, 0% reported a neutral view, and 0% reported seeing
value in and a need for both print and digital textbooks. The remaining 50% of respondents in this category did not answer the question being asked. Of those respondents who reported using the internet every day, for both entertainment and information seeking/professional purposes, 43.5% reported a positive view of digital/online textbooks, 20.6% reported a negative view, 6.9% reported a neutral view, and 28.3% reported seeing value in and a need for both print and digital textbooks. Approximately 7.6% of respondents in this category did not answer the question being asked. Of those respondents who reported using the internet every day, mostly for entertainment, 25% reported a positive view of digital/online textbooks, 25% reported a negative view, 0% reported a neutral view, and 50% reported seeing value in and a need for both print and digital textbooks. Approximately 25% of respondents in this category added responses and information that did not answer the question being asked. This data is reflected in Figure 26 (below).

![Parental Views About Digital Textbooks by Internet Usage](image)

*Figure 26: Parental Views About Digital Textbooks by Internet Usage*
Of those respondents who reported the main household homework helper to have completed some high school, 0% reported a positive view of digital/online textbooks, 50% reported a negative view, 0% reported a neutral view, and 0% reported seeing value in and a need for both print and digital textbooks. Another 50% of respondents in this category did not answer the question being asked. Of those respondents who reported the main household homework helper to have graduated high school, 57.1% reported a positive view of digital/online textbooks, 14.3% reported a negative view, 0% reported a neutral view, and 19.1% reported seeing value in and a need for both print and digital textbooks. Approximately 14% of respondents in this category did not answer the question being asked. Of those respondents who reported the main household homework helper to have earned a college degree, 46.7% reported a positive view of digital/online textbooks, 16% reported a negative view, 8% reported a neutral view, and 32% reported seeing value in and a need for both print and digital textbooks. Approximately 5.3% of respondents in this category did not answer the question being asked. Of those respondents who reported the main household homework helper to have earned a graduate or professional degree, 33.3% reported a positive view of digital/online textbooks, 33.3% reported a negative view, 4.8% reported a neutral view, and 27% reported seeing value in and a need for both print and digital textbooks. Approximately 6% of respondents in this category did not answer the question being asked. This data is reflected in Figure 27 (next page).
Of those respondents who reported a household income below $25,000, 43.5% reported a positive view of digital/online textbooks, 20.6% reported a negative view, 6.9% reported a neutral view, and 28.3% reported seeing value in and a need for both print and digital textbooks. Approximately 7.6% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $25,001 to $45,000, 31.3% reported a positive effect, 25% reported a negative effect, 12.5% reported no effect, and 0% reported both positive and negative effects. Approximately 31.3% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $45,001 to $65,000, 16.7% reported a positive effect, 50% reported a negative effect, 8.3% reported no effect, and 12.5% reported both positive and negative effects. Approximately 12.5% of these respondents in this category did not answer the question being asked. Of those
respondents who reported a household income of $65,001 to $85,000, 37.5% reported a positive effect, 56.3% reported a negative effect, 12.5% reported no effect, and 0% reported both positive and negative effects. There were no respondents in this category who did not answer the question being asked. Of those respondents who reported a household income of $85,001 to $125,000, 40% reported a positive effect, 40% reported a negative effect, 5% reported no effect, and 0% reported both positive and negative effects. Approximately 15% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $125,001 to $175,000, 27.8% reported a positive effect, 44.4% reported a negative effect, 0% reported no effect, and 5.6% reported both positive and negative effects. Approximately 22.2% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income above $175,000, 13.6% reported a positive effect, 63.6% reported a negative effect, 4.6% reported no effect, and 9.1% reported both positive and negative effects. Approximately 9.1% of respondents in this category did not answer the question being asked. This data is reflected in Figure 28 (next page).
Figure 28: Parental Views About Digital Textbooks by Income

Of those respondents who elected to complete the DDPPS in English, 38.7% reported a positive view of digital/online textbooks, 24.1% reported a negative view, 5.8% reported a neutral view, and 31.4% reported seeing value in and a need for both print and digital textbooks. Approximately 7.3% of respondents in this category did not answer the question being asked. Of those respondents who elected to complete the DDPPS in Spanish, 64% reported a positive view of digital/online textbooks, 16% reported a negative view, 4% reported a neutral view, and 8% reported seeing value in and a need for both print and digital textbooks. Approximately 8% of respondents in this category did not answer the question being asked. This data is reflected in Figure 29 (next page).
Question 19: Please share how this laptop/digital learning program does or does not meet the educational needs of students in this world of constant technological change.

Of those respondents whose children attend a low-SES high school, 50% reported a positive view that this district’s digital learning program does generally meet the needs of students, 7.1% reported a negative view that this district’s digital learning program does not meet the needs of students, and 21.4% reported a neutral or mixed view and believed some needs were met, but not all. Approximately 21.4% of respondents in this category did not answer the question being asked. Of those respondents whose children attend a mid-SES high school, 49.1% reported a belief that this district’s digital learning program does generally meet the needs of students, 20.8% reported a belief that this district’s digital learning program does not meet the needs of students, and 15.1% reported a neutral or mixed view and believed some needs were
met, but not all. Approximately 17% of respondents in this category did not answer the question being asked. Of those respondents whose children attend a high-SES high school, 35.1% reported a belief that this district’s digital learning program does generally meet the needs of students, 25.7% reported a belief that this district’s digital learning program does not meet the needs of students, and 25.7% reported a neutral or mixed view and believed some needs were met, but not all. Approximately 13.5% of respondents in this category did not answer the question being asked. This data is reflected in Figure 30 (below).

![Parental Views on Whether Program Meets Student Needs by SES Category](image)

**Figure 30: Parental Views on Whether Program Meets Student Needs by SES Category**

Of those respondents who reported using the internet every day, mostly for information seeking or professional purposes, 36.3% reported a belief that this district’s digital learning program does generally meet the needs of students, 22.7% reported a belief that this district’s digital learning program does not meet the needs of students, and 22.7% reported a neutral or
mixed view and believed some needs were met, but not all. Approximately 18.2% of respondents in this category did not answer the question being asked. Of those respondents who reported using the internet no more than a few days each week, 50% reported a belief that this district’s digital learning program does generally meet the needs of students, 0% reported a belief that this district’s digital learning program does not meet the needs of students, and 50% reported a neutral or mixed view and believed some needs were met, but not all. There were no respondents in this category that did not answer the question being asked. Of those respondents who reported using the internet every day, for both entertainment and information seeking/professional purposes, 43.3% reported a belief that this district’s digital learning program does generally meet the needs of students, 21.2% reported a belief that this district’s digital learning program does not meet the needs of students, and 20.4% reported a neutral or mixed view and believed some needs were met, but not all. Approximately 15.9% of respondents in this category did not answer the question being asked. Of those respondents who reported using the internet every day, mostly for entertainment, 25% reported a belief that this district’s digital learning program does generally meet the needs of students, 50% reported a belief that this district’s digital learning program does not meet the needs of students, and 25% reported a neutral or mixed view and believed some needs were met, but not all. There were no respondents in this category that did not answer the question being asked. This data is reflected in Figure 31 (next page).
Of those respondents who reported the main household homework helper to have completed some high school, 50% reported a belief that this district’s digital learning program does generally meet the needs of students, and 50% reported a belief that this district’s digital learning program does not meet the needs of students. Of those respondents who reported the main household homework helper to have graduated high school, 20% reported a belief that this district’s digital learning program does generally meet the needs of students, 20% reported a belief that this district’s digital learning program does not meet the needs of students, and 13.3% reported a neutral or mixed view and believed some needs were met, but not all. Approximately 47% of respondents in this category did not answer the question being asked. Of those respondents who reported the main household homework helper to have earned a college degree, 48.5% reported a belief that this district’s digital learning program does generally meet the needs
of students, 19.1% reported a belief that this district’s digital learning program does not meet the needs of students, and 25% reported a neutral or mixed view and believed some needs were met, but not all. Approximately 9% of respondents in this category did not answer the question being asked. Of those respondents who reported the main household homework helper to have earned a graduate or professional degree, 38.2% reported a belief that this district’s digital learning program does generally meet the needs of students, 25.5% reported a belief that this district’s digital learning program does not meet the needs of students, and 20% reported a neutral or mixed view and believed some needs were met, but not all. Approximately 16% of respondents in this category did not answer the question being asked. This data is reflected in Figure 32 (below).

![Parental Views About Whether Digital Learning Program Meets Needs of Students by Education Level of Homework Helper at Home](image_url)

**Figure 32: Parental Views on Whether Program Meets Student Needs by Education Level**
Of those respondents who reported a household income below $25,000, 42.9% reported a belief that this district’s digital learning program does generally meet the needs of students, 0% reported a belief that this district’s digital learning program does not meet the needs of students, and 14.3% reported a neutral or mixed view and believed some needs were met, but not all.

Approximately 57% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $25,001 to $45,000, 68.8% reported a belief that this district’s digital learning program does generally meet the needs of students, 12.5% reported a belief that this district’s digital learning program does not meet the needs of students, and 12.5% reported a neutral or mixed view and believed some needs were met, but not all. Approximately 6.3% of respondents in this category did not answer the question being asked.

Of those respondents who reported a household income of $45,001 to $65,000, 29.4% reported a belief that this district’s digital learning program does generally meet the needs of students, 23.5% reported a belief that this district’s digital learning program does not meet the needs of students, and 23.5% reported a neutral or mixed view and believed some needs were met, but not all. Approximately 24% of respondents in this category did not answer the question being asked.

Of those respondents who reported a household income of $65,001 to $85,000, 47.1% reported a belief that this district’s digital learning program does generally meet the needs of students, 17.6% reported a belief that this district’s digital learning program does not meet the needs of students, and 17.6% reported a neutral or mixed view and believed some needs were met, but not all. Approximately 17.7% of respondents in this category did not answer the question being asked.

Of those respondents who reported a household income of $85,001 to $125,000, 21.1% reported a belief that this district’s digital learning program does generally meet the needs of
students, 26.3% reported a belief that this district’s digital learning program does not meet the needs of students, and 36.8% reported a neutral or mixed view and believed some needs were met, but not all. Approximately 15.8% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $125,001 to $175,000, 47.4% reported a belief that this district’s digital learning program does generally meet the needs of students, 31.6% reported a belief that this district’s digital learning program does not meet the needs of students, and 15.8% reported a neutral or mixed view and believed some needs were met, but not all. Approximately 5.3% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income above $175,000, 30% reported a belief that this district’s digital learning program does generally meet the needs of students, 30% reported a belief that this district’s digital learning program does not meet the needs of students, and 25% reported a neutral or mixed view and believed some needs were met, but not all. Approximately 15% of respondents in this category did not answer the question being asked. This data is reflected in Figure 33 (next page).
Figure 33: Parental Views about Whether Digital Learning Program Meets Student Needs by Income

Of those respondents who elected to complete the DDPPS in English, 36.4% reported a belief that this district’s digital learning program does generally meet the needs of students, 26.3% reported a belief that this district’s digital learning program does not meet the needs of students, and 20.3% reported a neutral or mixed view and believed some needs were met, but not all. Approximately 16.9% of respondents in this category did not answer the question being asked. Of those respondents who elected to complete the DDPPS in Spanish, 69.6% reported a belief that this district’s digital learning program does generally meet the needs of students, 0% reported a belief that this district’s digital learning program does not meet the needs of students, and 26.1% reported a neutral or mixed view and believed some needs were met, but not all. Approximately 8.7% of respondents in this category did not answer the question being asked. This data is reflected in Figure 34 (next page).
Question 20: Please share how your child’s experience with this laptop/digital learning program did or did not prepare them for success with remote learning when schools closed due to COVID-19 in March 2020.

Of those respondents whose children attend a low-SES high school, 27.8% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 11.1% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 5.6% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this
district’s digital learning program. Approximately 61% of respondents in this category did not answer the question being asked. Of those respondents whose children attend a mid-SES high school, 49.1% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 10.9% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 5.5% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 34.5% of respondents in this category did not answer the question being asked. Of those respondents whose children attend a high-SES high school, 42.5% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 11.3% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 7.5% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 40% of respondents in this category did not answer the question being asked. This data is reflected in Figure 35 (next page).
Of those respondents who reported using the internet every day, mostly for information seeking or professional purposes, 24% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 16% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 4% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 56% of respondents in this category did not answer the question being asked. Of those respondents who reported using the internet no more than a few days each week, 0%
reported a positive view and belief that this district’s digital learning program did prepare
students for the remote learning mandates prompted by the shutdown of brick and mortar schools
at the start of the COVID-19 pandemic, 50% reported a negative view and belief that this
district’s digital learning program did not adequately prepare students for the remote learning
mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19
pandemic, and 0% reported a neutral or mixed view and belief that students were partially, but
not completely prepared for remote learning during the COVID shutdown by their previous
experience with this district’s digital learning program. Approximately 50% of respondents in
this category did not answer the question being asked. Of those respondents who reported using
the internet every day, for both entertainment and information seeking/professional purposes,
49.2% reported a positive view and belief that this district’s digital learning program did prepare
students for the remote learning mandates prompted by the shutdown of brick and mortar schools
at the start of the COVID-19 pandemic, 9.8% reported a negative view and belief that this
district’s digital learning program did not adequately prepare students for the remote learning
mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19
pandemic, and 7.4% reported a neutral or mixed view and belief that students were partially, but
not completely prepared for remote learning during the COVID shutdown by their previous
experience with this district’s digital learning program. Approximately 35% of respondents in
this category did not answer the question being asked. Of those respondents who reported using
the internet every day, 100% did not answer the question being asked. This data is reflected in
Figure 36 (next page).
Of those respondents who reported the main household homework helper to have completed some high school, 100% did not actually answer the question being asked. Of those respondents who reported the main household homework helper to have graduated high school, 47.4% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 15.8% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 5.2% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 37% of respondents in
this category did not answer the question being asked. Of those respondents who reported the main household homework helper to have earned a college degree, 37.8% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 8.1% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 9.5% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 46% of respondents in this category did not answer the question being asked. Of those respondents who reported the main household homework helper to have earned a graduate or professional degree, 49.1% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 14% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 3.5% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 33% of respondents in this category did not answer the question being asked. This data is reflected in Figure 37 (next page).
Of those respondents who reported a household income below $25,000, 12.5% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 12.5% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 0% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 75% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $25,001 to $45,000, 43.8% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of
brick and mortar schools at the start of the COVID-19 pandemic, 12.5% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 0% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 44% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $45,001 to $65,000, 34.8% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 8.7% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 4.3% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 52.2% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $65,001 to $85,000, 57.9% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 5.3% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic.
pandemic, and 10.5% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 31.6% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $85,001 to $125,000, 38.9% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 11.1% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 0% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 50% of respondents in this category did not answer the question being asked. Of those respondents who reported a household income of $125,001 to $175,000, 63.6% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 9.1% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 0% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 27.3% of respondents in
Of those respondents who reported a household income above $175,000, 36.8% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 26.3% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 0% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 36.8% of respondents in this category did not answer the question being asked. This data is reflected in Figure 38 (below).
Of those respondents who elected to complete the DDPPS in English, 42.3% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 11.5% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 6.9% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 40% of respondents in this category did not answer the question being asked. Of those respondents who elected to complete the DDPPS in Spanish, 47.8% reported a positive view and belief that this district’s digital learning program did prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, 8.7% reported a negative view and belief that this district’s digital learning program did not adequately prepare students for the remote learning mandates prompted by the shutdown of brick and mortar schools at the start of the COVID-19 pandemic, and 4.3% reported a neutral or mixed view and belief that students were partially, but not completely prepared for remote learning during the COVID shutdown by their previous experience with this district’s digital learning program. Approximately 43.5% of respondents in this category did not answer the question being asked. This data is reflected in Figure 39 (next page).
Implications of and reflections on all of the results presented in this chapter will be discussed in the next chapter.
CHAPTER 5: DISCUSSION

In this chapter, I will discuss the results of the data presented in the previous chapter. Though few statistically significant relationships were found, many notable observations can be made to benefit schools and individuals immediately, and serve as an impetus for further study. This discussion will proceed largely in the order that results were presented in Chapter 4. The first topic to be discussed will be the results of the quantitative data analysis, that is, the results of the statistical analysis of all standardized testing data presented in this study. Next, I will discuss the results of the qualitative portion of this study, that is, the results of the DDPPS survey data.

Quantitative Results: Standardized Testing Data

The first research question set forth in this study asked how or whether the one-to-one digital device program in this district impacted the socioeconomic gap between certain standardized reading and writing test scores of Grade 9 through Grade 12 students. The simple answer provided by an analysis of the data is that while this laptop program is not making things better, it is also not making things worse. Statistical analysis revealed no significance in the movement of standardized test scores between or among SES groups, either by way of increases or decreases on the whole, or in the discrepancy between scores in different SES groups. This is disappointing on some level, as we would hope to see a reduction in the divide after the implementation of this one-to-one laptop program. However, this lack of impact on the gap does provide relief. Eliminating the concern that a one-to-one digital learning program, in and of itself, may heighten existing inequalities is certainly an important finding.
As noted in the literature review chapter of this dissertation, existing studies have expressed concern that one-to-one laptop learning programs could actually exacerbate the academic divide between students in low-income and high-income school communities. However, the size and diversity of schools compared in previous studies of one-to-one programs make it difficult to accurately evaluate their impact on academic achievement data (Stone, 2016; Warschauer, 2005; Warschauer et al., 2014; Zheng et al., 2016). Because the district investigated in this study is one of the largest in the United States, and because its one-to-one digital device program was implemented in the most standardized way possible, this allows for the evaluation of academic output from a program in which identical curricular content is delivered through identical digital devices by educators similarly, if not identically, trained. Essentially, this study eliminated many of the variables that plagued previous studies, and in doing so, found that the implementation of a one-to-one program prompted no notable change in the academic achievement gap between the haves and have nots. In this case study, the gap simply held. So, while the digitizing of curriculum and offering of digital devices to all students may not close the gap, we need not be concerned that it is furthering it.

Though no statistical significance was found, there are observations about the data worth noting and perhaps investigating further. For instance, in the year of implementation, the percentage of students passing the Grade 9 ELA did not increase or decrease by more than a single point in any SES category. However, one year after implementation, low-SES schools showed the steepest decline in percentage passing—over five percentage points—while both mid- and high-SES schools changed by only a fraction of a percent in either direction. Also worth noting is how quickly the percentage of students passing the Grade 9 ELA in that low-SES
category rebounded two years after implementation, gaining back 4.67 percentage points. While this study cannot reveal the cause for this sharp decline and quick recovery of Grade 9 scores in low-SES schools, it is certainly worth investigating. Were school leaders in low-SES schools quicker to respond to the decline? Were they under more of a microscope and, as a result, did they receive supplemental resources that schools in the other SES categories did not receive? Were teachers in these schools offered additional training after the implementation as economically-challenged schools often do through programs like Title I, etc.?

Interestingly, the opposite situation occurred for the AP Literature exam. One year after implementation of the one-to-one program, the percentage of students passing in high-SES schools clearly declined most, while the passing percentage in low- and mid-SES schools held relatively steady. The AP Literature exam data is also unique in that, with the exception of low-SES schools two years prior to implementation, aggregate scores in all school categories for both years after the implementation were lower than any year prior to the implementation. This was not the case with any other assessment. One possible explanation worth investigating is that—excluding 2020, when all AP tests were offered digitally in addition to the traditional format because of COVID-19—the AP Literature and Composition exam is exclusively a paper-and-pencil test. It seems logical to wonder if a full year of digital practice and preparation for a highly rigorous paper-and-pencil exam is best practice, and these AP Literature and Composition results could serve as evidence for this dilemma. However, evidence against the likelihood that digital instruction and preparation precipitate a decline of paper-and-pencil test scores is also found in this study. The AP Language and Composition exam is also fully paper-and-pencil, and post-implementation passing percentages on this exam were only consistently lower in mid-SES
schools. Further, two years after implementation, both high- and low-SES schools achieved higher passing percentages on the AP Language and Composition exam than they achieved three years prior to implementation, the first year measured in this study. The impact of a fully digitized curriculum and one-to-one laptop intervention program specifically on academic skills assessed via hand-written assessments is certainly a concern that has been noted in existing literature (Stone, 2016; Warschauer et al., 2014), and one that warrants further investigation. Although, considering the speed with which all things digital change, one might wonder if paper-and-pencil assessments could be obsolete by the time a comprehensive study on the matter is able to be completed. Suggestive of this possibility is that the College Board—the organization that develops all AP exams—recently announced that by 2024, the SAT will be offered exclusively in digital format. This is yet another example of the digital world often changing too quickly to keep pace with.

Another factor worth considering when looking at fluctuations in test scores surrounding the implementation of this one-to-one program is the impact of the quality of the digital devices issued by the school relative to the quality of devices that students were accustomed to prior to the program. Though some changes were small, in the year of implementation, aggregate passing percentages decreased for all tests in high-SES schools. Then, with the exception of the AP Language and Composition exam scores, high-SES schools rebounded so passing percentages two years after implementation exceeded those in the year of implementation. In any public school program, cost is a key consideration in making purchases, and the digital devices distributed to students in this program are not known to be of particularly high quality. As will be discussed later in this chapter, many parent respondents to the Digital Device Program Parent
Survey (DDPPS) complained that the school-issued laptops in this program boast less than optimum processing capabilities. One might question, then, if requiring students to use a school-issued device of lesser quality than they are accustomed to, something most likely to occur in high-SES school communities, might negatively affect their learning for a time. The data on low-SES schools in this study may support this speculation.

Low-SES schools, where students are conceivably accustomed to less costly and less top-of-the line digital devices than their higher-income counterparts, actually saw an increase in the year of implementation for all exams except the AP Language and Composition exam. Mid-SES school results in the year of implementation were mixed, posting increases in the aggregate passing percentages for the Grades 9 and 10 ELA exams, but decreases in both AP exams. Finally, with the exception of the AP Language and Composition exam results in low-SES schools, both low- and mid-SES school categories stood in contrast to high-SES schools, with lower passing percentages two years post-implementation than in the year of implementation. Again, though no degree of statistical significance was found here, the visible movement in the line graphs suggest that the relationship between a one-to-one implementation, test scores, and reported household income may be worth looking into at the individual student level.

**Qualitative Results: Closed-Ended Survey Responses**

The second research question set forth in this study asked to what extent the socioeconomic status (SES) of a high school (as determined by reported household incomes of its students) related to the attitudes and beliefs of parents about the one-to-one digital device program and its impact on student learning. Feedback was elicited by email via the Digital
Device Program Parent Survey (DDPPS), which was presented in two parts. The first part comprises closed-ended questions that quantify qualitative information via a Likert scale, and those results are discussed below.

A correlation analysis was run between responses to all eleven closed-ended Likert-type items on the DDPPS and each of the following five measures: the SES of the school attended by the respondent’s child, the level of education attained by the parent (or other adult at home) most likely to help with homework, the respondent’s household income, the respondent’s frequency and type of internet use, and the language (English or Spanish) in which the respondent chose to complete the survey. Of these 55 correlation analyses run, only the following four interactions proved to be statistically significant:

- the relationship between the language (English or Spanish) in which the respondent chose to complete the survey and Q9 (Devices like the laptop my child received from their school may result in unequal access to educational resources between homes)
- the relationship between Q1 (Which school does your child currently attend?) and Q8 (Devices like the laptop my child received from their school may lead to distraction or video game addiction)
- the relationship between Q13 (Which of the following best describes how you use the internet?) and Q11 (Devices like the laptop my child received from their school make it easy for students to do schoolwork anywhere)
the relationship between Q13 (Which of the following best describes how you use the internet?) and Q12 (I am just as able to help my child with homework on their school-issued laptop as I was before this laptop/digital learning program).

Discussion on these interactions follows below.

Parent Language and Belief that Digital Devices Lead to Inequity

Q9 asked to what degree parents agreed with the following statement: Devices like the laptop my child received from their school may result in unequal access to educational resources between homes. This question represents perhaps the greatest overarching concern propelling this study. Is the digitizing of education negatively impacting the equitable delivery of quality learning? More specifically, the answer sought in this study was whether parents perceive the one-to-one digital learning program implemented in this school district to have caused any degree of inequity in access to educational resources from one student’s home to another. As revealed in the previous chapter, the greatest percentage of both English-speaking and Spanish-speaking respondents disagree with the notion that use of laptops in learning creates inequity. However, said disagreement is stronger among the Spanish-speaking respondent population, with a distinct majority of respondents disagreeing.

This is especially interesting because previous studies have focused on non-native English speakers as a student population that is more vulnerable to digital inequities than others, and a population that has been marginalized when implementing programs centered on educational technology (Katz et al., 2019; Marrapodi, 2016; Rideout & Katz, 2016). However, the DDPPS results reveal that Spanish-speaking parents are much less likely to be concerned
about such programs negatively impacting equity in education. Further, no other demographic
presented a statistically significant interaction with respect to this question. So, despite the
physical access gap of the digital divide having all but closed, it seems the mere distribution of
digital devices to all children is still enough to mitigate at least some degree of parental concern
about inequality of resources.

SES and Belief that Digital Devices Cause Addiction/Distraction

Q1 asked parents to identify the school attended by their child, and Q8 asked to what
degree parents agreed with the following statement: *Devices like the laptop my child received
from their school may lead to distraction or video game addiction*. Video game addiction and
general distraction are highly specific concerns that are not a targeted focus of this study.
However, this question was adapted directly from the survey (Zhu et al., 2018) upon which the
DDPS was based, and as will be discussed later in this chapter, multiple responses to the open-
ended questions of the DDPPS reflect clear parent displeasure with their children using school-
issued laptops to play video games as a distraction from schoolwork. Some parents even used the
word “addiction” of their own accord. It was also important to gauge the range and intensity of
negative parental attitudes towards the digitization of education, as parental attitudes can impact
student attitudes and, by extension, the likelihood of student success in a digitized classroom.

Despite Q1 requiring respondents to identify the specific school attended by their child,
schools were grouped by socioeconomic status in the analysis stage, so responses were analyzed
by SES category rather than individual school location. And though multiple parents referenced
distraction, gaming, and even addiction in the open-ended questions of the DDPPS unprompted,
the greatest percentage of parents in each SES category disagreed that school-issued digital devices cause that distraction or gaming addiction in their responses to Q8. Beyond that, it was interesting to note that while the smallest variance between all responses occurred in high-SES schools, where opinions were fairly evenly distributed, there was a clear polarization of opinions in low-SES schools. A very small percentage of respondents from low-SES schools expressed a neutral opinion about school laptops being the cause of their child’s distraction from schoolwork, as responses were strongly split with over 45% of respondents indicating agreement/strong agreement, and over 40% indicating disagreement/strong disagreement. Finally, with low-SES school parents landing in two distinct camps on this matter, and high-SES school parents being all over the place, parents of children in mid-SES schools were much less likely than either group to blame digital devices for their child’s distractions or excessive gaming, with fewer than 20% of parents agreeing/strongly agreeing, and over 55% of parents disagreeing/strongly disagreeing. There was no statistical significance found between individual respondent’s household income and responses to Q8, so it begs further investigation into why statistical significance was found based on aggregate SES groupings of schools. The superficial finding here is that the wealthier a school community is, the more variant parental opinions are on the link between laptop use in schools and student distraction and video game addiction. A deeper and more targeted investigation is needed to uncover the reason for this, but awareness of this phenomenon can certainly help school leaders plan for community discussion of such matters.
Parent Internet Use and Belief that Digital Devices Aid Anywhere Learning

Q13 asked parents to quantify the scope and frequency of their internet use. Q11 asked to what degree parents agreed with the following statement: *Devices like the laptop my child received from their school make it easy for students to do schoolwork anywhere*; and Q12 asked to what degree parents agreed with the following statement: *I am just as able to help my child with homework on their school-issued laptop as I was before this laptop/digital learning program.*

Existing research cited in the literature review claims that parental internet use has a significant impact on how children view and use digital devices and information, so finding that Q13 had a statistically significant relationship with not just one, but two other survey questions was particularly validating. Through a national telephone survey of 1,191 low- and mid-income parents, Katz et al. (2019) found that parental internet use as measured by both scope and frequency of online activity was highly predictive of internet use in their school-age children, and called for intervention programs that extended beyond classrooms and into the homes of children and their families. Theirs was a nationwide study that qualified participants using only two measures: having a school-aged child and having a household income below $65,000. The fact that the study of one specific digital learning program in a single school district affirmed the findings of Katz et al.’s broad, national study underscores the importance of a parent’s role in a student’s education, especially in schools with full-scale digital learning programs in place. It also supports the call for developing targeted parent outreach programs in this district and in others that implement one-to-one programs in the future.
Q11 asked parents to share their opinion on whether or not laptop learning programs like the program implemented in this district offer location-based convenience to completing schoolwork. The overwhelming majority of parents agreed that this program does offer such convenience, with over 80% of parents in all but one category of internet use either agreeing or strongly agreeing. The single category of parents that did not express overwhelming agreement is parents who reported using the internet no more than a few days each week. In this day and age, one would be hard-pressed to find many individuals that do not use the internet in some way on a daily basis. Being that such infrequent internet use is out of the norm, it is not surprising that parents who fall into this category would respond in such a categorically different way.

The most interesting, and perhaps most telling, bit of information gleaned from this interaction, though, is that the only category from which a marked percentage of parents reported strongly disagreeing with this convenience factor is parents who reported using the internet every day, but mostly for entertainment. Considering what we know from the existing literature, we can reasonably assume this is because parents in this category are likely to lack the skills or the need to use the internet for more professional or information-seeking endeavors. Again, as suggested by Katz et al. (2019), this information points to an opportunity for schools to offer additional education and support to help parents acquire internet skills that move beyond entertainment.

Parent Internet Use and Ability to Help with Digitized Homework

Responses to Q12 were of even greater interest to me than Q11, because the adequacy of homework help available to underprivileged students at home was of paramount concern in the
nascent stage of this project, and always troubled me as one of the most likely ways in which one-to-one device programs might negatively impact the digital divide in public schools. So it was simultaneously validating and dismaying that this was, in fact, one of the few relationships found to be statistically significant. This concern gets at the very heart of this study, and the social action that I argue must be taken to ensure that truly equal access is not precluded by factors completely outside of a student’s control. Children cannot control how their parents use the internet, but clearly, that internet usage has an impact on parental attitudes and/or beliefs about helping with homework. Schools need to intervene here.

It is genuinely alarming that no parents who reported using the internet mostly for entertainment are confident in their abilities to help their children with homework now that it has been entirely digitized. Further, a full 40% of those parents who use the internet only a few days a week do not feel confident in helping their children since the implementation of this digital learning program. While these two categories may represent a smaller portion of respondents than those who do use the internet more vigorously, these are still significant and disconcerting numbers. Parents were given no choice in whether or not to digitize their children’s schools, so if they no longer feel comfortable helping with homework because of that digitization, their ability to be involved and support their children is also being decided by the powers that be.

The matter of parental agency in the digital lives of their children is a prickly one. There are certainly understandable reasons why parents feel it is necessary to monitor and restrict their children’s use of digital devices and platforms. Digital humanities scholars acknowledge that exposure to such things as incessant internet marketing, violence, and adult content—many of which appear in responses to the open-ended questions of the DDPPS—are reasonable causes for
parent concern when it comes to their children’s digital activities. However, many scholars concurrently call such monitoring into question, citing either matters of ethics and privacy rights, or the possibility that overzealousness in parental monitoring stunts a teen’s development of self-restraint and ability to act ethically in digital environments (Beever et al., 2020; Birkerts, 2015; boyd, 2014). This aside, Birkerts (2015) still suggests that when school leaders unilaterally implement digital learning programs, it represents an “institutional short-circuiting of the parents’ power to curb the screen exposure of their children” (p.117). Such a total removal of parent agency reflects a definite power imbalance that requires correction. And beyond a show of respect for parent agency, school leaders must also concern themselves with who can support these students at home now that their parents can not. This represents yet another call to action for districts to develop or expand parent education programs to help parents become comfortable facilitating their students’ success with a digitized curriculum at home.

As a former K-12 library media specialist, I have felt strongly for some time that the 21st century school library is a highly underutilized resource in our public schools. School libraries have now become ubiquitously known as media centers, and more school librarians are referring to themselves as digital media specialists. The role of these professionals has expanded far beyond fostering a love of reading, suggesting titles, and directing students towards books on shelves. Many schools have begun to set aside digital makerspaces in their traditional school libraries to ensure that the youngest generation is armed with the skills needed to become creators and not just consumers of digital content, and school librarians at all levels are now charged with teaching media and information literacy skills to students. There exists so much potential for these physical hubs of our public schools to also use these resources to become
significant points of community outreach. This is especially critical to consider in schools with marginalized student populations whose parents struggle to understand today's digitized classrooms, but whose support is essential to the academic success of their children.

Qualitative Results: Open-Ended Survey Responses

As mentioned previously, the Digital Device Program Parent Survey (DDPPS) aimed at answering the second research question set forth in this study: to what extent does the SES of a high school relate to the attitudes and beliefs of parents about the one-to-one digital device program and its impact on student learning? The DDPPS was administered by email in two parts, the second of which comprises open-ended questions that allowed respondents to share any information they felt was relevant to the question. Those responses are discussed below.

It is a deeply held belief of mine that no single population should be deliberately silenced in the name of giving voice to another. For that reason, I did address general results attributed to some of the most marginalized parent populations in the initial discussion of responses to the five open-ended questions of the DDPPS, but I did not include or exclude respondent comments based on any particular demographic category. It is important and necessary for school leaders to gain an understanding of the reception of this one-to-one program by the parent community as a whole, so responses are discussed in the order the questions were presented in the DDPPS. And, as mentioned in the previous section, the removal of parental agency by school leaders implementing digital learning programs is a problem that afflicts all parent populations. However, since the driving motivation for this project was to analyze the effect of this program on the digital divide, it is particularly necessary to ensure that a voice is given to parents from
some of the most marginalized student populations—non-English speakers, the economically disadvantaged, and those with little formal education—and the end of this section will focus on discussing the responses of only these populations.

Effect of a One-to-One Program on Parent Role

Q16 asked parents: Please share any ways in which this laptop/digital learning program has affected your role in your child’s education. This open-ended question was closely linked with Q12, which asked parents to declare to what degree they felt comfortable helping their children with homework after the implementation of this one-to-one digital device program. As discussed above, Q12 was one of the few Likert-type questions that reflected a statistically significant response when correlated with the demographics of the parent respondents in this study, and giving parents a voice was also one of the primary reasons for its design. Surprisingly, while over 30% of parents who chose to complete this survey in English shared that this digital learning program has negatively impacted their role in their child’s education, less than 10% of parents who completed this survey in Spanish said the same. This defied preliminary expectations.

When looking at this question through the lens of economics and parental level of education—characteristics which have repeatedly been found to be directly linked—similarly surprising results were found. The concern going into this study was that parents of lesser education and economic means might be less comfortable with advanced digital technologies, and may thus have a harder time helping their children with a digitized curriculum. This presupposition was definitely reflected in the category of parents who reported having earned
less than a high school diploma, with 50% of these parents reporting a negative impact, and the other 50% responding in a way that did not answer the question posed. Because parental support is so important in the academic success of a child, this finding underscores the benefit to these children that could come from schools and school media centers providing outreach programs to parents that need extra support to help their children in this changing world.

However, with the exception of those parents who earned less than a high school diploma, parents from high-SES schools and parents reporting the highest levels of income and education were by far the most likely to report that this one-to-one program had a negative impact on their role in their child’s education. Parents from mid-SES schools were also more likely to report negative effects than those from low-SES schools. Parents with the second-highest reported income category were the second most likely of all categories to report a negative effect, and both of the highest earnings categories reported more negative effects than any positive effects or both positive and negative effects. With regard to education, the lines are similarly drawn. Again, with the exception of non-high school graduates, the more education a parent reported having earned, the more likely they were to be displeased with the effect this one-to-one program had on their role in their child’s education. Parents with graduate degrees were more displeased than parents with college degrees, and parents with college degrees were more displeased than those who only graduated high school.

The reasons parents gave for claiming this program had a negative impact on their role in their child’s education ranged from perceiving the system to be overcomplicated, to feeling a sense of alienation, to seeing an increase in conflicts with their children. In some cases, a lack of the familiar—the physical display of books and papers spread across the dining room table—
simply prompted nervous parents to speak against the program from a place of discomfort. As one parent put it, “Without a textbook, I had difficulty helping my child with schoolwork.”

A common theme in these responses was the perception of an excessive number of technologies in use at the same time, as expressed in one parent’s frustration that “there are numerous platforms and online methods that are too time consuming to learn and master for efficient parent involvement.” Another similarly complained that “teachers use different websites and platforms and make it hard for parents to keep up or check on the progress of their child.”

Echoing these sentiments of discontent, another reported:

There is little standard among teachers. I used to be able to refer to one book for all subjects. But now they have 5+ resources/websites to search or find information from. I have no idea where to look to help them study. Some teachers use slideshows, some teachers use websites, some teachers use applications, some teachers use Google docs to house information. It’s extremely difficult to figure out where to look for everything.

Many parents expressed the same frustration, one plainly stating that this digital learning program “has basically taken me out of the loop. Parent Skyward access is difficult to initiate. All teachers do NOT utilize the same learning strategies platforms (Canvas etc) which makes it extremely difficult for the child and parent to navigate.” And while surely some parents may have been too intimidated to even try to navigate these various systems, others insisted. One parent, determined to do their due diligence, shared:

One of my kids was not turning in one type of an assignment and the teacher called me. When I asked for help finding the assignment, it took about 24 clicks and looking in 5 different spots to find all the assignments for that class. That is testing a kid’s executive
function, not their knowledge on the subject. He wasn’t knowingly missing assignments. He legitimately didn’t see it in this one obscure place away from other types of assignments for the same class.

Many parents agreed, as another reported, “It has completely removed me from his learning experience, unless under critical need situations (failing a class).” Some parents made a direct call for additional training to combat these issues, sharing that “there was minimal training or direction for parents in how to use skyward or canvas.” One parent expressed significant displeasure with the complexity of the system, asserting that “Parents have to be tech savvy and have access to the internet in order to monitor progress. This alienates many people.”

Some of the concerns reflected by parents were more behavioral, such as “I now have to monitor my child's computer usage and constantly redirect back to homework. I do more redirecting because of the video distractions on the computer than when it was paper and pencil.” One parent commented that this laptop program simply “caused more arguments with my child” and another bemoaned that it “made me a jail keeper and supervisor of online time.” Such increases in parent/child conflict and difficulties navigating the learning systems were clearly noted by several parents, but not all were displeased.

Approximately 25-30% of parents from both language categories expressed that the program has had a positive impact on their role in their child’s education. Some parents actually feel they are now more able to be involved, as one shared, “I’m more involved and able to know how they are doing in school by obtaining all this information through the online apps offered by the school.” Also appreciated by some parents is the ability to now see the actual work their children are doing. As one parent stated, “it has made it easier to see the work she is submitting
by clicking on Canvas assignments.” In contrast to parents who expressed frustration about the
difficulty of navigating the systems, some commented on their ease of use. As one parent shared,
“It has simplified my role. Now, instead of making sure all books are brought home, I only have
to make sure the computer is charged.” Others agreed, sharing such sentiments as “I can keep
track of grades, assignments, and missing work much easier” and “I like that everything is in one
place with the subjects and teacher communication.”

Some parents were not expressly negative or positive, but did share insightful
information like they “had to take more of a role to provide instruction to supplement.” Some
stated that the program had no impact on their role at all, with one parent expressing their belief
that “As a parent, you are either involved in your child's schoolwork or you are not. Regardless
of the media used to deliver the content.” This statement may seem logical to some degree, but it
can also be presumed to be made from a place of privilege. Apathy sometimes comes to mind
when an educator notices a parent’s less than full involvement in their child’s schooling. And
apathy certainly resides among all human communities, but educators must be cautious that
apathy is not the first assumption when parents are absent. The list of reasons for a parent’s lack
of involvement in their child’s education is endless, and well beyond the scope of this project.
But the goal of this particular project was to identify whether or not this newly digitized model
of schooling might add to that list, particularly for parents who are non-English speakers, are
economically disadvantaged, and possess little formal education. The comments shared in
response to this first question indicate no clear differences in opinion based on such
characteristics. But as one primary goal of this project was to highlight their voices, the specific
comments made by parents in these categories will be grouped together and shared and discussed later in the chapter.

Effect of a One-to-One Program on Child

Q17 asked parents: *Please share any ways in which this laptop/digital learning program has affected your child.* Since Covid-19 hit in the spring of 2020, opinions about the effect of digital learning on students—particularly remote digital learning—have not been difficult to come by. Because the entire country shifted to remote—and necessarily digital—learning, everyone now has some degree of experience with it, so everyone has an opinion. It was expected that in responding to this question, parents would complain about a gamut of things from the loss of reading and writing skills, the demise of cursive handwriting, too much screen time, a lack of social skills, and an inability to think or do things “like we used to.” I anticipated many “they can’t even…” statements from parents insistent that schools should still be structured and managed the way they were when they were students. Some of the broader themes that emerged from the parent responses reflected a focus on how this program impacts children’s preparation for the future, academics and learning, general behavior, communication and soft skills, and even physical health. What is surprising, however, is who did the most complaining.

Though not as extreme as presented in the previous section, a noticeably higher percentage of English-speaking parents reported negative impacts of this digital device program on their children than Spanish-speaking parents. Also similar to results from the previous question is that the highest incidence of reports of negative effects comes from parents at high-SES schools, and from parents reporting the highest levels of both education and income. There
were few mentions of financial circumstance in response to this question, with just a couple of parents expressing concern that less fortunate children might struggle without the proper internet connectivity at home. However, a small justification of this one-to-one program did come through one parent’s expressed gratitude that their daughter “had a laptop to actually use. She would have had to use an old, outdated one if it hadn’t been for the one from the school.” This is exactly what the program was designed for, so while this singular comment was heartwarming, it was disheartening to see so few people express such a sentiment.

The most extreme negative and non-academic concerns reflected in the responses to this question included more than a few parent worries about things like their newly “video game addicted, lying” children having “terrible access to youtube, googledocs, and ads for porn.” Another shared, “It’s horrible to give kids that are already screen obsessed a screen.” Not all expressed concerns were this vehement, but parents are clearly worried about their children using their school issued devices for non-academic activities. Parents noted concerns about “more screen time, distraction with online games, music, etc.” directly leading to other behavioral concerns like an increased sense of irritability and moodiness, and a general decline in social skills. Many parents believe the program “limits good conversational skills to be practiced in class,” presumably because they imagine students work exclusively from their own desks on their own devices.

Some parents also expressed sincere concern about the negative impact the digitization of school has had on their child’s ability to learn, and they fear children are just memorizing for tests and not retaining or processing knowledge. One parent suggested that “because the information is so easy to Google or copy and paste, they lack the ability to critically search for
evidence or read to find information.” This was echoed by another parent who accused this digital learning program of making it “too easy to open a different tab and play games, search youtube, open google to cheat.” Despite talk among pro-digital educators about how today’s students are actually reading and writing more now than ever, there were expressed concerns among parents about the digital leading to a reduction in their children’s reading, and explicit calls for more paper and pencil literacy activities. One parent shared, “they need to read real books,” and another stated, “I do not think my child learns as well through the laptop. Writing things on paper is better for retaining information.” Others were concerned about some learning styles not being accommodated with work done digitally, with one parent sharing, “My child is a kinesthetic learner, his struggle to grasp concepts has magnified with intro of laptops.” And while some parents were all business in voicing their woes with respect to this program, a bit of humor could be found here and there. One parent lamented their son’s poor ability to manage multiple streams of incoming information, expressing dismay that “he has 39 tabs open at a time.” Surprisingly, one of the very common themes expressed was concern about the detriment of digital learning to the physical health of their children, with many parents concerned about the possibility that this required increase in screen time is the cause of their children’s headaches and vision problems.

On the other hand, many parents applauded the program for improvements they recognized in their children, noting benefits to their children's physical health, specifically with regard to the need to carry just one laptop in a backpack as opposed to many heavy textbooks and notebooks. One parent expressed gratitude that their child had “no more back pain carrying heavy books.” Several parents also claimed that this digital learning program provided a boost to
their child’s academic success. These parents noted that their children’s technology skills have grown, and that this program “prepares them for real world computer use.” Along with similar sentiments from several others, one parent declared that “it made him independent in keeping track of his own homework/assignments. It even encourages to get ahead on future assignments.” Such practical matters and soft skills were mentioned by many, grateful that their child now has “less papers to lose” and is “much less likely to lose things” because “everything she needs is right there for her. Subjects, books, grades, teacher announcements.” One parent also said their child’s “time management skills improved.” Parents were also keen to point out, however, that one size does not fit all, noting that this program has impacted different children in different ways.

Uniquely positioned to discuss how this one-to-one program affects different children, some parents specifically identified themselves as having more than one child in the program. One such parent shared:

It has been different for both of my kids. One of my kids was easily distracted and I had to teach him how to manage that on the computer. He was very engrained in online learning, however that also competed with the natural distractions that can occur. However, it was very helpful, because this child often lost papers and was not good at organizing information, so housing everything in Canvas with reminder dates, etc… helped alleviate his losing and forgetting due dates, leaving papers behind at home, not turning in work because it got lost, etc. My other child had no problem with the digital access and was not distracted by it. That child thrives in both environments. Having the laptop and digital learning cuts down on what is carried in the backpack and access to
everything is on the laptop for the most part, which is very efficient. It has been a positive experience.

Several parents agreed, acknowledging that the success of digital learning depended on the child, favoring those who were already intrinsically motivated. One might argue, however, that this has always been the case: in classrooms, on athletic fields, in the workplace. To the more motivated go the spoils, and whether or not every instance of expressed concern or success in this survey surfaced as a direct result of this one-to-one program can certainly not be proven. One parent wisely noted, “He gamed more and played outside less. Would that have been true without the laptop? Possibly.” These are teenagers, and teenagers are known to be a volatile bunch.

As mentioned earlier, providing a forum for non-English speaking parents, parents with low incomes, and parents who possess little formal education to voice their opinions and ideas about this one-to-one laptop program was a critical aim of this study. The specific input gleaned from parents in these categories will be grouped together and shared and discussed later in the chapter.

**Parent Perception of Digital Textbooks**

Q18 asked parents: *Please share how you feel about your child having access to online, digital textbooks instead of hard copy, paper textbooks as a result of this laptop learning program.* Since the birth of the concept for this study, the kitschy, end-of-school year playground chant, “no more pencils, no more books, no more teachers’ dirty looks…” has echoed in the back of my mind. Though the one-to-one digital device program at the heart of this study does not require teachers or students to completely abandon more traditional methods of teaching and
learning—many teachers do still require handwritten notes or work—it has all but eliminated paper-based textbooks, and has led many teachers to rely on only digital methods of both delivering curriculum and accepting student work. The themes that emerged from coding parent responses to this question included concerns about convenience and practicality, disadvantaged students, environmental friendliness, preparation for the future, health and safety concerns, impacts on academics and learning, and concerns about the implementation of the program. As with the previous two questions, there was a noticeably higher percentage of English-speaking parents reporting negative views of digital textbooks than Spanish-speaking parents. Unlike the two previous questions, though, reported level of household income did not have a direct relationship to responses. And though the category of non-high school graduates was again an outlier, the most reports of negative views came from parents at high-SES schools, and from parents reporting the highest level of education. The reverse is also true, with positive views on digital textbooks more likely to come from lower-SES school parents and from those with less education.

Many parents were concerned with the impact of exclusively offering digital textbooks on children they perceived as disadvantaged, either because of economic situation or because of physical and/or learning disabilities. Without giving a reason for their spotty service, one parent expressed frustration that “our internet service isn't the greatest and if you have no internet, you can't access the books.” This problem can plague students with poor connectivity because their parents cannot afford the cost, but also students who simply happen to live in dead zones or lesser developed areas of the district. Another parent voiced concern for children with certain learning styles being at a disadvantage in this program, and the resultant lack of engagement that
might befall the difficulty they experience in trying to learn in a modality that simply doesn’t suit
their style. This parent argued:

while it is important to understand our changing world, basic communication skills and
human interaction still reign. In addition, students are being asked to learn and constantly
update their knowledge on software programs instead of just on the knowledge they
should be acquiring about the class subject matter. Reliance on digital textbooks
discounts the fact that some children learn tactiley, some auditorily; digital learning
relies mostly on visual learning. Plus, it's not easy to "flip back" to a resource or page in a
digital textbook. The harder we make basic learning, the less students take an interest in
what they are truly being asked to do.

Another parent insisted that “hard copy paper texts MUST BE AN OPTION for students with
learning difficulties. Digital textbooks cannot take the place of hard copy texts for every student.
It places them at a disadvantage!” And yet another was worried for their daughter, insisting that
“she learns better with the pages that she can mark up.”

Many parents echoed this sentiment, acknowledging the need to adapt to the times, but
expressing sincere worry about the difficulties this program has presented not only because of
learning disabilities, but due to specific physical limitations. One parent shared, “It's good to
have access but we NEED books. My child has a visual disability and this 11" screen is a
nightmare.” Other parents expressed the belief that this digital learning program has not only
exacerbated matters for students already experiencing learning challenges due to disabilities, but
that it is actually the direct cause of some physical health issues. One parent shared, “I worry that
the strain of reading text on a laptop is going to lead to vision problems much earlier in life,” and
another stated “the future health effects are greatly concerning regarding bone growth and
eyesight. My child already has a stooped neck from being online all day in school without proper
monitor placement.” In addition to these troubles related to learning, health, and safety, the
practical theme of usability emerged as a common concern.

Many parents found this program to be an inconvenience whose drawbacks outweigh the
benefits offered to children. One parent conveyed deep concern about their son’s experience,
complaining that it is “very hard for him to maneuver and access things online. He feels very
overwhelmed and can’t keep up with daily classes.” This could be a natural reaction to the
unfamiliar, but the same concern led another parent to plead, “please, please, please bring back
textbooks. We have tried using the digital textbooks, they are difficult to navigate, can be slow
due to internet connections, and I have not been able to print them out to have a physical copy.”
Clearly, all parent concerns deserve respect, but it is also important to contextualize the concerns
being expressed.

Parents have always shaken fists and worried about the inescapable dangers their children
face in society, with each generation making its own broad claims about the next. In this fashion,
multiple mentions were made in responses to this question about the increased “internet risks”
their children were facing due to digital books, though teens would likely face the same risks
with or without this program via their personal phones or devices, or those of their friends and
classmates (boyd, 2014). One parent broadly claimed that “this constant screen time and access
to internet based materials . . . is going to damage this generation of youth.” Again, such parent
concerns need to be thoughtfully digested and addressed, but sweeping generalizations that
“future generations will be even more woefully prepared for real interpersonal interaction” seem to reflect a somewhat narrow view of an inarguably very changed world.

Like it or don’t, 21st century parents must at least try to reconsider how words like “real” and “interpersonal” should be defined. If we presume that some parents conceptualize “real” and “interpersonal” to describe only face-to-face interactions, it becomes clear that there is a need and an opportunity to develop this limited perspective. If we are to remain connected with today’s adolescents, it is critical to recognize that they are constantly developing “real interpersonal” relationships, even if those relationships begin in a virtual environment such as an online classroom or a social media space. As the parent of a teenager, I find myself regularly taken aback by the number of “real”—aka, face-to-face—friendships I observe among this age group that began purely through social media platforms like Instagram or Snapchat. On more than one occasion, I have inquired as to how my daughter met another teen I have seen in the same physical space as her, and “Snapchat” is usually the answer. In that sense, virtual interactions often do develop into “real” face-to-face interactions. So, a larger issue to consider here may be that despite their parents growing up in a very different world, digital environments are real to today's students. Today’s adolescents do not necessarily equate “real” with physically present, so parents must begin to try to understand this. There is a much larger conversation to be had here regarding changing notions of materiality, presence, space, and place a la Baudrillard (1981/1994), Delagrange (2011), Hayles (1999), Turkle (2012) and others. However, that conversation deserves much more space than this discussion section allows, so I will leave it at the suggestion to use the parent concerns expressed in this survey to further investigate these concepts.
Despite the many negative responses to the question about digital textbooks, a great deal of parent support was also expressed. In contrast to express concerns about the detrimental effects of digital textbooks on their children’s health, several parents specifically cited digital books as a solution to physical pain caused by heavy backpacks. One parent shared, “My youngest child is the only one who has been completely digital and is my ONLY child (out of 4) without physical back pain from carrying books in a backpack.” Another reason for parent satisfaction with the shift to digital textbooks is the convenience they offer. Parents claimed it was “much easier to have them all as digital” and that a digital textbook on a laptop “provides easy, fast access to information.” One parent called the digital textbooks “awesome,” and said, “we came from a charter school that did not have access to laptops for the students and the change is remarkable.” On a completely different note, several parents spoke from a green perspective about their satisfaction with the use of digital textbooks. One such parent shared, “I am from the old school of having paper, but I think being able to do it online is better for the environment,” and another expressed gratitude that it “saves trees.”

Parents also expressed significant satisfaction with how the digitization of textbooks is a great way to prepare their children for the future. One parent declared, “It’s a technological world. They deserve the chance to have the tools early to be ready for the real world.” In similarly acknowledging this benefit of real-world preparation, another parent explained “Companies provide employees laptops. Most businesses function electronically. Kids should start to adapt, gain knowledge, and be able to fully function electronically as well.” And while not stating specific or explicit reasons they found this program’s digital textbooks to be
beneficial, some parents seemed to simply accept that “innovation and evolution are necessary,”
with one parent specifically conceding, “I am becoming more comfortable with this.”

Some parents did not situate themselves in one camp or another, and expressed a need to
have both digital and print texts available, again acknowledging that different children have
different needs. Much of the reluctance to give purely positive reviews may also stem from what
parents are used to. One parent stated, “I prefer textbooks, but it has been invaluable to have
laptops offered by the school. More schools should offer laptops, as they are expensive to buy,
and I can see a lot of families not being able to buy them,” and another wrote, “computers are the
way for the next generation, but, oh do I miss books!” Despite the nostalgia of turning a page,
many parents openly acknowledged a shifting of the guard. One admitted, “I could not learn in
that manner; but she seems to have no issue,” and another similarly expressed, “I guess it’s being
comfortable with what I grew up with. There is something to be said about having a book in
front of you that you can look up material and reference. I know you can do the same with the
computer, but it just feels different.”

Some of the mixed reviews were based on more than just nostalgia, and instead on
sincere beliefs that all subjects and learning goals are not equally suited for a digitized
environment. One parent wrote, “learning to operate in an online environment is important.
However, I think certain subjects are more easily understood with a physical textbook.” As a
long-time virtual school teacher myself, I can vouch for the unique difficulties my colleagues in
fields like Mathematics or the Arts have experienced as online instructors. So there is certainly
merit to calls for multiple modalities in some subjects, which would comfort parents who
suggested they “would love to have both formats available.” Another parent expressed the belief
that “opportunities for a balance of ‘hands on’ learning should be included in instruction. There is too much dependency with online learning as the primary source.” The same parent also wrote, “Of course this past year that format proved to be most useful, but under typical circumstances, students should be able to experience learning in a variety of ways.” Parents overwhelmingly agreed with this sentiment that this particular one-to-one laptop program was a blessing in the very atypical circumstances of the Covid-19 school shutdowns, and that will be discussed later in the chapter when the responses to Q20 are discussed.

As mentioned in closing the discussions on Q16 and Q17, and in keeping with the impetus for this study, the specific input gleaned from non-English speaking parents, parents with low incomes, and parents with little formal education will be shared and discussed later in the chapter.

Parent Belief on Whether One-to-One Program Meets Student Needs

Q19 asked parents: Please share how this laptop digital/learning program does or does not meet the educational needs of students in this world of constant technological change. One of the most uniquely challenging aspects of the digital era, as discussed throughout, is the impossible speed and scope of the changes that occur with the technologies we use and the amount of new information that is created. New devices, programs, and apps are developed and released on a daily basis, each of which generates new bits of information to be understood, stored, and applied. Once you have mastered a thing in this era, that thing might be on its way out to make way for the new. As also discussed in the literature review, much research has been devoted to the need to develop new pedagogies that cast aside traditional goals of facilitating
mastery of content, and that instead target the development of critical thinking skills that will enable students to quickly adapt to new environments and tools, and to acquire information in novel ways (Beetham & Sharpe, 2007/2020; Gee, 2013; Hayles, 2012; Mayer 2009/2020). On the whole, responses to Q19 were more positive than negative, indicating a general belief among parents that this one-to-one laptop program is meeting the needs of students to this end in some ways. However, several themes emerged regarding problematic elements like the need to improve training for teachers and students, balance digital and analog resources, renew focus on interpersonal communication skills, work towards deep learning, and prevent tech failures. Once again, positive views abound from Spanish-speaking and low-SES school parents, while parents from high-SES schools reported the highest percentage of negative views. However, no clear relationship was revealed between parental opinions on digital textbooks and household income or level of education.

As in responses to other open-ended questions, many parents indicated their belief that in order to truly meet their children’s needs, “there needs to be a balance.” Another parent wrote, “I think there needs to be more of a blended learning. I think they still need books to be able to make that connection for reading differently than they do on screen.” As discussed in the literature review, on-screen reading is different (Hayles, 2012; Mayer 2009/2020), so there is merit in modifying traditional methods or developing new instructional strategies and materials specific to the new ways that our brains process information in the digital era. Another parent wrote, “It is good to have kids developing computer literacy but this is too much. Doing math online has to be the worst.” Again, we see the call for flexibility with regard to teaching within specific subject areas.
Also repeated in responses to this question were concerns about interpersonal communication. One parent expressed concern that the laptop program “can meet educational but not social needs,” and another boldly claimed that “social skills can never be learned online...you have to have social interaction to acquire social skills.” Here again we see a disconnect between generations, and how one defines the concepts of socialization and communication. As mentioned earlier, today’s adolescent equates digital devices with socialization and communication, while their parents often view digital and social as being mutually exclusive. Along the same lines, another parent lamented that this one-to-one laptop program “does discourage having verbal communication,” and some parents shared their children’s magnified and growing lack of comfort with approaching their teachers face-to-face. This is another indication of a disconnect between generations with regard to semantics, as verbal communication in the digital age does not necessarily require physical presence or even audible voice-to-voice dialogue.

As I mentioned earlier, I anticipated absolute “they can’t…” statements in responses to the open-ended questions of the DDPPS, and this question did not disappoint. One parent asserted that “kids can not learn via a computer screen. Their processing of information is affected.” Another more dramatically claimed “they can't figure out any more regular daily challenges, everything must be searched on the internet. Not learning, just copying. Not developing, just imitating.” While these claims were painted with quite broad brushes, there is also a single, very viable concern implicit in both about a lack of thinking and reasoning occurring in today’s classrooms. These are not entirely unfair accusations. However, this underscores the need to develop and/or successfully implement new pedagogies alongside one-
to-one digital learning programs that represent a complete overhaul of an existing model, especially when that model has essentially been in place for centuries. The devices are not entirely to blame, and they’re not going anywhere.

In line with laying the blame on devices, one parent expressed dismay that “kids are paying attention less due to the distraction of always having a screen in front of them.” The issue, however, is not that students are suddenly not paying attention. This has been a core matter of classroom concern since time immemorial, and is not unique to the digital era. But Netflix, Snapchat, YouTube and the like are certainly more challenging to contend with than passed notes, hacky sacks, and fidget spinners, as these distractors of old were simple to remove. Considering the high cost of the cell phones and iPads on which students access modern classroom distractions, however, teachers may certainly be less likely to confiscate them. In fact, some school leaders have explicitly advised teachers not to confiscate any personal electronic devices, lest the school be held accountable for resultant damage or theft. That pickle can be ascribed in part to shifting societal values and beliefs about authority and personal entitlements. It is not easily addressed, or at all within the scope of administrable educational policy, so the solution for this lack of engagement—to the degree a solution is possible—likely lies in the development of more engaging digital pedagogies, instructional methods, and materials.

Another common complaint of parents, many of whom claim that this district’s one-to-one digital device program could, but falls short of meeting student needs, is that the technology provided to students is simply inadequate. This frustration was expressed by many respondents with regard to both network issues and the hardware and software distributed to students. One parent shared that “sometimes learning is difficult because educational sites are blocked,”
reflecting the Catch-22 of implementing security monitoring software that protects children from
the internet risks parents listed, but also precludes them from accessing some generally harmless,
educationally valuable, and sometimes necessary online materials. Another parent accused that
“every time the [district] systems are down, students are missing out on education because
teachers no longer teach without the electronics.” However, despite displeasure about times
“when the network goes down, and the planned activity is interrupted,” one parent said the
program could meet needs “with good quality devices.”

About those devices . . . There seems to be a high degree of consensus that there is a
compelling need to, as one parent expressed in no uncertain terms (and all caps), “GET BETTER
LAPTOPS.” Another parent less harshly shared that “they are able to manage some software
programs, but the devices are not capable of the programs that my child needs for their
engineering classes.” As discussed previously in light of the decline of all test scores in high-SES
schools, it is worth considering that requiring the use of lesser quality devices than some students
are already accustomed to may not yield positive results. In this vein, one parent shared, “my
children have been exposed to and have had access to computers at home for quite some time.
Transitioning to using school issued laptops was a problem due to the poor quality of the devices
that often had technical issues.” Other parents noted not only concern with the devices
themselves, but with the technical support available when these budget devices inevitably failed.
“One of the biggest issues with the laptop program is old faulty laptops that don’t work
properly,” one parent claimed. “My child continually has problems with his device and the
technology department just tries to patch up his device.” The same parent that pleaded in all caps
for new laptops also shared that “it sometimes takes 30-40 minutes for a laptop to start up and
open necessary software. They're slow and the school IT people say they can't do anything about
that.” Another voiced unrestrained displeasure, sharing that “the laptops are locked every time
you turn around you can't do things with it. They need a million apps to work around all this
junk. They are old and broken and one-person tech support for a 3K+ HS is a joke.” The solution
to all of these expressed concerns is obviously a simple one: get better laptops and more tech
support. Despite the simplicity of the solution, however, public school districts must constantly
contend with increasingly slashed budgets, so the question is whether it is a viable solution. This,
obviously, is a matter for those who hold the purse strings in schools, or for community partners
with deep pockets looking to invest in bettering their local school communities.

Another clear and repeated call from parents centered on the need for better and more
training for teachers and students. In response to Q19, one parent simply stated, “Teaching needs
to advance,” while another expressed concern that “the teachers need to be more proficient at it
instead of guessing.” Yet another claimed that “the worst thing about this program is that
teachers have become very lazy relying on online materials and just showing power points rather
than actually teaching the class.” These are obviously broad statements made from a limited
perspective—parents are not in the classroom on a daily basis to observe exactly how the
curriculum is being taught. There is surely some truth at the source of these frustrations, but it is
difficult to use these claims as a path forward for improvement. However, one parent shared an
exceptionally thoughtful (and quite long) opinion replete with critical considerations that must be
given to the implementation of such a disruptive and far-reaching program as the one-to-one
program investigated in this study. This parent wrote:
“[this district’s] implementation as well as teachers’ assumptions based on each child having access to a computer are extremely flawed. All students are given computers, but no typing classes. All students are given a computer, but no basic operating class. A computer alone does not mean that a student has access to internet at home and other places. While there are some hotspots available for students, we often had a wait list. Additionally, some students/families are embarrassed to admit they do not have internet. So now the gap the program has sought to narrow has actually widened. Additionally, many teachers rely on online platforms to teach children. There are a couple dozen platforms used by teachers… That is a lot of places to look to figure out if you have an assignment due. That is a lot of platforms for students and their parents to understand.”

Perhaps without knowing, this parent very clearly and concisely situated this district’s one-to-one digital device program within the throes of the "Matthew Effect," described in the literature review as the phenomenon in which the highly privileged are better able to make use of new resources than the underprivileged, perpetuating a cycle that seems impossible to break (van Dijk, 2005). This parent clearly decried the very assumptions that plagued theories of the first- and second-level digital divides also discussed in the literature review, whereby advocates for social justice in technological contexts attempted to bridge gaps with the mere provision of hardware, software, and connectivity (van Dijk, 2005; Wei, 2012), but disregard for the persistence of the third-level divide that emerges from categorical inequalities like health, household, and social network (van Dijk, 2020) over which children have no control.

It is unclear based on the information available on this district’s laptop learning program whether much consideration was given to existing theories of the digital divide prior to planning
and implementation. It is also vital to recognize that school leaders and teachers can only do so much to eradicate the markers of inequity with which children arrive at the schoolhouse door—human nature is such that we can expect no guarantee in equality of outcome. However, it is worth poking around a bit to learn if theories such as van Dijk’s (2020) resources and appropriation theory were on the radar of those involved in the initial planning of this one-to-one implementation. If not, this is certainly an indiscretion in need of correction moving forward so the concerns reflected by this very astute and articulate parent are not repeatedly realized.

Despite some vehement concerns with this digital learning program, parents were relatively grateful for the preparation it offered their children. Some parents offered simple and non-specific reasons such as “it helps because it allows you to be in the daily practice of technologies” and “digital learning definitely does help our children prepare for the future.” Some spoke more specifically to its benefits in educational contexts, stating that “it is vital to be proficient in digital learning.” Another parent offered that “laptops and digital learning are the way of the future; they need to keep up with the changes that will face them in the real world.”

But what is the purpose of digital learning and our public school system?

Many hold that the core responsibility of the public school system is to prepare its students for success in life after senior year. In addition to higher education, this means career-readiness, and many parents spoke to the value of this district’s digital device program in preparing their children for today’s much altered workforce. One parent shared their belief that “laptops are becoming a part of almost every career so computer literacy is a necessity for the future.” Another affirmed that “it absolutely meets their needs as this is the way all of today's business is conducted. The earlier a child is exposed, the more successful they will be once they
integrate into the working society.” Still speaking to the future, but not specifically to college or career readiness, some parents felt this program instilled key life skills in their children. One parent wrote, “It meets their needs because they have to adapt and change as they will have to adapt and change as adults” and another shared that “it gives them greater independence, responsibility, discipline.” So for at least some parents, the preparation offered by this digital learning implementation was not only valuable for its catalytic role in mastering digital technologies, but also for the opportunities it presented their children to acquire the critical life skills of responsibility and adaptability.

Finally, some parents reflected specifically on how this program benefitted not just students, but entire families. One parent even shared the idea that the skills acquired by students through this program could be passed on to less-skilled members of their household, suggesting that “it helps students to know new tech and to teach their siblings or... parents.” This is yet another indicator that some parents and guardians would benefit from intervention on behalf of the schools to get their tech skills up to speed to better support their children at home, or at least remain more in the loop with monitoring their children’s academic progress online. One final observed benefit to families shared in response to this question offers a more promising indication that things are somewhat on track for at least some families in need. This parent shared that “the laptop program has responded to the needs of families. I see a lot of families not being able to buy them, widening the educational disparity, resulting in larger economic gaps.” So, despite significant concerns already discussed about the potential for a poorly implemented digital device program to exacerbate the digital divide, at least one parent expressed confidence that this particular program is actually meeting its aim to that end, at least to some degree.
As mentioned in closing the discussions on the previous three open-ended DDPPS questions, and in keeping with the aim of this study, the feedback received specifically from non-English speaking parents, parents with low incomes, and parents with little formal education will be shared and discussed later in the chapter.

**Student Preparedness for Remote Learning During COVID-19 Pandemic**

Q20 asked parents: *Please share how your child’s experience with this laptop/digital learning program did or did not prepare them for success with remote learning when schools closed due to COVID-19 in March 2020.* My plan to investigate the impact of this public K-12 school district’s one-to-one digital device program on the digital divide was born long before the Covid-19 pandemic hit the United States in the spring of 2020. So, while fascinating to me, matters related to remote learning as prompted by Covid-19 was never intended to be a primary focus of this study. However, as the pandemic intensified and ultimately shut down every public K-12 school district across the country, it felt dismissive and irresponsible to not address the historic, worldwide, mass digital learning movement thrust underway at the precise moment I began my research of a public school district’s digital learning program. Failing to address the matter would likely have seemed dismissive to the thousands of parents I planned to survey as well, I presume, as they suddenly found themselves panicked and forced participants in a one-to-one digital device program: *The Extreme Edition.*

No clear relationship was discernible between responses to this question and SES of school, level of parental education, or household income, and reporting percentages from both Spanish- and English-speaking parents were very similar for both negative and positive impacts.
Parents in the lowest income category reported an equal percentage of positive and negative opinions on this, and parents in the highest income category reported only a 10 percentage point difference between positive and negative responses. But with the exception of these two income categories, parents in almost every category of language, income, education, and school SES were far more likely—often four or five times more likely—to indicate that this one-to-one program had a positive rather than negative impact on their child’s ability to adjust to remote learning when COVID-19 hit and shut down schools in March of 2020. Not all parents, however, were pleased.

Despite the obvious lack of control teachers held over the circumstances surrounding the pandemic, some parents were unfiltered in expressing frustration about how unprepared both the students and the teachers were for the shift to remote learning. One parent mercilessly recounted at length:

There was no preparation. When the digital learning began back in middle school these kids weren't ready then. They had not had any digital training in elementary on how to operate programs like Word, Powerpoint, Google classroom or Canvas. Our elementary had computer lab but removed it when more mandatory PE was mandated. There were vital skills they missed out on and then were thrown into the frying pan in middle school. There was no standard as to the programs that were used. Some teachers used one thing, some another. I was extremely confusing and the assumption was they would just figure it out because they are the technology generation. Taking time to struggle though how to operate the different programs while trying to learn the material was and is too much. If this is going to be an ongoing program, get some classroom time teaching elementary
schoolers about Google classroom or Canvas or whatever you are going to use. Teach them how to download and save the document and teach file organization so they can start with good organization skills. I looked on my 6th grader's laptop to find assignments she said she did and she would have 6 copies of it because no one taught her how to download and save it. She would be completing the same work over and over again because she simply couldn't find it. Duh.

While this parent was clearly emotional and their response should be read accordingly, it must not be discounted. This laundry list of perceived problems with this one-to-one program prior to the pandemic is both valid and revelatory. As discussed throughout this dissertation, simply throwing hardware at children without ascertaining that those students possess the requisite skills to manage it will never solve problems. Had the perceived weaknesses delineated above been prevented or minimized by better planning from the start, students in this district would surely have been more adept at managing online learning from home when schools closed for Covid.

In addition to complaints about the poor preparation of students for digital learning prior to the pandemic, some parents expressed disappointment with the lack of preparation and skill among teachers to teach well from a distance. One parent shared that “teachers needed greater training as mine pretty much taught themselves. There was too much distractions, lack of self discipline and control for my children to benefit from online learning. Everyday was a struggle.” Another echoed this concern, sharing that “students were their own teachers for the most part. Many of them resorted to cheating and a lot of learning did not take place. Many of our high achievers lost interest or couldn't handle the huge responsibility of remote learning.” Despite the
efforts of some parents to communicate these sincere concerns and very real frustrations with restraint, some were not as gracious.

One parent unapologetically proclaimed “this last year of learning was a joke. I saw the attempt to teach the kid; I saw the assignments given; I saw grades given. It was a joke, in many cases. The kids barely learned.” Another parent discounted any efforts made by teachers or school officials, claiming sole responsibility for her child’s success in the forced remote-learning situation: “my child was prepared because his dad and I walked him through the learning process of digital learning.” This bold laying of blame illuminates a problematic issue rampant in remote learning environments and virtual schools: the sometimes complete dismissal of and disregard for the humanity of teachers that do what they do from behind a screen.

Bothersome as it may be, it is somewhat understandable from a developmental perspective for an egocentric teenager to forget or fail to consider that the teacher on the other side of their screen is actually a living, breathing human. It is far more troubling, however, when parents also seem incapable of understanding the very human aspects of teaching in a digital environment. Worse still is the possibility that some parents do understand, but willingly disregard this humanity for the sake of their need to make demands and cast aspersions from behind the guard of a screen. Recognizing the humanity of participants in digital communities like online classrooms, again hearkens the work of scholars like Baudrillard (1981/1994), Delagrange (2011), Hayles (1999), and Turkle (2012), who interrogate digital age issues of materiality and the time-honored binary of presence versus absence. The place of such work in relation to this study will be briefly discussed in the conclusion.
Other parents who did not believe this district’s existing laptop learning program to have helped in facilitating the shift to online learning during the pandemic refrained from placing blame directly on the schools or teachers, instead admitting of their children that “at home they did not feel the same responsibility.” This supports the widespread opinion that exclusively online learning is not the best option for every student, and that some students learn best in more structured environments specifically designed to be conducive to learning. Other parents went further, acknowledging that traditional classroom teachers did not choose this modality, and explicitly crediting them with doing the best they could in forced circumstances. In this defense of good teachers, one parent said:

It truly is neither here nor there. Teachers were thrown in to a no-win situation being asked to teach without having the tools necessary to do so. There is a reason why we still have teachers and we all don’t just teach ourselves everything. Computers are a useful assistive device and have the potential to increase efficiency in that we literally have encyclopedias at our fingertips. But data has shown that it’s the relationships that determine outcomes.

Some parents took to the comments to speak out against online learning altogether, even calling out specific schools by name. One parent broadly proclaimed that “a teacher cannot get full attention and interest from students from an online class,” revealing again a persistent and prevalent belief discussed in the literature review: the belief that online learning environments are not only different from, but inherently inferior to their face-to-face counterparts.

Everything touched by the COVID-19 pandemic, which is to say everything that any of us have ever known, has been inextricably laden with the most powerful of emotions. Couple
this with the emotions entrenched in parenting, the most primally protective of human relationships, and one can begin to understand the fierce abandon with which some parents attacked the best efforts of teachers and school leaders during this time. However, in spite of some especially venomous charges, responses to this question revealed that parents were overwhelmingly “very grateful to have this in place already when the pandemic disrupted traditional classroom models,” because of the relative ease with which their children were able to continue daily instruction. One especially enthusiastic parent shared, “My child was READY. Completely ready to transition and I feel like he hasn’t missed a beat. I honestly feel that it was the teachers who had the learning curve…not the students.” Another parent similarly acknowledged the efforts of teachers and the preparedness of their child, writing, “Teachers did their best and should be applauded for their efforts! She knew how to use canvas so that was one less challenge to overcome.” Some parents expressed unqualified and absolute certainty that “students definitely could not have navigated the pandemic as well” if this one-to-one laptop program had not already been in place. One parent simply stated that “being a part of the laptop program did prepare my child to switch to online learning,” another explained that “it helped a lot since there were no delays in learning, they continued with their classes and learning,” and yet another declared that the existing one-to-one program “absolutely prepared her. Much smaller learning curve for her when switched to [remote learning] since she went to a laptop middle school.”

Some parents offered slightly more guarded responses while still acknowledging that having the program already in place likely helped. One such parent shared:
I’m sure it helped some. All of their work was already online, so it was the soft skills that were more of a problem. My child does not motivate herself well in a completely virtual environment. But it probably would have been harder if she wasn’t used to fully working on the laptop.”

Another commented on the relative ease of the shift being a result of their children’s familiarity with the one-to-one laptop program, but suggested the need for some children to be given time to acclimate to their teacher being in a different physical space:

“It was a fairly seamless transition. My students already knew the systems/software. It was just adjusting to having the teacher on the screen instead of the same room. I'm really thankful that [the district] had the laptop system prior to this because when schools closed the transition was pretty easy from my students' standpoint.”

This is saying quite a bit, as most would agree that little was easy during the time when schools closed.

*When schools closed.* This three-word phrase is in the final parent comment above as well as in the wording of Q20. It was the moment *when schools closed* that the world seemed to stop spinning for parents, school-aged children, and educators. It was *when schools closed* that we were all suddenly stationed at home with only our immediate family members in our physical presence. It was *when schools closed* that we were the most tired, afraid, and uncertain that we had ever been. It was *when schools closed* that we rationed toilet paper and napkins and hand sanitizer and masks. As mentioned earlier, this final question of the DDPPS was not a part of my original plan for this study, so I intended to only briefly remark on the responses to it, and to ponder those responses for future research. But immediately after typing this otherwise mundane
three-word phrase, I found myself gripped by the monstrous significance of it. Because for parents, school-aged children, and educational professionals worldwide, this is the precise phrase that will mark the opening of every future discussion about the moment in time when everything we knew changed forever.

I expected it would be interesting to analyze the responses of parents about how this one-to-one program might have made things easier when schools closed. I expected there to be some value in learning from what we didn’t do so well when schools closed. But I hope there isn’t. Because—and I didn’t expect this—each time I type that three-word phrase, the emotional rawness of the time when schools closed makes its presence known, and I didn’t even know that rawness was there. In the next section, I will discuss the open-ended question responses shared specifically by non-English speaking parents, parents with low incomes, and parents with little formal education. But I hope to never need to discuss what to do better when schools close.

Voices From the Margins

As mentioned earlier, it is right and just and important for the sake of making improvements that school leaders obtain understanding of how the entire parent community feels about this program on the whole. However, the primary aim of this project was to evaluate whether the one-to-one digital device program at the center of this study is effectively serving communities most in need, and to offer feedback on a corrective path forward if it is not. For various reasons, some of the most marginalized parent populations—non-English speakers, the economically disadvantaged, and those with little formal education—often contribute less input
on school programs than their counterparts. So, to highlight their voices, this last section of Chapter 5 will focus on discussing the responses of only these populations.

*Parents Who Chose to Respond to the DDPPS in Spanish*

As mentioned earlier, the feedback given from parents who chose to respond in Spanish was much more positive on the whole than those who completed the survey in English. There were a few specific but isolated comments from this group, including concern about “when the network goes down, and the planned activity is interrupted.” Another parent felt it was wrong “not to deliver the HIGH SCHOOL certificate if we did not pay any damages caused to the laptop . . . that seems like blackmail.” For the most part, however, responses from this parent population almost all fit within one of three categories. Their concerns about this digital learning program largely centered on academic problems related to distraction and disengagement, social interaction, and vision problems.

Some complaints were broad and offered little explanation, with parents expressing such basic concerns like their child “can't concentrate” or experienced “greater distraction.” Some parents did contextualize a bit more, including one parent who shared, “My daughter was bored. . . . she told us that some teachers only said ‘turn on your computer and review the power point presentation.’ This is not teaching.” This seems to reflect the greater general concern that instructional strategies have not quite caught up with the digital classroom, and supports the call for better or more teacher training on digital learning. Another parent shared “they used and talked with the laptop but he did not concentrate at all.” This comment represents a common parent concern that laptop use in classrooms prompts a distraction from academics and a turn toward the social. However, the concern that students are now not social enough as a result of
digital learning was also a commonly expressed concern. While one parent offered no explanation, sharing only that their child “has become more antisocial,” another directly connected this concern to the computer, asserting that “teenagers need to have contact with their peers, being on the computer reduces this interaction.” The rub here is that both claims cannot be correct. We cannot decry student use of digital devices to interact socially while simultaneously claiming it is because of these devices, “the human contact is lost, which in the end is more than necessary for interaction with colleagues.” This calls into question again the definition of such words as social and interaction. The devices are not going anywhere anytime soon, so the path forward must include conversation to help bridge the generational gap with regard to what counts as interacting or being social.

Perhaps the most interesting discovery made in reviewing the comments exclusively from Spanish-speaking respondents is that expressions of concern about their children’s vision as a result of increased screen time were much more common than it in the general parent respondent population. One parent was reserved in suggesting, “Maybe it affected his sight a little,” but others were more certain. One parent shared, “I don't like it, studying for long periods on the computer can damage her eyesight.” This is definitely something to reflect on, because unlike concerns about what it means to be social, a much changed phenomenon in the digital age, matters of visual health have surely not evolved much. The measurable benefit of blue light glasses is a topic worth researching in light of such valid concerns, and perhaps a worthwhile preventative measure to implement along with a fully digitized curriculum. However, this represents another cost consideration for low-income families, and another provision that would
need to be budgeted for by the purse string holders in school districts that implement digital learning programs.

Parents Reporting a Household Income Below $45,000

Comments from parents who reported a household income from the two lowest categories, below $25,000 and between $25,001-$45,000, reflected similar academic concerns related to distraction and concentration, as well as more specific academic concerns related to learning behaviors. Some of the more general concerns shared about distraction and concentration came from the same Spanish-speaking respondents included in the paragraph above, and will not be repeated. One low-income parent blamed the lack of adequate supervision in the classroom for these concerns, charging that because of this one-to-one program, “there is more opportunity to do things other than schoolwork and not be monitored.” One agreed that teachers were largely to blame, boldly accusing that learning through laptops “is a good idea if the teachers did their job properly.” Not all parents blamed the teachers, though, as some declared the digital learning program to be problematic at home as well.

One parent expressed that their children’s experience with digital learning from home during the pandemic precipitated “low academic performance, since at home they did not feel with the same responsibility.” Another shared the opinion that their child “became more lazy” because of this program. A few parents in the low-income category were displeased with digital devices in general, complaining of “too much electronic time.” Others tied this displeasure to problems with more learning specific behaviors, one asserting that their “child isn’t retaining information as well as before, too much copy and pasting going on,” and another lamenting “too much cheating.” In addition to these learning-specific behaviors, one parent shared dismay that
the program “caused more arguments with my child.” Another parent, also part of the group who completed the survey in Spanish, noted problems “in the vision” of their child because of the added screen time.

Finally, a couple of parents expressed concern about logistical issues related to the program, with one explaining “our internet service isn't the greatest and if you have no internet, you can't access the books,” and another requesting that “progress reports and report cards to come to the home automatically, especially when doing school online.” It has been some time since progress reports and report cards were mailed to the homes of students, and part of the assumption that prompted that change is that everything being online makes for easier parent monitoring. However, if other matters preclude parents from doing that monitoring, resurrecting mailed progress reports—at least as an available option—may be an issue worth reconsidering.

Parents Who Possess a High School Education or Who Did Not Graduate From High School

The concerns reflected by parents who either possess only a high school education or who did not graduate from high school at all again revealed themes similar to the two demographic categories above, which are similar to those that emerged from the entire population surveyed, regardless of any particular demographic. A few parents again expressed concern with the potential for increased digital device use to cause vision problems. Several expressed concerns centered on academic issues like a decrease in their child’s grades and the possibility that kids aren't deeply learning curricular content because of an increase in cheating and the ease with which assignments can be passed by simply copying and pasting answers. As one parent shared, “I think, they aren’t learning things to retain them. Just memorizing some general facts, take the test, then dump material.” However, though the logistics of copying and
pasting have certainly been facilitated with the advent of digital devices, these concerns about cheating and a lack of deep learning are still not unique to the digital age. These are the same behaviors that have always troubled parents and educators, albeit reinvented. Other concerns expressed by parents in this group (and all groups) were more digital-specific, like logistical concerns about the schools issuing “old faulty laptops that don’t work properly” and having “difficulties with the internet that was interrupted” during the school day. Also noted was how easily students can now be “off task and watching Youtube and playing downloaded video games . . . the student should have everything needed included in the digital format and not be able to go outside the curriculum online.” Again, though, plenty of students were fairly adept at passing notes, doodling, and such back in the good ol’ days. So, this too is a dilemma that has perhaps been exacerbated, but not necessarily introduced by the use of digital devices in classrooms.

Other parents in this category ascribed concerns about their children’s social and emotional well-being to the mandated use of a digitized curriculum. One parent claimed their child “felt he could not do anything right and fell apart emotionally” as a result of the program. Another claimed their daughter “studies, but now feels most teachers act as though she's just a number.” Improving all of these issues, however, may come down to one simple complaint made by a parent in this group (and other groups) about the “lack of proper training for teachers,” and, perhaps, for parents as well. Specific to the shift to at-home remote learning during the pandemic, one parent shared “it was all new and a little hard for me to keep up with 5 kids school work during COVID-19.” This likely would be the case for any parent who found themselves trying to manage the educational goals and activities of five children at once for the
first time. So again, a frustration not specific to the digital. However, the key to all of this may lie in a very simple phrase within this parent’s comment: *it was all new.*

Repeatedly throughout this chapter, parent complaints revealed concerns and frustrations caused primarily by lack of familiarity with the particular software systems used in this district’s one-to-one implementation, distractions and risks experienced by their children because of required use of digital devices, and logistical issues like hardware and network problems. No expressed concerns were unique to any specific parent demographic. However, the times are a-changin’, and they always have been. What seems most clear in considering how to move forth effectively with both existing and future digital learning programs is that significant education and continued conversation needs to occur among all stakeholders—parents, teachers, students, and school officials—to help school communities better navigate the changes of the digital age. Granted, as mentioned earlier, these changes occur with such speed that it is exceedingly difficult to completely keep pace with them. But there are absolutely disparate paradigms of thought among these players about how we should now work and relate to one another, and these chasms must be addressed and merged if we are to move forward successfully and bridge ever-widening generational gaps. It is the persistence of opposing mental models that seem to be causing the greatest difficulty within digital learning programs designed to prepare children for a very changed world. In the next chapter, I will discuss recommendations for moving forward based on analysis of the quantitative and qualitative data generated by this study, as well as suggestions for future studies within the context of the digital divide and digital learning.
CHAPTER 6: CONCLUSION

Limitations of the Study

All human efforts have blindspots. This study is no different, and I would like to explicitly name its limitations, both the inherent and those born of later realized oversight or imperfect design. First, this study was completed during the most unprecedented moment in recent history, a moment that also happened to very specifically affect parent opinions of digital learning, the central topic of this study. Because of the shutdown of schools due to the Covid-19 pandemic, for the first time ever, almost every parent across the nation became forcibly entangled in a digital, remote learning program of some form. As to be expected during a time of great fear and uncertainty, parent emotions were heightened at the time the DDPPS was administered, and their opinions about digital learning were particularly acute.

So, despite the aim of this study to garner input on the digital learning program in place before the pandemic, and despite all but one survey question asking about only the program through which laptops were issued to all students before the pandemic—a program in place for several years at all schools whose parents were surveyed—many survey respondents could not divorce this existing program from the remote learning program newly put in place when schools closed. As a result, many parent responses intensely and passionately targeted a specific version of the one-to-one device program that had been significantly altered by the emergency circumstance of Covid-19. And though most public schools have returned to offering full-time face-to-face instruction, many families have newly chosen to continue with virtual schooling. Because every parent and every student has now experienced it, the distance learning landscape
has been forever changed. It is no longer the obscure pocket program it once was, selected only by a very small percentage of students and families with very unique needs and lifestyles. So though this conflation of programs by parents in their DDPPS responses is cited here as a limitation, it can also offer a much broader perspective on the now more normalized phenomenon of remote learning in the K-12 arena.

Another limitation is that despite concerted efforts to minimize the reading level of the survey to make it accessible to all, some respondents simply did not answer the questions being asked. As discussed in Chapter 3 regarding the development of the qualitative survey instrument, the DDPPS was recursively revised using the spelling and grammar check feature in Microsoft Word until the Flesh-Kinkaid readability index was reduced to a sixth-grade reading level. It was difficult to reduce the readability any further, so this limitation may have been the result of some parents having difficulty reading the questions, which likely occurs on many open-ended survey questions. However, as just mentioned, this inherently historic moment may also have prompted some respondents to simply use the DDPPS as an opportunity to vent extreme frustration with digital learning unrelated to the one-to-one device program in place prior to the pandemic. The information gleaned from such parents is certainly useful, but must be interpreted through the lens of a different research question.

Finally, and regretfully, I was struck late by the irony of a flaw in the design of the dissemination of my survey by a parent comment from one of the open-ended questions. This parent wrote about the program, “Parents must understand and have access to technology to even track their student’s progress. Think about the generational families - the grandparents that take care of their grandkids but aren’t technologically savvy.” The disappointment I experienced in
reflecting on this comment is best represented by another parent response, previously quoted in this dissertation: “Duh.” I should have done better. Survey respondents in this study obviously had to have access to technology, as well as the savvy to use it in order to participate. Grandparents, the homeless, those without Wi-Fi either on a cell phone or at home (despite hotspots being offered for free by the district) are voices that were unintentionally excluded from this study, but important to its fullest execution. Additional survey and/or interview methods could be employed in future related studies to secure the input of parents and guardians in these particular categories, but any such additions or adjustments would have to be weighed and designed cautiously to avoid introducing bias into the methodology.

**General Answers to Research Questions**

As with many investigations of programs that attempt to quantify or present absolute truths regarding the human condition, this study generated perhaps more questions than it answered. The first research question set forth in this study asked whether this one-to-one digital device program impacts student scores on the FCAT/FSA ELA Reading and Writing, the Advanced Placement (AP) English Language and Composition exam, and the Advanced Placement (AP) English Literature and Composition exam in high schools of varying socioeconomic status. The purely mathematical answer to that question is that it did not. Based on the analysis of the data conducted in this study, there was no statistically significant movement of scores either within or between SES groups. But, as discussed in the previous chapter, the effect sizes were quite large, suggesting possible value in further study of individual student scores, or study of a much larger number of socioeconomically categorized and similar
one-to-one implementations. Evidence supporting future studies aside, however, this study reveals only that a comprehensive one-to-one laptop program cannot be decisively declared to either improve or harm test scores based on the SES of a school community, nor will it reduce the achievement gap between them. A one-to-one laptop program is neither a solution to nor a perpetuator of the academic digital divide.

The second research question set forth asked to what extent does the socioeconomic status of a high school relate to the attitudes and beliefs of students and families towards this one-to-one digital device program and its potential impact on student achievement and learning? Again, no alarming distinctions were discovered in the survey responses of 250 parents representing both English- and Spanish-speakers, and all levels of education and income. If anything can be said at all, Spanish-speaking parents responded with much more gratitude and positivity on the whole than their English-speaking counterparts, and parents at the highest income and education levels responded with more complaints. A sign of privilege and entitlement? Perhaps. Finally, affirming similar findings in a previous study (Katz et al., 2019), this study revealed that parents who currently use the internet for very limited and entertainment-driven purposes tend to have the most negative take on this district’s one-to-one program, and on their own ability to support their children in it. Generally speaking, however, similar complaints and commendations were made by parents across all demographic categories.

With no alarming discoveries being made in either the quantitative or qualitative approach to answering the question of the impact of one-to-one laptop learning programs, how do the results of this study fit into the body of existing digital divide literature, especially as such literature relates to education and one-to-one digital device programs in schools? This was
essentially the third research question set forth in this study. And as discussed earlier, some existing studies suggested the potential for such programs to make matters worse (Stone, 2016; Warschauer, 2005; Warschauer et al., 2014; Zheng et al., 2016), so this study should assuage those concerns. The findings of this study should allow school leaders to feel more confident moving forward with such digital learning programs, as the world certainly calls for more digital prowess with each passing day. Throughout the data analysis phase of this project, however, many questions related to more tangential digital divide research surfaced that could serve as grounds for future research.

**Areas for Future Study**

*Did schools with existing one-to-one programs see less learning loss during the pandemic?*

As was discovered in the general parent responses to Q20, most parents felt strongly that the mandated shift in this district to remote, digital learning at home during the pandemic was made easier because this one-to-one laptop learning program was already in place. Obviously, not all parents, students, and districts were so fortunate. Throughout much of 2020 and into 2021, national news broadcasts reverberated with stories of parent frustrations and absolute instructional shutdowns in schools across the country. Because of the complexity of the situation—parents were sick, teachers were sick, people were dying, and everyone was afraid—learning losses were certain to occur in all environments. However, it may be worth investigating whether those losses were less severe in districts that had already implemented fully digitized curricula and/or laptop learning programs prior to the mass shutdown in March of 2020.
How does a one-to-one digital device program impact student literacy achievement according to socioeconomic status?

Though data analysis in this study found a lack of statistical significance in the movement of standardized test scores across all years and school SES categories, the existence of very large effect sizes suggests that statistically significant results may simply not have been detectable within such a small sample size. Because the small sample size regarding the number of SES categories \((n = 3)\) may have underpowered the data analysis, statistical significance could possibly be found with a larger sample size. This finding provides support for further study of the matter on a larger scale with a greater number of schools, although the difficulty with this is neutralizing the many variables discussed with previous studies. Another possibility is to shift the sample from categorized school communities to student specific data at multiple schools within this same district. Having access to individualized, student-specific data would also allow a study that leans further into van Dijk’s (2020) resources and appropriation theory, to evaluate for achievement differences based on the personal categorical inequalities he cites such as cognitive intelligence, age, gender, ethnicity, personality, and health/ableness, as well as the positional categorical inequalities he cites such as education, labor, household, and social network. Investigating possible correlations between academic achievement and these measures at the individual level, rather than as aggregates of a school community, would certainly lend further insight into this matter.

The Role of The Teacher in Newly Implemented Digital Learning Programs

There was some concern at the outset of this project that representation of the teachers involved in the implementation of this digital learning program was noticeably absent. This
omission was intentional from the beginning, however, as this study sought to focus specifically on the impact of the digital on marginalized communities, and on the perspectives and voices of parents from such communities. However, there is obviously space for countless more education-focused studies to investigate the role of the teacher in digital learning. Studies might home in on how teacher training and years of experience impact methods of instructional delivery, levels of parent and/or student satisfaction, or measured levels of student achievement in this particular one-to-one digital device implementation. Such elements have been the focus of other studies, and as with other elements, the size, scope, and consistency of this particular one-to-one implementation offers a field of study that eliminates the variables or lack of data that have likely clouded the results of previous studies.

Changing notions of materiality, space, place, and presence are also areas of study in the digital humanities that are worth investigating specific to the remote learning program enacted in this district during the Covid-19 pandemic. As mentioned previously, there is a disconnect between generations regarding what it means to be present, with older generations associating presence with the need to be in the same physical space at the same time. Today’s teens, however, can very much feel “with” one another via an exclusively digital presence when connected by digital devices. This disconnect can cause parents to lack faith in the viability of online digital learning. Another issue related to presence, space, and place as related to online teaching and learning is the disassociation some students and parents feel with the very humanity of their teachers. They equate their teachers with the digital interface through which they interact with them, and essentially “forget” they are also human flesh and blood. This is a problem. For
one thing, it can lead to unrealistic and non-human-centered expectations of teachers, which, interestingly, is a concern presented by one parent in response to the DDPPS. This parent shared:

some teachers now feel like kids have access to work 24/7. Some teachers have work due by 7pm the same day assignments are given. This discourages and penalizes extra-curricular involvement. What about the kids who have sports or music or art or theatre after school? What about the kids that go to extended care? What about the high schoolers who work?

This idea of unrealistic communications expectations caused by the digital is not new (Bailie, 2014; Birkerts, 2015; Selber, 2004), though it has not been extensively researched in the K-12 arena, and would be a worthwhile venture.

**Recommendations**

While this study engaged complex issues of agency and authority and a school’s role in leveling society-wide and longstanding inequalities, some simple and clear logistical recommendations did emerge. Future implementations of one-to-one digital device programs would be wise to consider several things. First, leaders must contend with the possibility that requiring student use of lesser devices may negatively impact learning for those who already have quality laptops. A simple solution to this, which the district targeted in this study has begun to explicitly allow, is to allow for what is often referred to as BYOD, or Bring Your Own Device, whereby students are allowed to use their own personal digital devices as long as the devices meet certain standards and parents allow the same software programs to be installed. If efficiently planned and managed, the assimilation of BYOD into a one-to-one program in which
a significant percentage of students plan to use their own devices might even allow for the purchase of fewer, but more high quality devices for those in need.

A second recommendation is to comprehensively revise program-wide instructional plans that do not already include facilitating student mastery of basic computer literacy skills. These may include skills such as typing, document saving, copying and pasting, and reference citing that teachers often incorrectly assume students possess. Such a plan should be vertically aligned, whereby a progressively complex set of skills is ascribed to each successive grade level, as well as horizontally aligned, meaning all teachers across a single grade level should be working to support the same skills. Third, there must be more and better teacher training. More adept instructional leaders might be appointed to create generic shells of digital learning environments that will provide interface and organizational consistency for students and parents, as well as flexibility for teacher implementation based on varying levels of technical skill. Fourth, parent training must at least be made available to parents whose lack of technical expertise renders them less than confident in helping their children with newly digitized learning. As mentioned multiple times in this dissertation, school library media centers provide an excellent forum for this type of community outreach, and school library media specialists are excellent candidates to engage in the development and delivery of such programs.

Though some of the recommendations above seem practical and simple, many of the questions herein and those that remain surrounding this one-to-one digital device program can certainly be considered to be questions of ethics. Questions of ethics are never simple. Is it ethical for students of greater economic means—by no choice or doing of their own—to be prevented from using digital devices already in their possession because they are of superior
quality to school-issued devices, in the name of equality and leveling the playing field? Is it ethical to close the divide by intentionally stunting the growth of those who currently hold the advantage? Is it ethical for school leaders to declare that the digital skills and behaviors of certain parents on the margins are not good enough—who is to say what people should know? Is it ethical for school leaders to have the authority to unilaterally grant children access to the wanton World Wide Web? Or should that authority remain with parents, regardless of whether those parents belong to a demographic that has been found to interfere with children’s opportunities for success (as defined by the powers that be)? And, lastly, in this uber-connected world, is it ethical to require students to participate in a program whose by-product is the collection of data and generation of a digital fingerprint for each and every student that could conceivably catch up with them down the road? A fingerprint they are likely completely unaware they are creating? Where is all of the information generated by these students going? Was there a plan in place for its protection? There are so many questions of data ethics and of digital ethics, yet there is little evidence that such issues were planned for, or that the developers of this program engaged theorists in this field prior to its design. I cannot say with certainty that this is the case, but future implementations should certainly present clear evidence of a theoretical ethics foundation to their programs.

Theories are often developed through the collaboration of experts that engage in observation of a phenomenon over time. As eloquently stated by Kaptelinin and Nardi (2006), whose work explores the transformative effects of digital technology use in social contexts, “theory gives voice to multiple points of view by inviting—or rather demanding—critiques, revisions, and reformulations. To eschew theory is to endorse a unitary point of view” (p. 23).
The very purpose of this one-to-one program was to ensure that educational opportunity is distributed equally to students with multiple points of view, and not exclusively those blessed by circumstance to be primed to take advantage of opportunities. A unitary point of view will not achieve that end, especially in a district with such a diverse student population as the one in this study, underscoring the need for sound theory at the core of any comprehensive overhauls of the instructional system. As discussed in Chapter 5, insisting on particular understanding of theories of the digital divide put forth by scholars such as Selwyn (2004), van Dijk (2020), and others prior to the implementation of this program would have been prudent. But the ethical implications of such an implementation—those of which we are aware and those of which we may not yet be—demand a better understanding of how to pragmatically apply theories of digital ethics for all future implementations moving forward.

When I initially conceived of this study, I imagined it being a pragmatic source of data for other school districts and leaders in evaluating whether to move forth with a similar one-to-one digital device implementation of their own. The more I considered the possible uses of the information generated from such a large body of data, the more I became excited about the far-reaching predictive potential of the results of this study. As a result, I coded a very crude machine (see Figure 40, next page) based on historical test scores that simply predicted whether aggregate scores would increase or decrease in a given school after the implementation of a one-to-one digital device program, based on the demographic characteristics selected from two available drop-down menus: average household income of students and the level of school—elementary, middle, or high. I had grand plans for the fuller development of this machine.
While it was fun to watch my clumsy coding in action, however, my excitement became concern. It is clearly problematic that such a drastic, mechanistic reduction of a diverse community of living and breathing children could theoretically determine the distribution of resources to it. Further, a more complex machine could easily be built to incorporate many other demographics such as home language, race, gender, etc., and the use of predictive analytics to determine which educational opportunities should be made available to or withheld from students based on cold computation of such characteristics is limiting at best. As an example, the use of predictive algorithms at some community colleges has automatically identified males of specific races and reported income levels as being “at-risk.” As a direct result of this algorithmic
labeling, these men were offered certain support services that also inadvertently limited their access to more advanced courses. Their agency was surrendered, at least in part, to a mathematical formula. Clearly, this end is reductive and ethically jarring, despite the benevolent aims of the initial analysis. Predictive analytics can result in the opposite of what equitable educational opportunity is about.

Reflecting on the potential for problematic applications of such tools is what first brought me to question if any formal consideration of ethics was part of the planning of this district’s one-to-one program. The Florida Department of Education (FLDOE) does explicitly identify four domains of expectations for school leaders, the fourth of which centers on ethics. As just mentioned, however, I was able to find no documentation of attention given to theories of digital ethics during the development of this program, though I cannot state with certainty that such theoretical underpinnings are absent. I can share only that the publicly available historical materials delineating the genesis of this project cite no such research, and reflect a more narrow and pragmatic focus on financial, logistical, and curricular matters. In retrospect, the lack of a clear and intentional ethics in the development of such a broadly implemented educational program seems incredibly imprudent, because even programs designed with benevolence may not always result in benevolent ends, particularly in the digital age.

In this era, digital ethicists should be positioned to answer the call from digital divide scholars for an action-oriented path forward in policy-making efforts regarding the ethical implementation of digital technologies in various environments (Selwyn, 2004; van Dijk, 2005; van Dijk, 2020). Societal inequalities have always generated questions of ethics, and one-to-one laptop programs like the one in this study exemplify educational policy aimed at reducing such
inequalities. Like parents and educators, however, contemporary ethicists can have disparate perspectives on what constitutes the best ethical approach to mitigating the concerns of the digital divide, sometimes theorizing without providing guidance grounded in applicable ethical concepts. Despite the highly theoretical nature of formal ethics, equity and ethics are inextricably linked, and in this highly digitized society, K-12 school leaders “must come to grips with digital ethics” (O’Brien, 2020) to support more thoughtful and effective tech-oriented policy-making.

Luciano Floridi’s (2013) framework for the ethical use of information—arguably one of the first developed—is based on the suggestion that the digital has not necessarily changed the world, but has rather revealed novel ways of understanding it. Especially because of the speed with which environments change in the information age, he relates developing an ethics of information to "building the raft while swimming" (Floridi, 2013, p.2), and asserts that it requires an understanding of a completely new level of abstraction, the frame of reference through which a person observes, experiences, and understands a phenomenon. He argues that because “our understanding and conceptualization of the very essence and fabric of reality is changing” (p.17), we must begin to situate humanity and the realm of the natural in a symbiotic ecological relationship with the artificial. We must conceive of man and machine in one, rather than man versus machine as discrete entities. All elements of this symbiotic relationship, Floridi claims, can be understood as units of information that comprise an infosphere in which all elements have some degree of agency. And while efforts should certainly be made to encourage students, parents, and educators to critically evaluate their own agency in this new and highly digitized world, to say that fully arriving at this brand of understanding would be a hard-won shift in the K-12 world is a gross understatement. Somewhat akin to the previous suggestion that parents
must come to new understandings of what “real” and “social” mean in the digital age, Floridi’s notion of a true information ethics requires an even greater leap to abandon everything we have always trusted about the world. It requires that we deny the pathos of nostalgia and adopt a strictly cerebral path forward in evaluating digital media if we hope to create a world in which information is overwhelmingly used for the good. However, even if this is the best route to ethically implementing a schoolwide digital program, it is not a realistic short-term goal for the general population.

In contrast to Floridi’s ethics of information, Beever et al. (2020) promote an ethics of the digital, a much more humanistic contextualization. Though Floridi makes compelling arguments that can certainly be built into an applied ethics, his conceptualizations retain too theoretical a positionality. Like Floridi, Beever et al. posit that because the amount of information that exists can now double every two years and flows at a rate faster than the human brain can process, the digital presents challenges that traditional forms of media have not. However, their model is immediately actionable in human-centered contexts like the public school district targeted in this study, and aims to represent the interests of as many perspectives as possible. Beever et al.’s approach is grounded in virtue ethics which “depends upon complex social dynamics” (p.34) and virtues “developed in conjunction with the communities of which we are a part” (p.35). This makes their framework of digital ethics a particularly appropriate response to van Dijk’s (2020) expressed concern that, like the digital learning program explored in this study, any top-down inequality mitigation program implemented “without taking into account the local culture is bound to fail” (p.153). If van Dijk is correct, the long-term success of this district’s one-to-one
program demands that school leaders take seriously and act on the parent perspectives elicited from this study.

Regarding the use of digital tools, Beever et al. (2020) cite a multitude of ethical concerns, and warn that “most algorithms are authored by humans, introducing the possibility of human bias and error into the instructions followed by the algorithms” (p. 81). Humans will always construct code from their own situated perspectives, so unless we actually create the technologies and digital programs we use each day, we are forced to accept and emulate both the explicit values and unintentional oversights of the designers and organizations that do create them. Another significant ethical concern of the digital is that even the morally abhorrent can find a digital community that will support and advance their views, and it is nearly impossible to monitor online discussion boards and communities in which hate speech and discrimination may run rampant. This echoes sentiments of many parents in this study, essentially voiceless in the design and implementation of this one-to-one program, who expressed concern about the access and exposure to inappropriate content that school-issued devices have granted their children.

Future implementations of similar one-to-one programs built through the model of applied digital ethics proposed by Beever et al., however, can begin to do work to mitigate digital social injustices. Floridi (2013) may not offer a direct practical application of his concept of ethics, but he does provide a clear and astute warning that if left unchecked, the digital divide will become a chasm, generating new forms of discrimination between those who can be denizens of the infosphere and those who cannot, between insiders and outsiders, between information rich and information poor. It will redesign the map of
To prevent such an unjust remapping, Beever et al. (2020) propose three practicable steps to ethical decision making: 1) identify moral problems and facts; 2) ask the right questions; and 3) make decisions through argumentation. Following these three steps while ensuring the inclusion of as many perspectives as possible from the greater school community, particularly those from marginalized populations, provides both a theoretically sound and actionable path forward for school leaders making decisions in the digital realm.

Complicating matters in the digital age is the very real possibility that by the time a situation has been evaluated thoroughly enough to decide the most ethical path forward, the situation may have changed, and the same players may no longer be involved. Further, the vast social, cultural, and political differences in what qualifies as ethical in an increasingly connected world make arriving at consensus a greater challenge than ever before. As such, it is critical that school leaders who wish to enact ethical practices in digital environments do so swiftly, and through collaborative efforts that enlist the value standpoints of individuals of differing personal and positional characteristics. With regard to the specific one-to-one implementation in this study, the ship has obviously sailed on the opportunity to engage the parent community in the initial design of the program, but the most ethical path forward calls for school leaders to seek parent input on any modifications to the program.

Beever et al.’s (2020) three steps do, however, provide a clear ethics-oriented deliverable to leaders in other districts in the nascent stage of implementing a one-to-one program, or who are looking for information on whether to implement such a program at all. Such leaders should
begin by explicitly discussing an applied digital ethics from the outset, including diverse representation of their parent and student communities in program design. By enlisting broader communities of engagement in planning and design, educational leaders concerned with justice oriented policy-making efforts and programs can certainly better create programs that will enable marginalized student communities to obtain more forms of social and technological capital. Including parents and students in the actual design of the digital tools to be used in the classroom would be the ultimate realization of participatory design, but it is also likely an impractical ask at this point. However, when implementing such a comprehensive digital learning program, school leaders can and should develop a curricular plan that mandates instruction towards basic procedural or critical digital literacies (Bogost, 2010; Selber, 2004) for all students. Despite failing to include parent and student perspectives in the original design, vowing to arm students with an astute awareness of the ontologies of the digital school environment they are now required to navigate, and thus a greater ability to think and act critically and ethically within that environment, would certainly move this district towards a more ethical administration of this program.

**Closing Thoughts**

When analyzing the results of programs that aim to mitigate the problems of inequity based on characteristics like income, education, and language, such as the one-to-one laptop program in this study, it is important to remember that definitions of success can vary greatly. Some will view any gains made by those in marginalized communities as a success, whether or not the rich have also gotten richer. For instance, with regard to this particular one-to-one
program, some will applaud the extensive digital experience provided to countless students whose economic circumstances would otherwise preclude them from obtaining daily practice with digital technologies, despite no significant closing of the achievement gap. On the other hand, some will insist that absolute gains mean nothing as long as relative inequalities persist or increase. As such, it is certainly also important when implementing such a comprehensive program to determine from its inception—through collaborative, goal-oriented argumentation in a diverse group of representative stakeholders—how such success will be measured.
APPENDIX A – DIGITAL DEVICE PARENT PROGRAM SURVEY (DDPPS)
Digital Device Program Parent Survey

Q0 By completing this survey, you will help researchers and school officials understand how parents/guardians feel about the district laptop/digital learning program. There is a total of 15 multiple-choice questions, and 5 open-ended questions that will take approximately 5 minutes to complete. Your responses will be completely anonymous, and the more details you can share, the more helpful it will be. Thank you for your time and commitment to success for all students!

Q1 Which school does your child currently attend?

A High School
B High School
C High School
D High School
E High School
F High School
G High School
H High School
I High School
J High School
K High School
L High School
M High School
Q2 I would recommend starting this laptop/digital learning program at other high schools.

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree

Q3 I would be happy if this laptop/digital learning program continued in my child's school.

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree
Q4 My child’s motivation and interest in learning improved with this laptop/digital learning program.

Strongly agree

Agree (13)

Neither agree nor disagree

Disagree

Strongly disagree

Q5 Devices like the laptop my child received from their school can make students more interested in their schoolwork.

Strongly agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

Q6 Devices like the laptop my child received from their school can make it easier for students to learn.

Strongly agree

Agree

Neither agree nor disagree

Disagree
Q7 Devices like the laptop my child received from their school may damage eyesight, reduce face-to-face communication, or deprive them of exercise.

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree

Q8 Devices like the laptop my child received from their school may lead to distraction or video game addiction.

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree
Q9 Devices like the laptop my child received from their school may result in unequal access to educational resources at home.

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree

Q10 Devices like the laptop my child received from their school can improve student communication skills.

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree

Q11 Devices like the laptop my child received from their school make it easy for students to do schoolwork anywhere.

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree

Q12 I am just as able to help my child with homework on their school-issued laptop as I was before this laptop/digital learning program.

Strongly agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

Q13 Which of the following best describes how you use the internet?

Every day, for both entertainment and information seeking/professional purposes

Every day, mostly for information seeking or professional purposes

Every day, mostly for entertainment

No more than a few days each week

Rarely or not at all
Q14 Which best describes the highest level of education completed by the adult in your household that usually helps your child with homework?

Some high school
Graduated high school
Earned college degree
Earned graduate/professional degree

Q15 Which of the following best represents your total household income?

Below $25,000
$25,001 - $45,000
$45,001 - $65,000
$65,001 - 85,000
$85,001 - $125,000
$125,001 - $175,000
Above $175,000
Prefer not to answer

Q16 Please share any ways in which this laptop/digital learning program has affected your role in your child's education.

________________________________________________________________
Q17 Please share any ways in which this laptop/digital learning program has affected your child.

________________________________________________________________

Q18 Please share how you feel about your child having access to online, digital textbooks instead of hard copy, paper textbooks as a result of this laptop program.

________________________________________________________________

Q19 Please share how this laptop/digital learning program does or does not meet the educational needs of students in this world of constant technological change.

________________________________________________________________

Q20 Please share how your child's experience with this laptop/digital learning program did or did not prepare them for success with remote learning when schools closed due to COVID-19 in March 2020?

________________________________________________________________
APPENDIX B – TRANSLATION VERIFICATION FORM
FORM: Translation Verification

Study Information

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<thead>
<tr>
<th>Protocol Name</th>
<th>Investigator</th>
<th>Primary Contact</th>
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<td>One-to-One Digital Device Implementation</td>
<td>Thorusia Gindlesporgan</td>
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Translation Information

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<th>Language(s) of Translation</th>
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Language Proficiency

- Fluent in Written English
- Fluent in Spoken English
- Fluent in Written Language(s) of Translation
- Fluent in Spoken Language(s) of Translation

List any qualifications, skills or experience for serving in this role: FL state-certified educator in Spanish and English for Speakers of Other Languages, English Language Learners Support Lead Teacher

Documents Translated

- Informed Consent Document
- Recruitment Flyer
- Recruitment Letter
- Survey
- Interview Questions
- Other (Specify)

Translator Acknowledgement

I certify that the provided translation is true, accurate, and correct to the best of my knowledge and ability. I have no affiliation or conflict of interest (financial or otherwise) with this study.

Translator Signature [Redacted] Date 4/6/21
EXEMPTION DETERMINATION

April 8, 2021

Dear Theresa Gindlesperger:

On 4/8/2021, the IRB determined the following submission to be human subjects research that is exempt from regulation:

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<tr>
<td>Investigator</td>
<td>Theresa Gindlesperger</td>
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<tr>
<td>IRB ID</td>
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<td>Documents</td>
<td>Faculty Adviser Review Document, Category: Faculty Research Approval;</td>
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<td>Reviewed</td>
<td>Explanation of Research, Category: Consent Form;</td>
</tr>
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<td>Gindlesperger - Request for Exemption, Category: IRB Protocol;</td>
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<td>List of databases and variables being accessed, Category: Other;</td>
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<tr>
<td></td>
<td>Survey email script, Category: Recruitment Materials;</td>
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<td></td>
<td>Translation Verification Form, Category: Translation Verification;</td>
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<td></td>
<td>Word download of Qualtrics parent survey, Category: Survey / Questionnaire</td>
</tr>
</tbody>
</table>

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made, and there are questions about whether these changes affect the exempt status of the human research, please submit a modification request to the IRB. Guidance on submitting Modifications and Administrative Check-in are detailed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system. When you have completed your research, please submit a Study Closure request so that IRB records will be accurate.

If you have any questions, please contact the UCF IRB at 407-823-2501 or irb@ucf.edu. Please include your project title and IRB number in all correspondence with this office.

Sincerely,

Katie Kilgore
Designated Reviewer
EXEMPTION DETERMINATION

June 4, 2021

Dear Theresa Gindlesperger:

On 6/4/2021, the IRB determined the following submission to be human subjects research that is exempt from regulation:

<table>
<thead>
<tr>
<th>Type of Review:</th>
<th>Modification / Update, Modification / Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title:</td>
<td>Case Study: A One-to-one Digital Device Implementation and Its Effect On The Digital Divide</td>
</tr>
<tr>
<td>Investigator:</td>
<td>Theresa Gindlesperger</td>
</tr>
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<td>IRB ID:</td>
<td>MOD00001905</td>
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<td>Funding:</td>
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<td>Grant ID:</td>
<td>None</td>
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<td>Documents Reviewed:</td>
<td>• Explanation of Research (English only), Category: Consent Form; • Explanation of Research (Spanish only), Category: Consent Form; • Gindlesperger - Request for Exemption, Category: IRB Protocol; • Survey email script, Category: Recruitment Materials;</td>
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This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made, and there are questions about whether these changes affect the exempt status of the human research, please submit a modification request to the IRB. Guidance on submitting Modifications and Administrative Check-in are detailed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system. When you have completed your research, please submit a Study Closure request so that IRB records will be accurate.

If you have any questions, please contact the UCF IRB at 407-823-2901 or irb@ucf.edu. Please include your project title and IRB number in all correspondence with this office.

Sincerely,

Gillian Bernal
Designated Reviewer
APPENDIX E – SCHOOL DISTRICT IRB APPROVAL
Application to Conduct Research
Research Notice of Approval

Approval Date: 05/18/2021
Expiration Date: 05/17/2022
Project Title: Case Study: A One-to-one Digital Device Implementation and Its Effect On The Digital Divide

Requester: Mrs. Theresa Gindlesperger
Sponsoring Agency/Organization/Institutional Affiliation: University of Central Florida

Thank you for your request to conduct research in [Redacted] We have reviewed and approved your application. This Research Notice of Approval (R-NOA) expires one year after issue date, 5/17/2022.

Additionally, we have received principal approval from the following school(s) to participate in your study:

- [Redacted] Principal [Redacted]

If you are interacting with [Redacted] staff or students, you may email the school-based administrators who have indicated interest in participating, including this notice as an attachment. After initial contact with applicable administrators, you may email any necessary staff included in your application. This approval notice does not obligate administrators, teachers, students, or families of students to participate in your research study/project; participation is entirely voluntary.

Badges are required to collect data virtually or in person at any campus or building, including virtual interviews/focus groups and virtual class observations.

You are required have in your possession the following items with you every time you conduct a research activity:

1. Copy of your R-NOA (research notice of approval)
2. [Redacted] badge

You are responsible for submitting a Change/Renewal Request Form to this department prior to implementing any changes to the currently approved protocol. If any problems or unexpected adverse reactions occur as a result of this study, you must notify this department immediately. Allow 45 days prior to the expiration date, if you intend to submit a Change/Renewal Request Form to extend your R-NOA date. Otherwise, submit the Executive Summary (along with the provided Cover Page) to conclude your research with [Redacted] and within 45 calendar days of the R-NOA expiration. Email the form/summary to research@[Redacted] All forms may be found at this link.

Should you have questions, need assistance or wish to report an adverse event, please contact us at 2019.07.31
research@net or by phone at

Sincerely,

Ph. D.
Director, Research and Evaluation
Public Schools

2019.07.31
REFERENCES


Bergmann, H. (2001). "The silent university": The Society to Encourage Studies at Home, 1873-


https://www.ocps.net/departments/multilingual_services


https://eric.ed.gov/?id=ED591339


Hammond, T., Watson, K., Brumbelow, K., Fields, S., Shryock, K., Chamberland, J., Barroso, L., de Miranda, M., Johnson, M., Alexander, G., Childs, M.D., Ray, S., White, L., Cherian, J., Dunn, A., & Herbert, B. (2020). A survey to measure the effects of forced transition to 100% online learning on community sharing, feelings of social isolation,
equity, resilience, and learning content during the COVID-19 pandemic. Available electronically from

https://oaktrust.library.tamu.edu/bitstream/handle/1969.1/187835/EngrEdSurveyTechnica
lReportFinal2.pdf?sequence=6&isAllowed=y


https://hdl.handle.net.eu1.proxy.openathens.net/2027/heb.05711


History of Florida's statewide assessment program. (n.d.) Florida Department of Education.

http://www.fldoe.org/accountability/assessments/k-12-student-assessment/archive/history-fl-statewide-assessment/


Jansen, H. (2010). The logic of qualitative survey research and its position in the field of social
research methods. Retrieved from


https://doi.org/10.9734/BJAST/2015/14975


In T. L. Heafner, R. Hartshorne, & T. Petty, (Eds.), Exploring the effectiveness of online education in K-12 environments (pp. 86-107). IGI Global.


https://doi.org/10.1080/1369118X.2017.1379551


LaunchEd Family Technology Handbook. (n.d.) Retrieved from


Scherer, R. & Siddiq, F. (2019). The relation between students’ socioeconomic status and ICT


Unemployment rates and earnings by educational attainment. (2019, September 4).


